Mónica Sofia Santos Mendes
Mestrado em Comunicação Educacional Multimédia
Licenciatura em Design de Comunicação

ARTiVIS
Arts, Real-Time Video and Interactivity
for Sustainability

Dissertação para obtenção do Grau de Doutor
em Media Digitais

Orientador: Nuno Manuel Robalo Correia, Professor
Catedrático, Faculdade de Ciências e
Tecnologia da Universidade Nova de Lisboa

Co-orientadora: Sílvia Lamy Tavares Chicó, Professora
Catedrática, Faculdade de Belas-Artes
da Universidade de Lisboa

Júri:

Presidente: Prof. Doutor António da Nóbrega de Sousa da Câmara
Arguentes: Prof. Doutora Christa Sommerer
Prof. Doutor Pedro Sérgio Oliveira Branco
Vogais: Prof. Doutora Maria Teresa Caeiro Chambel
Prof. Doutor Paulo Bernardino Neves Bastos
Prof. Doutora Teresa Isabel Lopes Romão

FACULDADE DE
CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Outubro 2012

ARTiVIS
Arts, Real-Time Video and Interactivity for Sustainability

Mónica Sofia Santos Mendes

ADVISOR

Nuno Manuel Robalo Correia, PhD

Full Professor | Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa

CO-ADVISOR

Sîlvia Lamy Tavares Chicó, PhD

Full Professor | Faculdade Belas-Artes, Universidade de Lisboa

*Thesis submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Digital Media*

Lisbon, 2012

ARTIVIS

Arts, Real-time Video and Interactivity

for Sustainability

by Mónica Mendes

with Professor Nuno Correia as advisor
and Professor Sílvia Chicó as co-advisor

Lisbon, October 2012

Dedicated

to my Family,

to my Advisors Nuno Correia and Sílvia Chicó,

to Pedro Ângelo,

to Asiima, Rosa, and Shrilekha,

and to Meco.

Acknowledgements

ABSTRACT

ARTiVIS » Arts, Real-Time Video and Interactivity for Sustainability

This thesis proposes to investigate innovative concepts and design methods regarding the use of real-time video as raw material for artistic exploration on environmental causes. In this exploratory project and practice-based research, we can also play a role as promoters of change in people's behavior regarding forest protection.

Can Digital Arts foster awareness and respect for nature? As a step in answering this question, we seek to contribute with a constructive approach to the destructive dynamics of fire that aggravate climate change, by addressing artistic, scientific and technological dimensions of the challenging issues explored in this research.

In order to test and progress the ARTiVIS research project, interactive installations using real-time video as raw material were created. *B-Wind!*, *Hug@ree* and *Play with Fire* were the three ARTiVIS experiences developed, publicly presented and evaluated in the scope of this research. *B-Wind!* focuses on the poetry of the movement to bring attention on how local action can have consequences in remote places; *Hug@ree* enhances affection through the physical contact with nature and on how individual action can collectively become so relevant; *Play with Fire* explores the paradox between the aesthetic wonder and the consequences of forest fires. The ARTiVIS system accomplished in the scope of this research is also comprised of the concept design of an online platform and the prototype of an open source forest surveillance kit that will connect to the platform. The aim is to stimulate consciousness and prevention of fire related damages to the forest.

Interviews were conducted in order to validate the theme and to inspire the developments of the ARTiVIS project. The interactive installations evaluation process gradually developed from usability aspects to more subjective issues like environmental awareness. From this process, we infer that these experiences contribute to a feeling of belonging, providing contact with nature and leading to social change through awareness on environmental issues – ultimately, for the design of a more sustainable environment.

KEYWORDS DIGITAL ARTS, EXPERIMENTAL DESIGN, REAL-TIME VIDEO, INTERACTIVE SYSTEMS, FOREST PROTECTION, SUSTAINABILITY

RESUMO

ARTiVIS » Artes, Vídeo em Tempo-Real e Interactividade para a Sustentabilidade

Esta tese propõe investigar conceitos e métodos de design inovadores utilizando vídeo em tempo-real como matéria-prima para exploração artística em causas ambientais. Neste projecto exploratório e investigação baseada na prática, podemos também desempenhar um papel relevante como promotores de mudança no comportamento das pessoas no que respeita à protecção das florestas.

Poderão as Artes Digitais suscitar consciência e respeito pela natureza? Como um passo para responder a esta questão, procuramos contribuir com uma abordagem construtiva relativamente à dinâmica destrutiva dos incêndios que agravam as Alterações Climáticas, com recurso às dimensões artísticas, científicas e tecnológicas dos desafios explorados nesta investigação.

De modo a testar e fazer progredir o projecto de investigação ARTiVIS, foram criadas instalações interactivas utilizando vídeo em tempo real como matéria prima. *B-Wind!*, *Hug@ree* e *Play with Fire* foram as três experiências ARTiVIS desenvolvidas, apresentadas publicamente, e avaliadas no âmbito desta investigação. *B-Wind!* centra-se na poesia do movimento permitindo tomar consciência de como a acção local pode ter consequências em locais remotos; *Hug@ree* evidencia a afectividade através do contacto físico com a natureza e em como a acção individual pode colectivamente tornar-se tão relevante; *Play with Fire* explora o paradoxo entre o encanto da contemplação estética e as consequências dos incêndios florestais. O sistema ARTiVIS concretizado no âmbito desta investigação inclui também o conceito de uma plataforma online e o protótipo de um kit de vigilância florestal de código aberto que vai comunicar com a plataforma. O objectivo é estimular a sensibilização e prevenção de danos relacionados com incêndios florestais.

Foram realizadas entrevistas de modo a validar o tema e a inspirar os desenvolvimentos feitos no projecto ARTiVIS. O processo de avaliação das instalações interactivas evoluiu gradualmente, partindo de aspectos de usabilidade para questões mais subjectivas como a consciencialização ambiental. A partir deste processo, inferimos que estas experiências contribuem para um sentimento de pertença, proporcionando o contacto com a natureza e conduzindo à mudança social através da consciencialização em assuntos ambientais – em última instância, para o design de um ambiente mais sustentável.

PALAVRAS-CHAVE *ARTES DIGITAIS, DESIGN EXPERIMENTAL, VÍDEO EM TEMPO-REAL, SISTEMAS INTERACTIVOS, PROTECÇÃO DA FLORESTA, SUSTENTABILIDADE.*

ARTiVIS
Arts, Real-Time Video and Interactivity
for Sustainability

TABLE OF CONTENTS

IMAGE INDEX

TABLE INDEX

1. INTRODUCTION

A healthy relationship between the evolving human nature and the changing natural world demands the need to iteratively rethink concepts and communication models through the exploration of new forms of expression and emerging technologies. This research proposes innovative design of interactive installations as ways of conceiving both digital media arts and practices for environmental sustainability through practice-based research with a critical attitude and experimental approaches.

Concerned with climate change, especially in what relates to forests and their preservation, in this research we are addressing artistic, scientific and technological aspects of this challenging theme. ARTiVIS[1] – *Arts, Real-Time Video and Interactivity for Sustainability* – is a project that encompasses research with the use of real-time video to protect forests. The project includes a series of interactive installations to raise awareness on the dangers that threaten the forests, the prototype of a hardware kit that will allow people to easily setup and enable the video stream of a forest, and the proposal of a platform that aggregates the real-time video streams together with forest monitoring systems. This research project will be here introduced and further described in later chapters of the thesis.

In this introductory chapter, the motivation and context of the research are specified, then the main questions pursued through the research are posed. Finally we present the objectives and contributions, publications, and an overview of how the thesis is structured, including what was reported and documented.

1.1 Motivation and Context

Forest covers 31% of the planet's total land area[2]. Precious forests have been sacrificed, especially in recent years. Every year millions of hectares of land across the planet are ravaged by fierce forest fires which rage out of control, destroying the environment, crops, homes and, in the worst case scenarios, lives [Viegas09].

---

1   ARTiVIS project website » http: / / artivis.net

2   United Nations, *International Year of Forests* » http: / / www.un.org / en / events / iyof2011 / wp-content / uploads / 2011 / 10 / Fact_Sheet_IYF.pdf

Figure 1.1. Maçal do Chāo, the place where everything started: *Quinta de Santo André* after a forest fire in 1994.

This research is also motivated by a growing number of relevant works that reiterate the power of art exploration and design as an efficient way of spreading a message. Chapter 2 looks at examples of practice, distributed mainly among the categories of "Nature as Art & Art on Nature" (cf. 2.2), "Environmental Activism in Media Arts and Design" (cf. 2.3), and "Community Building and Local Culture" (cf. 2.6).

The reasons for this multidisciplinary research arise from the various areas of interest and research, as well as from the diversified contexts of the author's experience and activities. Three main areas stand out in this case: (1) the will – and the need – for an active approach regarding awareness on the natural environment, (2) the effectiveness of the use of real-time video for informative purposes, and (3) the potential for exploration of the real-time video stream in artistic contexts with demanding challenges in technological issues.

1.1.1 The Natural Environment

Living in places that have been extremely exposed to forest fires like Portugal [Catry07, Silva10], makes us very sensitive to the destruction of forest patrimony by fire hazards, which also applies to a world scale. In fact, "Globally, 95 percent of all fires are caused by various human activities" [FAO04, Silva10]. Despite previous measures [Catry07, Forest09, GMES10, LPN03], an attitude towards prevention prevails pertinent and urgent [AFN12, FAO04, Pedrosa07].

This initial environmental awareness motivation came from direct experience with forest fires:

Figure 1.2. The same *Quinta de Santo André* in 2012, showing the results of a reforestation project 18 years after the forest fire.

I have always been close to forests; in my father's village, there used to be

many forest fires; one particularly touched me: it was huge and powerful,

fascinating, almost sublime! Only it was in our own forest... pine trees,

chestnut trees, olive trees, holm oaks that will not recover in our lifetime

– how devastating, what a pain! Nowadays, my father has a reforestation

project: a whole mountain and the valley for wood production, growing

tree species like cedar, sycamore, cherry, pine, chestnut, oak trees.

Almost twenty years have passed, still another twenty will be needed

to be able to experience a similar sight."[3]

As designers and researchers, we have decided to undertake the challenge of contributing to help humanity in a meaningful way. Contributing for the cause of forest fires prevention is an approach that may ultimately help reduce the climate change threat.

With this research approach and theme proposal, we commit to play a role as promoters of change in people's behavior through environmental awareness for forests protection.

---

3   In About the ARTiVIS project » http:/ / artivis.net / about.html

1.1.2 Real-Time Video as Information Media

Real-time video was first considered from its use for sports practice, when looking at the video stream of webcams that deliver significant visual information on surf conditions, such as the sea waves height, wind visible effects and, obviously, the crowd. This experience could be then extended to other contexts – *What if we use this information functionality for forests protection? Moreover, what about combining this feature with the potential for contemplation?*

In this approach, the real-time video of forests is brought to fruition not only for its immediate function of reporting information, but also for aesthetic contemplation, as windows to nature that will also be the gates to surveillance systems monitored by the ARTiVIS community.

1.1.3 Exploration of Real-Time Video in Challenging Arts and Technology Contexts

The use of real-time video in artistic contexts was also inspired by enjoying the artworks observed in art exhibitions such as *ARCO*[4] (between 2007 and 2011), including works that use real-time video in local networks [Jacinto06], and its unexplored use as remote feed in this scope.

A trigger for this proposal on the technological side was the potential glimpsed in the creation and rise of new programming languages and environments such as *Processing* and *openFrameworks* and physical computing extensions powered by the use of microcontrollers such as *Arduino*[5] that would enable artists to use it. Early artworks by John Maeda [Maeda04] were followed by its broad use in several examples [Watson07, Madeira09, O'Shea09] that are described in the following chapter regarding the state of the art.

1.1.4 Forest Fire Subjective Experience

This chapter is enlightened with interviews quotes – reinforcing and confirming initial assumptions – by people's testimonies corroborating hypothesis, their fears and suspicions.

Structured interviews were conducted to both local people who live by the forests as well as those who own forests in the small village Maçal do Chão in order to assess their position in relation to the ground motivations of this study. The whole region of the area of Serra da Estrela that includes Maçal do Chão has been severely affected by forest fires. This qualitative user analysis enabled us to confirm and to adjust the research based on existing data with the testimony of the people involved. Although these interviews are described and analyzed in detail in the evaluation chapter of this research (cf. 5.3.1), we are

---

4 ARCO – *International Contemporary Art Fair*, Madrid » http: / / www.ifema.es / ferias / arco / default2_i.html

5 These technologies and the URLs are described in the state of the art chapter regarding computer vision and physical computing (cf. 2.5)

here highlighting some of the contents related with the research theme and approach. Quoting their answers to the questions reinforces the assumption of this research to the need for an urgent intervention:

Have you witnessed a forest fire? If so, how did it happen? And what did you feel during and after? "I was concerned. I was helping firefighters with water hoses. The firefighters launched a counterfire. It feels bad".

When asked about forest fire causes and the main reasons for this happening in the region, the respondents' answers varied. Examples included: the drop of a match or cigarette butt, setting fire to forests "on purpose", glass under the Summer heat, farmers burning brushwood. There are even those who claim people are hired to drop flammable items from mid air. The testimony of a helicopter pilot referred to a tight State budget, as well as numerous financial interests behind forest fires.

Regarding prevention methods that were being applied, some were unaware, although others referred to "surveillance by guards in towers and in cars", or that "people should be more cautious when smoking. They should also clean the forests and create new paths in order to facilitate the fire authorities work".

When in the end they were asked: *What do you think of the participation in experiences and artistic approaches in this scope?*, most respondents had no idea of what this represented, and others were unaware of the meaning behind what was being asked, but as a whole they were intrigued and open to the perspective of new ideas that attain the desired goal: "I think it is very good, it fits with what I just said about more information for awareness"; "Everything that can be done in that sense – artistic approaches, engagement – all these means should be used because they mobilize and bring awareness".

This empirical data ends up making evident the same concerns and proposals as the studies and research on this subject, further detailed in the next section.

1.2 Research Questions

Although forest fires have decreased as a result of several initiatives, little attention has been paid to educating and raising awareness among the population, especially when dealing with natural and humanized landscapes with a great environmental and cultural value. Raising awareness on living natural elements around us, and respect for nature, is an essential departure assumption towards contributing to fire prevention for sustainability. Selected procedures include natural regeneration, removal of invasive species and improvement of the natural regeneration using species of high environmental value, and elaboration of a code of good practices on burned area recovery [Pedrosa07].

Beyond institutional campaigns and isolated initiatives, much can be done [FAO04]. Government support is one of the factors that can make a difference when it comes to incentives[6].

On the other hand, "critical weather conditions have recently caused unprecedented damages in economic terms and in number of human casualties. (...) governments are discussing potential options under future climate change conditions that may trigger more dangerous and more frequent forest fires" – in the *5th Forest Day*[7] (coinciding with *COP17*[8]), motivations were clear: "The need for greater awareness of the latest research on Africa's forests is underscored by predictions that the continent will be hit hard by climate change"[9].

As a citizen doing research and art practices, one can also play a role for effective change in people's behavior regarding forests protection: *What are the possibilities of proposing constructive approaches to the destructive dynamics of fire that aggravate climate change?*

1.2.1 Can Digital Arts foster Awareness and Respect for Nature?

A substantive part of the motivation for this research is the relationship between Art and Nature. Moreover, there is also a great potential regarding sustainability.

Original approaches through digital media art works on environmental causes have shown people's engagement and effective impact towards awareness and activism. In this concern, Allan stated (2001) that "one must move from ontology (what is art?) to pragmatism (what can art do?)" [Daniel11, p.56]. Paradigmatic examples are duly described in chapter 2 sections "Multiple Inspirations", "Nature as Art & Art on Nature", "Environmental Activism in Media Arts and Design", and "Community Building and Local Culture", complemented with the references from each of the related work sections in chapter 4.

In this scope, the contributions by artists, designers, researchers, and activists with sustainability in mind – like Terry Irwin, Bruce Mau, John Tackara, Brenda Laurel, Gabriela Albergaria, Edward Burtynsky, Julia Butterfly Hill – are further described throughout the pages of this thesis. Specific artworks and hybrid projects that were very compelling regarding its impact and awareness achieved through art and nature for sustainability – *Nuage Vert, Funky Forest, In Fondo al Mar, Massive Change, 350.org 10/10/10, Refarm the City*, the *Treehugger Project, Games for Change, An Inconvenient Truth* – are also recalled throughout the following chapters. Internationally recognized events in media arts with sustainability and surveil-

---

6   An example is a village in China, that had no uncontrolled fires for over 35 years, since a policy that provided benefits and income from the forests to the villagers was adopted [FAO04].

7   *The Forest Day* has become one of the most influential annual global events on forests. *5th Forest Day*. December 4, 2011, Durban, South Africa, by the *Center for International Forestry Research* » http:/ / www.forestsclimatechange.org / events / forest-day / forest-day-5.html

8   COP17 – *The 17th Conference of the Parties to the United Nations Framework Convention on Climate Change* (UNFCCC) and the *7th Session of the Conference of the Parties* serving as the *Meeting of the Parties* (CMP7) to the Kyoto Protocol » http:/ / www.cop17-cmp7durban.com

9   In *CGIAR Research Program on Climate Change, Agriculture and Food Security* » http:/ / ccafs.cgiar.org / events / 04 / dec / 2011 / forest-day-5

lance as the core goal through themes – such as "Repair" and "Goodbye Privacy" at *Ars Electronica*, "Climate Change as Cultural Demand" in *Transmediale, Art and Activism lecture series* at *Art|Sci*, "The Art of Gathering Environmental Data" in *Pixelache*, "Machine Wilderness" in *ISEA*, "Greater Good" at *SXSW Interactive*, and exhibitions like "The Tree" at the *Getty Museum* and "Sustainable Futures" at the *Design Museum* – are also considered for their contribution towards environmental awareness.

With combinations of artistic explorations and functional purposes like these, can we conceive a project that is both artistic and functional?

Regarding the impact and the potential of art and technology on society and the environment, we aim at creating a "forests showroom" experience through digital media, in order to inspire lifestyle change. The questions, reflections and its challenges can be further refined as follows:

> » Why and how would we contribute with our skills to environmental sustainability practices?
> » Can repurposed surveillance technology bring people together to protect their forests?
> » What about the creative uses of real-time video as raw material for artistic experiments?
> » In which ways are artists, technologists and activists working together using open source technologies?
> » How can anyone become part of a forest surveillance community like ARTiVIS?

Rather than trying to answer all these questions in a definitive way, we also agree with Victoria Vesna that the artist's role is not to answer the questions, but to raise them [Vesna11]. Through the development of this research project, we addressed these issues and possible approaches for solutions.

1.2.2 Objectives of the Research

Building forest surveillance systems to record and make the data available to an open community, ARTiVIS aims to combine visual aesthetics experiments with broadcasting access. Refuting the idea of waiting for dramatic evidence to come, we are actively building on a paradigm shift proposal so that ours and generations to come bring a wiser way of thinking that can contribute towards a better world.

With this proposal, we aim to develop ideas that can become creative and thought-provoking. Through research with a critical perspective and experimental artistic approaches, this practice based research lives at the intersection of Art, Science and Technology. ARTiVIS explores real-time video's technological challenges to offer participants ways to experience and to remotely access the natural environment.

The objectives of the overall research are:

> » To create digital contexts of aesthetic contemplation of nature by exploring the beauty and danger of trees and forest fires.
> » To raise awareness on the natural environment by establishing a bond between people and forests, using technology in artistic contexts.
> » To empower local populations with a way to share the beauty of their forests and help prevent forest fires through monitoring by online communities.
> » To explore new ways to use real-time streaming video of forests for awareness, activism and artistic purposes.
> » To help prevent forest fires by extending surveillance systems to online communities through "the emotion of real-time" monitoring.

In this scope, we are creating interactive experiences that are meant to stimulate awareness and prevention of fire related damages to the forests, while engaging community members to participate with a sense of wonder and enthusiasm.

1.2.3 The ARTiVIS Outcomes

Regarding the impact and the potential of art and technology on society and the environment, we aim to create a "forests showroom" experience, in order to inspire change in the lifestyle of the public. The ARTiVIS outputs are a tradeoff between aesthetic pleasure from contemplative observation and interactive experiments of forests real-time videos. With the goal to promote a more sustainable world through digital media and experimental design, the outcomes of this iterative process include:

» Interactive installations for public exhibition that use real-time video of forests as raw material. These include *B-Wind!*, *Hug@ree*, and *Play with Fire*, the interactive experiences that were implemented in the scope of this project.

» The prototype design of an online video sharing platform, in order to display real-time forests videos and corresponding artistic explorations, working as the ARTiVIS community hub.

» The design of an open source hardware and software *DIY (Do It Yourself) forest surveillance kit* prototype common to all the installations, for repurposing surveillance technology to bring people and their communities together to protect their forests. Resulting video streams and collected data will be uploaded and become part of the online platform network.

All together, we foresee that these interactions provide the experiences of contact with nature contributing to a feeling of belonging, strengthening the relationship with the forest, and leading to local communities growth and empowerment. An overview of the research and dissemination done and the ARTiVIS system outputs can be visualized in the following concept map.
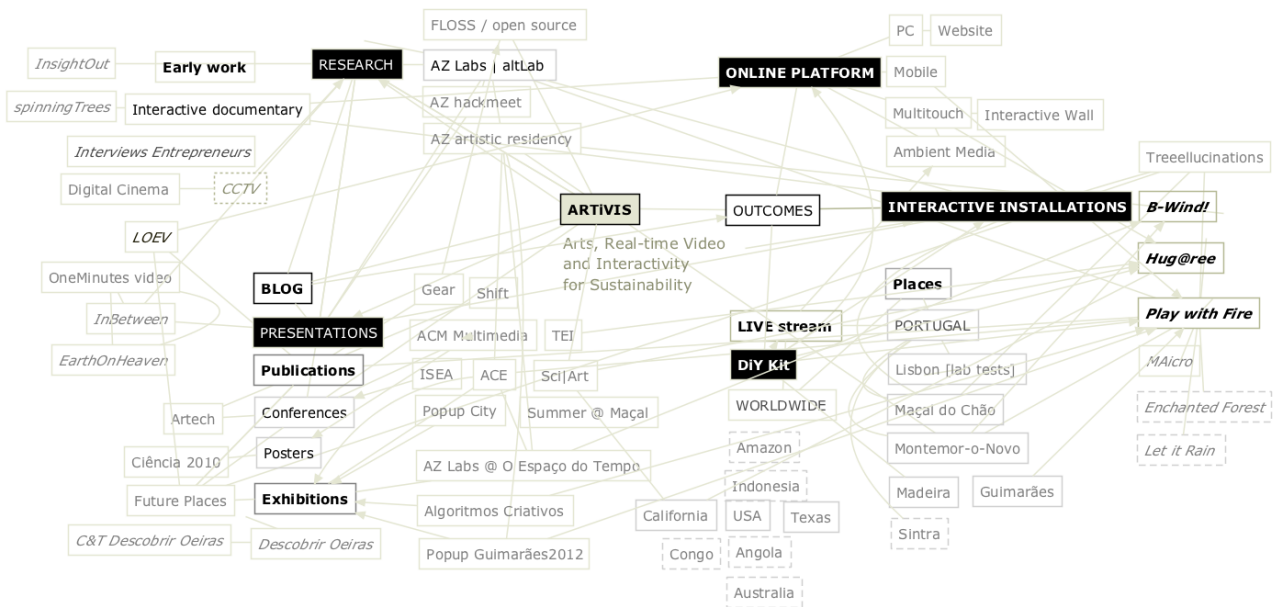
Figure 1.3. Concept map of the ARTiVIS research framework and outcomes.

1.3 Publications and Presentations

The current research work on this ARTiVIS (initially RTiVISS[10]) proposal and development of its components has been published in diverse venues and contexts, including: three full papers (*Artech 2010*, *ISEA 2011* and *NordiCHI 2012*), one short paper and a poster (*ACM MM'10*), three demonstrations in interactive arts showcases (*TEI 2011*, *ACE 2012* and *DIS 2012*), two doctoral consortia (*CoLab UT Austin|Portugal Program 2011* and *DIS 2012*), one research symposium (*Future Places 2012*), one workshop (*CHI 2011*), two posters (*FCT, FCG*).

The work was also presented in a wide range of artistic, technologic and sociological contexts: exhibitions, demos, school visits, summer school, hackmeets, both proposed [such as *Algoritmos Criativos* (*Creative Algorithms*), *SXSW 2011*, and *ACE 2011*] and invited (like in *Pop Up City Lisbon* and *Pop Up Guimarães 2012*).

10   Prior to 2011, ARTiVIS (*Arts, Real-Time Video and Interactivity for Sustainability*) was mentioned as RTiVISS (*Real-Time Video Interactive Systems for Sustainability*). This change was meant to better express the concept of the research and to allow non English speaking participants to better pronounce the name of the project. » http: / / monicamendes.wordpress.com / 2011 / 11 / 05 / artivis /

The interactive installations *B-Wind!*, *Hug@ree* and *Play with Fire* – were in total presented in four collective exhibitions (*Pop Up City Lisbon, AZ Labs Showcase, Creative Algorithms, Pop Up Guimarães 2012*), two self-proposed public presentations in rural environment, four hackmeets (*AZ Labs 2010 and 2011*, and *Artropocode 2011 and 2012*). These presentations were preceded of early work presented in screenings. The websites of the ARTiVIS interactive installations, online platform and *DIY forest surveillance kit* were published in the scope of this research and are presented in *Appendix G*.

The following list summarizes the text work published in the scope of this PhD research, herein presented in chronological order starting with the most recent.

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2012) "Digital Art, HCI and Environmental Awareness: Evaluating Play with Fire", Proceedings of the *7th Nordic Conference on Human-Computer Interaction, NordiCHI 2012*, Copenhagen, Denmark, October 14-17, 2012, pp.408-417. DOI 10.1145 / 2399016.2399079

MENDES, Mónica (2012) "ARTiVIS – Arts, Real-Time Video and Interactivity for Sustainability", Proceedings of the *ACM conference on Designing Interactive Systems, DIS 2012* , Doctoral Consortium, Newcastle, UK, June 11, 2012.

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2012) "Play with Fire", Proceedings of the *ACM conference on Designing Interactive Systems, DIS 2012*, Demonstrations, Newcastle, UK, June 13, 2012.

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2011) "Play with Fire", Proceedings of the *8th International Conference on Advances in Computer Entertainment Technology*, ACE '11, Creative Showcase and Interactive Art, Lisbon, Portugal, November 08-11, 2011. DOI 10.1145 / 2071423.2071530

MENDES, Mónica, CORREIA, Nuno, NISI, Valentina, ÂNGELO, Pedro (2011) "Play with Fire | A Real-Time Video Experience for Sustainability", Proceedings of the *17th International Festival of New Media, Electronic and Digital Arts – ISEA2011*, Istanbul, Turkey, September 14-21, 2011 | Conference paper online at http: / / isea2011.sabanciuniv.edu / paper / play-fire-real-time-video-experience-sustainability

MENDES, Mónica (2011) "RTiVISS as a Sustainable Design Proposal", *CHI 2011 Workshop: Sustainable Interaction Design in Professional Domains – Visible – Actionable – Sustainable*, position paper, Vancouver, Canada, May 7, 2011 | Workshop site and position papers online at http: / / sustainablehci.wordpress.com

MENDES, Mónica, CORREIA, Nuno (2011) "Big Brother Goes Green: Surveillance for Sustainable Forests", *South by Southwest Interactive Festival*, Dual panel presented at SXSW Interactive, *Greater Good* category, Austin, USA, March 11-15, 2011 | Abstract and podcast online at http: / / schedule.sxsw.com / events / event_IAP6736

MOTA, Catarina, MENDES, Mónica, ÂNGELO, Pedro, LOBO, Ricardo (2011) "Audiência Zero", *MCD – Musique & Cultures Digitales #62 - Media Labs in Europe, Mapping Places and Networks*, pp40-41.

MENDES, Mónica, ÂNGELO, Pedro, CORREIA, Nuno (2011) "Hug@ree: A RTiVISS experience", Proceedings of the *5th international conference on Tangible, Embedded, and Embodied Interaction, TEI'11*, Art Explorations exhibition and extended abstract, Funchal, Portugal, January 25-29, 2011, pp.257-260. DOI 10.1145 / 1935701.1935753

MENDES, Mónica, CORREIA, Nuno (2010) "RTiVISS | Real-Time Video Interactive Systems for Sustainability", Proceedings of the *International Conference on Multimedia, ACM MM '10*, Interactive Art Program, Firenze, Italy, October 25-29, 2010, pp.1437-1440. DOI 10.1145 / 1873951.1874238

MENDES, Mónica, CORREIA, Nuno (2010) "Design for Mobile Devices at Future Places in Perspective", in *Calling All Futures: an Overview of Future Places Past, Present, and...*, Proceedings of *Future Places Festival 2009*, Porto, Portugal, pp.21-28.

MENDES, Mónica (2010) "RTiVISS Real-Time Video Interactive Systems for Sustainability", Proceedings of *5th International Conference Artech 2010*, Guimarães, Portugal, April 22-23, 2010, pp.29-38. | Awarded *Best Portuguese Paper of the Conference*.

CORREIA, Nuno, MENDES, Mónica (2009) "Interface Design for Mobile Devices", Proceedings of *Future Places Festival 2008*, Porto, Portugal, pp.47-49.

1.4 Document Structure

This section consists of a short description of the content of each of the chapters that compose the structure of this thesis.

In this **chapter 1**, we began by introducing the motivation and context – departing from the natural environment, exploring the potential of real-time video information and its use in challenging arts and technology contexts, and quoting people's voice and subjective experience on forest fires as a confirmation of the need of action regarding this issue. Whether digital arts can foster awareness and respect for nature is the main research question, presented after the facts related with climate change and forest fires. Following further subsequent questions, the objectives of the research and the ARTiVIS outcomes as contributions are then briefly unraveled. The chapter closes with the list of publications made within the scope of the project.

In the following **chapter 2**, we review the state of the art through the presentation of a broad set of references related to the subjects involved in this multidisciplinary approach. This research also addresses a range of subjects in which we consider art and design activism, focusing on activism towards the environment. Through the conceptual inspirations regarding art works on nature and environmental activism in media arts and design, along with real-time video streaming, surveillance and forests monitoring case studies, computer vision and physical computing with sensors and devices, to community building and local culture, we described approaches that are relevant for this research. We close this section with a comprehensive discussion of the references presented and their value for the research.

Chapter 3 explains the general concept and design of the ARTiVIS project proposal and then the methods adopted. Further developments with early work are also outlined by describing the video work done and the ARTiVIS interactive installations that were designed beyond the scope of this research – *Treeellucinations*, *Enchanted Forest* and *MAicro*.

In **chapter 4,** the design and implementation of the diverse components of the ARTiVIS are revealed. The outputs that are described in detail cover the online platform mashup information and interface design, the *DIY forest surveillance kit* prototype that connects to the platform, and the concept, related work, development and presentations of the interactive installations *B-Wind!*, *Hug@ree*, and *Play with Fire*.

The other main component of the current research is described next in **chapter 5**, where tests planned and put in practice are outlined, followed by the data collection and results analysis. This is where the description of the process, methods and contents of the interviews done on the theme of forest fires and on the perspectives of entrepreneurship are presented, along with the diverse iterations of tests for the interactive installations evaluation and results analysis. This section includes the highlights of the *B-Wind!* interactive installation evaluation process consisting of user experience tests and participants observation, the *Hug@ree* iterations regarding user experience, observation and questionnaires, and also the *Play with Fire* user experience tests, observation and questionnaires done during the public presentations of the installations. The research results analysis are then reported in the conclusions of this evaluation chapter.

Finally, in the conclusions and future perspectives **chapter 6**, research results and conclusions are presented, assuming the limitations of the study, and outlining future work rooted in the research work accomplished.

Additionally, the **Appendix** covers data used in and resulting from this research process along with the implemented projects. This section includes the structured interviews questions, the observation form guidelines, and the different test forms proposed to the participants of the interactive installations. The gallery of photos archive published online is presented as a contact sheet for a visual documentation of the field work, the development process and public presentations of the research, and as well as the videos gallery. These mosaics and the blog interface of the ARTiVIS research iterations, the project websites of the online platform, the *DIY forest surveillance kit*, and of the interactive installations *B-Wind!*, *Hug@ree*, and *Play with Fire* also work as starting points for detailed viewing online. The technical riders of the interactive installations deployed – *B-Wind!*, *Hug@ree*, and *Play with Fire* – are also included, as well as the workshop proposal of the *DIY forest surveillance kit*, and the printed media cards and captions designed for the public presentations of the interactive installations. To conclude, we present a media clipping section that allows to acknowledge how others have been looking at us and how far the knowledge about the project has spread beyond the scope of the research.

2. REVIEW OF THE STATE OF THE ART

ARTiVIS is a transdisciplinary project and as such it requires a diversity of references. Involving the use of digital media, the focus on the natural environment, and real-time video, ARTiVIS combines references from the Arts, Sciences, and Technology. The selected case studies presented in this chapter are examples that inspired the ARTiVIS concept, its features or future perspectives.

The current chapter introduces the main topics and references for the work. Starting by the references that inspired the concept (cf. 2.1), we provide an overview of the major influences in this research. Since the key issue is the natural environment, we show examples of artistic approaches to nature, whether on art works on nature or the nature itself as art (cf. 2.2), as well as of environmental activism in media arts and design (cf. 2.3). Then we look more deeply at some examples using real-time video streaming, surveillance and forests monitoring, in a section where both controversies on surveillance and privacy are raised, and artistic approaches making use of real-time video are presented (cf. 2.4). Computer vision and physical computing topics are presented through the description of references related with the technologies used in the project and the case studies that effectively showcase it (cf. 2.5). We also look at community building and local culture dynamics and examples in search of good practices and guidelines for the creation of the ARTiVIS community (cf. 2.6). Finally, we synthesize and draw reflections regarding the overall universe of references, discussing the relevance of the work done so far towards the ARTiVIS research (cf. 2.7).

Additionally, specific references of work related to the concept and development of each of the components of the ARTiVIS project – online platform, DIY kit and interactive installations – are presented in the corresponding sections of the ARTiVIS design and implementation (cf. chapter 4).

2.1 Multiple Inspirations

The concept of this research had already been maturing for a long time (from around 2000) before its formal start in the framework of the PhD (2008-2009). Throughout this time – before and during this research – some references have worked as conceptual sparks while others have contributed to the ideas and to further reflection around the theme and project development. The following references described

in this section stand out as the main influences that can be identified as part of the *leitmotif* of the ARTiVIS research project.

"Interested in how the study of natural forms and the qualities integrated within them can inform new and more responsible ways of designing as well as form the basis for a new type of design education", designer and researcher Terry Irwin has been an inspiration since the very beginning of the incubation of ideas. Her research on a new design paradigm from a holistic, ecological worldview provided guidance during the development of the whole project [Irwin05].

Victoria Vesna, for the Blue Morph installation exhibited during *ACM Multimedia in 2010*[11] and later as research advisor at *Art/Sci center+lab*, is a reference in this research regarding her pioneering role and artworks in new media interactive installations combining Art, Science and Technology, the multidisciplinary events she has been mentoring, and the insight in her books. In the case of *Database Aesthetics* because it shows "how an aesthetic emerges when artists take the challenge of creating work using the vast amount of information that bombards us daily" [Vesna07, p.10], and in *Context Providers* for the reflections gathered on how today's artwork is changing "as a result of new strategies influenced by data structures, intelligent systems, and information networks" [Vesna11, p.9].

John Maeda's artistic programming projects, that explore the area where design and technology merge, such as the generative *Nature* series [Maeda04], have also been a key inspiration for the theme, as well as his research on simplicity. With the goal to achieve the balance, across *The Ten Laws of Simplicity* everything in design, technology, and business is questioned, as Maeda summarizes in law number ten, named "The One": "Simplicity is about subtracting the obvious, and adding the meaningful" [Maeda06, p.89]. Also Casey Reas is a reference as a creative programmer [Reas10] and for specific aspects of his generative art work with *Processing* [Reas07], such as in *TI* [Reas08], where an original display on the floor is applied through projection mapping in round "living surfaces" that seem to emerge from the ground.

Pigeons Wall, by Glorianna Davenport at MIT, an interactive media piece situated in sensor-rich architectural spaces, also remains as a latent reference herein recalled because of its effectiveness on demonstrating interaction effects on people's behavior, simply by passing by. Interaction scenarios, particularly in casual or formal architectural spaces exploring the relationships among immersion, interaction, and public space, are also issues considered in this project [Davenport00].

Artist-scientists like Christa Sommerer and Laurent Mignonneau, whose work seek to integrate the forms, processes and effects of life into art [Grau04], have been especially inspiring in the scope of this research. On the theme of the interaction between humans and nature, their installation *Interactive Plant*

Growing [Sommerer97] reflects on the relationship between real plants and human participants, who can remotely control a 3D real-time growth of virtual plants on the screen, through a sensitive interaction with their hands on the real plant.

Camille Utterback's *Text Rain* installation is also remarkable, given the poetry of her work where technology is embedded in an unnoticeable way and as digital art that is assumed as "the purest form of experimental design" [Bolter05].

The research proposed is also motivated by the *Institute without Boundaries* inaugural project, *Massive Change* where, through a sustainable lens, the designer is seen as a problem solver with the ability to effect positive change for humanity, exploring a discourse on the future of global design [Mau02]. The impact of research projects that lead to books such as Naomi Klein's *No Logo* [Klein00] is also part of the motivations. These activist approaches are aligned with John Thackara's proposals, who raises the questions related to environmental sustainability in his book *In the Bubble* – emphasizing that ethics and responsibility can inform design decisions without impeding social and technical innovation [Thackara05]. This work was preceded by his long term project "about design for resilience", *Doors of Perception*, connecting natural energy with social energy in talks, workshops, and the blog[12] – another consistent project that has inspired the approach carried out in this research.

2.2 Nature as Art & Art on Nature

"A time-honored subject in the visual art, tree images have been painted and sculpted for centuries. Regardless of changes in medium and style during the twentieth and twenty-first centuries, artists have continued to find inspiration in trees" [Steinkamp11]. Forests and trees have an incredible potential for artistic representation, not only noticeable in romanticism, but also in the work of contemporary artists who, overcoming modernist prejudices, now approach this topic with new perspectives [Chicó06].

The poetics of land emerge in Alberto Carneiro's work with nature using tree trunks as the raw material in his art work. The main structural axes of his work are based on the origin of art in nature and nature as "polarizing our aesthetic feelings", and the recurring presence of the "tree" as a second nature transmuted into art. Alberto Carneiro was a pioneer in the use of the concept of ecological art applied to art making. In his *Ecological Art manifesto*, the artist claims "We do not affirm that a tree is a work of art. We will only say that we can take it and turn it into art" [Carneiro91, p.62]. He created his own language in art, where nature is not something distant; rather than a concept, nature is the first place from which

---

12   *Doors of Perception* » http:/ / www.doorsofperception.com

the other places happen, emerging not as representation, but as *presentification – A forest for your dreams* is one of the installations where the natural elements are transferred to the space of art[13].

Gabriela Albergaria is another Portuguese artist constantly bringing the theme of nature into the most prominent galleries and museums, albeit with a different approach. The artist takes gardens and history as the *leitmotif* of social and collective references that intercross with subjective memories of personal experiences. As Delfim Sardo states about her work: "Gardens are in themselves powerful metaphorical constructions, in essence alien to the romantic idea of landscape in the sense that they do not stand out as a fragment, but as an allegory of a world" [Albergaria10, p.23]. Working mainly with natural elements such as branches, soil, and leaves when (re)creating trees into the galleries, whether by drawing, photography, sculpture, installation or by performance, Albergaria's work raises contradictory feelings. That is the case of *Project Room*, where the exhibition room at the Belém Cultural Centre was "occupied"[14] by an enormous elm with the tiniest branches touching the ceiling. The original tree was manipulated, branches were cut and nailed to each other with screws in a composition that followed the intervention planned by the artist over the natural forms. What initially looks like a poetic large scale drawing on a white piece of paper also evokes the colonization social process through the tree sculpture that is invading the space. The enchantment that comes from observing the tree shapes is also broken with the violence of finding big screws that unite the branches.

In the scope of *Land Art*, among the multiple references that would not fit this state of the art brief overview, the internationally renowned American artist Robert Smithson has an outstanding role. Smithson coined the expression *Earthworks* as an *Earth art* movement in which the landscape and the work of art are inextricably linked, and is most well known for his provocative earthwork the *Spiral Jetty* (1970). In this research, the *Nonsites* are especially relevant regarding the dialectic between the outdoors and indoors, displacement and location [Smithson70].

The photographic work by the Korean artist Bae Bien-U is admirable regarding the enchanting atmospheres capturing the poetry of the forest [Bien-U07], through selected points of view, weather conditions and times of the day. On the other side, the activist approach by the Canadian photographer Edward Burtynsky representing the result of environmental changes in nature transformed by industry recalls how "our success" affects the world, the dependence on nature, and the concern for the health of our planet [Burtynsky08] – which sets us into an uneasy contradiction. Combining photography and digital tools, Chris Jordan's meticulous work with the mundane details of American consumer culture is a visual doorway into the consumerism of a disposable society [Jordan09].

---

13   In "Alberto Carneiro – Uma floresta para os teus sonhos, 1970", Fundação Calouste Gulbenkian » http: / / www.cam.gulbenkian.pt / index.php? article=60158&visual=2&langId=1&ngs=1&queryParams=,autor | Carneiro%20Alberto&queryPage=0&position=1

14   *Project Room* at the Belém Cultural Centre, in Lisbon » http: / / www.storm-magazine.com / novodb / arqmais.php?id=327&sec=&secn=

In his *The Shape of Time* exhibition, David Claerbout presents *Ruurlo, Borculoscheweg, 1919 (1997)*, a picture that appears to be just a photograph, but "suddenly, one becomes aware of a light summer breeze blowing over Borculoscheweg, slightly touching the foliage of the monumental Oak in the projection. (...) The tree is alive, outliving the children playing underneath and the two men walking by, who are dead-still". The uncanny emerges from this way of attributing life to a lifeless tree in a photograph and thus to a long gone moment in 1919. The artist has established two media colliding and in that sense also two "time-senses"collide. By using *hypermediacy* to immerse the viewer in the illusion of an interactive object with this documentary analog registration that is simultaneously a life injected tree, Claerbout is also making us critically aware of the workings of media through art [Assche08, Korsten10].

Recent events such as the exhibition *The Tree* at the *Getty Center* and the related lecture "Why do we love Trees?"[15] – including the participation of Jennifer Steinkamp regarding her work with 3D animated trees – keep exploring the artistic approach to trees and the affective relationships we create within those representations. More recently, the exhibition *Inspired by Nature: Celebrating the Beauty and Complexity of Trees* also integrated Steinkamp's video installation, a computer-generated video projection of a 3D maple tree that cycles through four seasons, revealing the "playful possibilities in contemporary technology" [Steinkamp11]. The huge projection scales that have been presented to the public, add much impact and immersion to her exhibitions.

In another expressive track, the famous DJ Sven Vath is also brilliantly mastering the use of the trees motion in his VJing performances[16], displayed in slow pace as if it were in real-time, paradoxically contrasting with the music's accelerated rhythm.

The *Akousmaflore* installation is a different kind of expression of bringing natural elements to exhibitions that was presented at the *ISEA 2011* exhibition *Uncontainable* by the French duo *Scenocosme* comprised by artists Gregory Lasserre and Anais met den Ancxt. A suspended garden composed of sensitive and interactive real plants reacts to contact through sound – when the visitors touch the plants, they respond with music [Scenocosme11].

Other interactive projects worth highlighting in this art and nature overview include *Funky Forest*, an interactive ecosystem where children create trees with their body and divert the water to the trees to keep them alive [Watson07]. *Parque* is also an interactive installation with an ecological message: "the growth of a forest is determined by the amount of attention it receives" [Madeira09], where the system recognizes vertical movements as inputs for making vector graphics trees grow. Based on the paradigm of a circularity between the digital and analog as a result of digitization of the world, *Pós-Paisagem* is an installation that presents the digital manipulation of sound, image and interactivity processed with what

---

the artists obtained from their direct contact with the natural landscape. Intended to become a spiral that detaches from the natural as a result of public interaction, this evocative installation was exhibited in the old cistern of the Fine Arts School of the University of Lisbon in the scope of the *Multidimensional Interactivity* research[17]. The rivalry between nature and humans is symbolized in *0 255 0*, a video mapping installation on the model of a city by André Sier that was presented at the *Creative Algorithms* exhibition. In a game-like environment, this interactive art piece whose title recalls the maximum value of green in the RGB color model, proposes an endless game in the form of an abstract simulation: "They try to over-take and uphold the city space and you can help them with your movements. (...) Humanoids and nature fight for city space, whom will you help to win?" [Sier12].

2.3 Environmental Activism in Media Arts and Design

A pertinent issue on the activism expression on this research is close to Fuad-Luke's apolitical approach that is done through participatory discussions and design's organizing principles such as "usability, the project, human needs, or 'doing good by design'" [Fuad-Luke09]. Although activism's core is still highly political, activism is arguably becoming more cultural, a statement that Ann Thorpe emphasizes in her review on Fuad-Luke's overview of activism within design culture: "these concepts contrast fairly sharply with more conventional activists' language that deals in rights, struggles, grievances and claim", and contribute to rethinking design practice[18].

Hand in hand, ecology and arts are leading to collaboration between organizations and individuals concerned with shaping a cultural agenda towards an ecological age. The *Arts & Ecology Centre of The Royal Society for the encouragement of Arts* (RSA)[19] stresses the work of the arts in addressing environmental concerns. *ISEA* is a symposium and series of events exploring the discourse of global proportions on the subject of art, technology and nature; in its 2012 edition, *ISEA* focused on the theme "Machine Wilderness – Re-envisioning Art, Technology and Nature", showcasing "creative solutions for how technology and the natural world can sustainably co-exist"[20]. Art as a part of the global warming discourse has also been evident during the *United Nations Climate Change Conference in Copenhagen*, 2009 (*COP 15*): "Artists are waking up to climate change" [Bunting09], regarding both exhibitions *Earth* and *RETHINK* – at the

---

17   *Pós-Paisagem* was presented as the result of the interactivity workshop by Rogério Taveira and Fernando Fadigas in the *Multidimensional Interactivity* research at the Fine Arts School, University of Lisbon » http: / / www.fba.ul.pt / portal / page?
     _pageid=401,1537370&_dad=portal&_schema=PORTAL

18   In "Book review: Design Activism – Beautiful Strangeness for a Sustainable World", comments by Ann Thorpe, design activism 2010 »
     http: / / designactivism.net / archives / 227

19   *RSA Arts & Ecology, Royal Society for the encouragement of Arts* » http: / / www.artsandecology.org.uk

20   I*SEA 2012, Eighteenth International Symposium on Electronic Art,* "Machine Wilderness – Re-envisioning Art, Technology and Nature", exploring the discourse of global proportions on the subject of art, technology and nature", Sept 19-24, Albuquerque » http: / / www.isea2012.org

intersection between Art, Culture and Ecology. During *COP16*[21], the first art exhibit visible from space – *350 eARTh*[22] – is a new and exciting way to communicate how climate change is impacting our planet and what creative solutions will contribute to limit CO_2 emissions in our atmosphere. 2011 was officially declared as the *International Year of Forests*[23] to raise awareness on sustainable management, conservation and sustainable development of all types of forests.

Digital Artists such as Tiffany Holmes, have engaged in eco-visualizations projects [Holmes07] in order to sensitize audiences towards sustainability issues and climate change. Regarding the ARTiVIS installations, this approach enhances the eco visualization aspect of such an engagement with the activist component triggered by the gestural interface, which reflects the participants actions directly on the real-time video of the forest.

Two different approaches for diverse kinds of pollution and corresponding visualization as forms of environmental activism were presented at *Ars Electronica*. *Nuage Vert* is an urban and community art project where pollution is made perceptible by using the smoke from a factory chimney as a projection surface [Evans08]. Moreover, citizens become aware of a site that is visible and ignored (a waste incinerator), realizing the impact that their waste production has on the environment. Recognized by its "unfolding sociopolitical relevance", *Nuage Vert* was the recipient of the *Ars Electronica 2008 Golden Nica* in the *Hybrid Art* category because it demonstrates "how art is capable of encompassing an entire city – its public sphere, its industry and its inhabitants"[24]. As in *Play with Fire* (cf. 4.5), the paradox is explored, in this case through a green laser cloud on the smoke screen, that is both fascinating and disturbing.

"Bringing poisons afloat" is the tagline of *In Fondo al Mar*, which has brought a different kind of pollution visualization to surface in the project presentation at *Ars Electronica 2010*, "Repair the Environment – Doing the right thing" panel[25]. This independent project by designer David Boardman and journalist Paolo Gerbaudo, is a data visualization platform regarding a series of sinking incidents in the Mediterranean Sea, involving ships "which are suspected of having carried toxic and radioactive waste" [Boardman10]. In order to get a better factual understanding, the visualization collects all relevant information, aiming to bring evidence to support the investigations about these incidents, ultimately suggesting that "the ships would have been sunk deliberately"[26]. This work is also a relevant reference for the ARTiVIS online platform (cf. 4.1), regarding community participation and the geographic visualization.

---

21 *COP16 – 16th Conference of the Parties to the United Nations Framework* Convention on Climate Change (UNFCCC), Cancún, Nov. 19-Dec. 10, 2010.

22 *350 eARTh* – Using art to spark a climate change movement » http:/ / earth.350.org | Understanding 350 » http:/ / www.350.org / en / node / 48

23 *International Year of Forests*, 2011 » http:/ / www.un.org / esa / forests / 2011 / UN-resolution.html

24 In "'Golden Nica, Prize of the Ars Electronica, for Pollstream", by Luminapolis, 2008 » http:/ / luminapolis.com / en / 2008 / 06 / ars-electronica-preis-fur-pollstream /

25 "Repair the environment" panel at *Ars Electronica 2010* » http:/ / www.aec.at / repair / en / program / repair-the-environment /

26 In "in.fondo.al.mar: Revealing Suspicious Ship Sinkings in the Mediterranean - Infosthetics (English), February 2010 »
http:/ / infosthetics.com / archives / 2010 / 02 / infondoalmar_revealing_suspicious_ship_sinkings_in_the_mediterranean_sea.html

With the motivation of contributing to a better world through climate change, in cinema we find the well known and controversial *An Inconvenient Truth,* with Al Gore [Guggenheim06] where the rise of CO2 levels is correlated with the rise of temperature and sea level. The following environmental documentary, *Eleventh Hour* [Conners07], produced and narrated by Leonardo DiCaprio, also includes the participation of the designer Bruce Mau previously mentioned (cf. 2.1) for his work with *The Institute without Boundaries* in "Massive Change" [Mau02].

Climate change and surveillance are very relevant and currently discussed topics in the areas of digital arts and design. New publications like "Design for Sustainable Change: How design and designers can drive the sustainability agenda" [Chick11] are proliferating and new releases are announced frequently, corroborating the urge to act and the designer action potential. The role and potential of design research in the transition towards sustainability [Pine98] has been discussed in mainstream design and digital media art events. Two of these sub-themes were carried out as "Repair" and "Goodbye Privacy" at *Ars Electronica*[27]. Another key event was "Changing the Change – Design Visions Proposals and Tools" [Cipolla08] on the role and potential of design research in the transition towards sustainability. *Transmediale* also put the threat to the sustainability of our planet in perspective in "Climate Change as Cultural Demand"[28], aiming to develop new institutional and individual modes of cooperation and cultural techniques for handling these large scale threats. *Art|Sci* and *Art|Global Health* centers at *UCLA* organized a broad *Art + Activism* program[29] including lectures and a poster series by designer Henri Lucas and his *Design Media Arts* students, under the umbrella of the *Art and the Public Good* program.

In the scope of the transdisciplinary platform for experimental art, design, research and activism *Pixelache Helsinki, Camp Pixelache* in 2012 was designed around the overarching theme of "Do It With Others", where artists, makers, cultural producers, researchers and activists work collaboratively "to create new co-production models for artifacts events with sustainability as the core goal"[30]; sub-themes included "The Art of Gathering Environmental Data", a series of events concerned with collecting, publishing and using environmental data in Art & Science practice, covering issues of special focus for ARTiVIS, such as environmental monitoring in the context of open data.

The Design Museum's *Sustainable Futures* exhibition (2010) is an overview that highlighted "the changing role of the designer and reveals how design can make a difference"[31]. In our approach towards environ-

27   *Ars Electronica Festival.* Linz » http : / / www.aec.at / festival_history_en.php
28   *Transmediale* (2009) "Perish in Beauty? Climate Change as Cultural Demand". Annual Festival for Art and Digital Culture, Berlin
       » http : / / www.transmediale.de / perish-beauty-climate-change-cultural-demand
29   *Art | Sci center+lab* "Art+Activism" lecture series, UCLA 2007-2009 » http : / / artsci.ucla.edu / ?q=categories / art-activism
30   *Pixelache Helsinki | Camp Pixelache* » htthttp : / / www.pixelache.ac / helsinki / camp12 / programme / call-for-proposals-demos /
31   *Sustainable Futures* exhibition at the Design Museum (2010) » http : / / designmuseum.org / exhibitions / 2010 / sustainable-futures

mental sustainability, ARTiVIS has sought legitimacy within this global context. This research has been presented at technology and entrepreneurship events like the "Greater Good" category at *SXSW – South by Southwest Interactive* [Mendes11a], usability and design events such as the workshop "Visible-Action-able-Sustainable" of *CHI Sustainability* community [Mendes11b], and art and science events like the "Sustainability" session at the *International Symposium of Electronic Arts ISEA2011* [Mendes11c]. The *Play with Fire* trailer was also screened at the third annual short film competition *Films for the Forest* (2012) created by Austin-based environmental non-profit *Rainforest Partnership*[32], held during the Community Screenings at the *SXSW Film Festival*. When presented at *Guimarães 2012 European Capital of Culture*, the ARTiVIS interactive installation *Play with Fire* was tagged in the "ecology" category (cf. Appendix K).

2.4 Real-Time Video Streaming, Surveillance and Forest Monitoring – *is Big Brother going Green?*[33]

Widely used for multiple purposes, diverse approaches with live streaming video and surveillance cameras as input have been proposed after *XCoffee*, known as "the first application breaking down the barriers of distance" [Stafford-Fraser01]. Nowadays, there is an endless number of webcams of every kind, where informational purposes prevail.

Regarding surveillance for forest fire prevention, the gap is being filled with a growing number of international institutions focused on forest research, such as the *Forest Data and Information Systems* [Forest09], and the *Global Monitoring for Environment and Security with the Forest Monitoring Services* [GMES10]. Video surveillance projects for forest fire prevention and early detection [Moreira05] include automatic fire detection based on image processing, such as *Forest Fire Finder* [Vieira11] and *iForest Fire* [Stula12], and air monitoring with wireless real-time capturing devices installed in flying robots [Steinhauser07].

Educational initiatives, such as *Público online* and *Ciência Viva*[34], enable the continuous observation of griffins[35] and bats[36] through the use of surveillance cameras. Another example by environmental activists that are using real-time video to observe and show nature is streaming from a camera pointing at a nest

---

32 *Films for the Forest* is a festival committed to raising awareness for rainforest protection, and providing opportunities to engage in discussions about tropical rainforests, sustainability and climate protection. *The Rainforest Partnership* partners with communities in Latin America to help develop sustainable economic alternatives to deforestation » http:/ / www.filmsfortheforest.org / #!winners

33 This is the title of our presentation at *SXSW 2011* » http:/ / schedule.sxsw.com / 2011 / events / event_IAP6736

34 The *Ciência Viva* (*Live Science*) Programme is the contribution of the Ministry of Science and Technology to the promotion of a scientific and technological culture among the Portuguese population » http:/ / www.cienciaviva.pt / cienciaviva / index.asp?accao=changelang&lang=en

35 "Grifos na Web", Griffins nest at Portas de Ródão, Portugal » http:/ / static.publico.clix.pt / grifosnaweb

36 "Morcegos na Web", 5000 Bats cave at Alviela, Portugal » http:/ / static.publico.clix.pt / morcegosnaweb

of white-tailed eagles in a forest in Estonia[37]. Also at the *Walt Disney Parks and Resorts* the observation of a nest of short-tailed hawks is an ongoing project, lead by Peter Stepniewicz[38], that allows viewing the feeds live and uploading snapshots continuously to a remote server.

However, surveillance is a controversial theme for its potential invasion of privacy and the use of the data. Back in 1993, Victoria Vesna already raises this issue with the installation *Another Day in Paradise*. Composed by three preserved trees – "surveillance", "video" and "touchscreen"– the installation raises a counterpoint that make us reflect upon the effects of surveillance systems in planned communities [Vesna98].

A propos, a very ironic approach to the theme of privacy is the interactive installation *My Little Piece of Privacy*, by Niklas Roy, who decided to install a small "but smart" curtain in his workshop window facing towards the street [Roy10]. With a surveillance camera and a laptop, a motor positions the curtain exactly where the pedestrians are when passing by. The presentation of a further developed version in the scope of the exhibition *Paranoïa* (2011) is an evidence of this *Big Brother* symptom.

In a different sense and scale, *Observing Surveillance* is a large project that documents and promotes public debate around the presence of video cameras placed in the capital of the United States after September 11. Exploring the use of media to promote public dialog, the project proposes the use of alternatives to text (as it is used in most briefs, testimony, or policy papers) to reach people. "Watch the watchers" is the goal of this so-called "battle over control of the technology of observation", and many of the images displayed in the exhibit attempt to communicate ideas through images [Epic02].

People are also reacting to the systems and claiming further privacy instead of the alleged safety advantages. To name an example, in 2011 alone in Portugal, 224 complaints regarding to video surveillance were presented to the *National Commission for Data Protection*. The complaints stem from the installation and use of these systems by neighbors or by condominium residents without the consent of the complainants, who felt that their privacy was threatened[39].

These are symptoms that not everything is consensual regarding the installation and benefits of video surveillance. Most cities in the world have their own CCTV (Closed Circuit Television) systems working

---

37   In connection with the joint activities of Estonia and Latvia (ESTLAT Eagles Cross Borders), the WTE cameras of a white-tailed eagle camera in Estonia (Linda and Sulev's nest) and in Latvia are working in the framework of the ESTLAT Eagles Cross Borders project » http: / / pontu.eenet.ee / player / kalakotkas.html including selected recordings, such as the birds couple » http: / / pontu.eenet.ee / player /

38   Stepniewic, Peter (2009) *Nest of short-tailed hawks*, CMU – Carnegie Mellon University, DisneyParks and Resorts

39   In "Videovigilância motiva 224 queixas na CNPD" (Video surveillance causes 224 complaints), by Cristina Ferreira, May 11, 2012 » http: / / tek.sapo.pt / noticias / telecomunicacoes / videovigilancia_motiva_224_queixas_na_cnpd_1242281.html

"for safety purposes", being London pointed as the most extreme case of a surveillance society[40]. *But what about the advantages of a surveilled society? What about safety, community engagement, transparency?*

The correlation of surveillance and safety take us to the unavoidable reference of the *panopticon* as the model of the perfect prison that paradoxically is transparent. In the eighteenth century, utilitarian philosopher Jeremy Bentham described it as "a place where prisoners could be under constant surveillance. The p*anopticon* placed prisoner cells around a central observation tower. From the tower, prisoners could be observed but could not see who was watching" [EPIC02]. Surveillance threat would then be enough to coerce the inmates in such a way that observation would no longer be necessary – "Hence the major effect of the Panopticon: to induce in the inmates a state of conscious and permanent visibility that assures the automatic functioning of power" [Foucault75]. Surveillance thus becomes a means of social and political control, as a way for those in power "not only to observe, but also to control" [EPIC02]. Surveillance is also used as a deterrent that sometimes is explored through the use of false cameras, their presence being persuasive enough[41]. As the researcher behind the *Vigília Open Design* forest surveillance project states, "an essential aspect of the use of new technologies in electronic surveillance of the forest is its deterrent potential. With regard to fires caused by human action, criminal or merely negligent, the presence of a well-publicized system of 'radar of the forest' has a high potential for modification of risk behaviors for the forest" [Ribeiro04].

Regarding collaborative surveillance by the community, *The Texas Border Sheriff's Coalition* (*TBSC*) "Virtual Community Watch"[42] is a real-time surveillance program designed to empower the public to proactively participate in order to fight border crime that is interesting to analyze. This network of cameras and sensors along the Texas-Mexico border feeds live streaming video and users are enabled to log in and directly monitor suspicious criminal activity along the border via the "virtual fence" of the community website – "This extra surveillance will allow the public to directly participate in reducing crime and improving their communities"[43], a statement that is presented as "a well-established fact that citizen involvement in community watch programs such as this one reduces crime". Another component of this program is the ability of the public to connect their own cameras to the server to create local "Virtual Neighborhood Watches" (that can, in turn, be connected to form additional *Virtual Community Watches*) with protection purposes regarding criminal acts that could affect their own families and neighborhoods. The counterpoint exists, indeed – until what extent is surveillance of the border positive? Community surveillance may exacerbate prejudices and intensify violence against the monitored people –

---

40   Report: *London No Safer for All Its CCTV Cameras,* by Ian Evans, 2012.02.25 » http: / / abcnews.go.com / International / report-london-safer-cctv-cameras / story?id=15776976#.T79d_r–jKGh

41   "Fake Security Cameras As a Crime Deterrent", by F. William Davis, 2011 » http: / / EzineArticles.com / 6621665

42   *Virtual Border Watch* (previously known as *Texas Border Watch*) » http: / / www.blueservo.net / vcw.php | A New Way To Patrol The Texas Border: Virtually, by John Burnett, NPR Social Media » http: / / www.npr.org / templates / story / story.php?storyId=101050132

43   In *About BlueServo* » http: / / www.blueservo.net / about.php

who may even be the ones who risk their lives in inhumane conditions in search of a better life. This issue goes beyond the scope of this research, but the question remains open for further reflection.

Information access is certainly a key issue, although not the only motivation: subjective experiences on the use of webcams for sea conditions regarding surf practice – such as *Beachcam*[44], *SurfReport*[45], and *Surfline*[46] – reveal potential beyond information. The feeling is mainly poetic, not to be misunderstood with "voyeurism", as in beach webcams identity is confidential[47]. In this case, what matters is not what people are doing, but what the waves are like.

This controversial perspective is not shared by everyone. In *The Art of Surveillance* chapter of his article "From DV Realism to a Universal Recording Machine", Manovich states: "Like normal video surveillance cameras that are tracking us everywhere, web cams rarely show anything of interest. They simply show what is there: the waves on the beach, somebody staring at a computer terminal, an empty office or street. Web cams are the opposites of special effects films: feeding us the banality of the ordinary rather than the excitement of the extra-ordinary" [Manovich01, p.12]. In this research, not only the observation of waves or the forest proposal are approached as systems that can bring information, but also as opportunities for contemplation of nature from remote locations for those who do not have access to it.

Surveillance camera feeds have been used in very exciting new ways in films. The theme of video surveillance and CCTV footage in digital cinema and the use of real-time video as material for filmmaking are promising fields to explore. Several references were collected in a concept map, presented as a research result of the participation in the *Digital Cinema* workshop by Tom Schatz[48]. Video surveillance in Hollywood movies [Kammerer04] are "artfully crappy"[49] and Schatz recognizes that its use is "More real, less mediated", closer to the CCTV footage directly from the source. Selected examples include *Timecode* by Mike Figgis (2000)[50] for its multiple screens aesthetics as in monitoring screens, *Alice* by Marco Martins (2005)[51] on the role of webcams monitoring used as the method to find the lost child, and *Look* by Adam Rifkin (2007)[52] regarding the issue of lack of privacy and the point of view from the surveillance cameras.

---

44   *Beachcam* – live webcams in Portugal » http: / / beachcam.sapo.pt / caparica-cds /

45   *SurfReport* –Livecams in Portugal – http: / / www.surfreport.pt

46   *Surfline* – Surf Report and HD Surf Cam in Southern California » http: / / www.surfline.com / surf-report / malibu-southern-california_4209 /

47   Directive of the European Parliament on the protection of individuals with regard to the processing of personal data and on the free movement of such data » http: / / eur-lex.europa.eu / LexUriServ / LexUriServ.do?uri=CELEX:31995L0046:EN:HTML

48   *UT Austin | Portugal Program – Digital Media Summer Institute 2010* » http: / / utaustinportugal.org / news / summer_institute_2010 / | Concept map presented as a result of participating in the workshop » http: / / monicamendes.info / digitalCinema.html

49   In an interview to Adam Rifkin, "Sneaky Sex, Spooky Scenes: Look Flick Eyes Voyeuristic Surveillance", by Hugh Hart, *Wired*, 2012 / 12 / 13 » http: / / www.wired.com / entertainment / hollywood / news / 2007 / 12 / look

50   "Timecode" in *IMDB* » http: / / www.imdb.com / title / tt0220100 /

51   "Alice" in *IMDB* » http: / / www.imdb.com / title / tt0459072 /

52   "Look" in *IMDB* » http: / / www.imdb.com / title / tt0810951 /
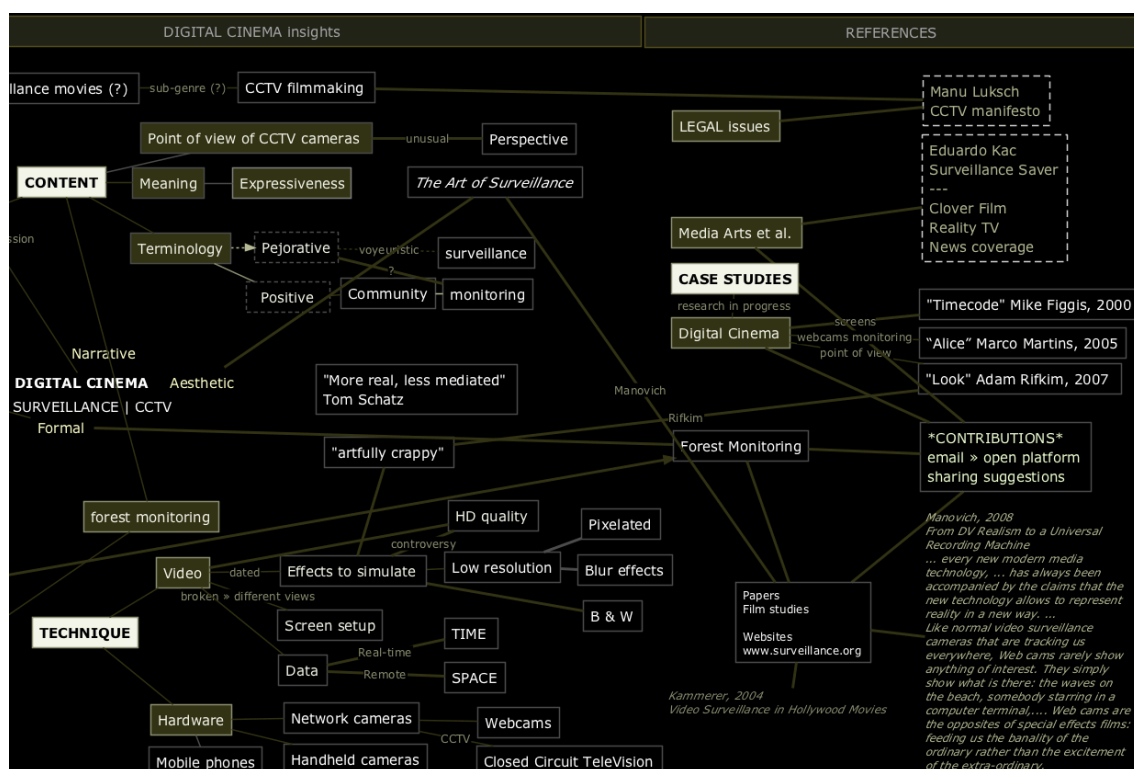
Figure 2.1. "How is Video Surveillance | CCTV explored in Digital Cinema?" Detail of the concept map presented in the *Digital Cinema* workshop.

Our increasing lack of privacy and the aesthetics of surveillance have been explored with unusual shots and video resolution in *Person of Interest* (2011)[53]. This thriller looks like a mixed reality game where "the notion of preventing crimes rather than solving them is an appealing twist"[54]. This is done through the analysis and cross-checking of the huge amounts of surveillance data where "pattern recognition soft-ware identifies the anticipated victims, while cutting-edge surveillance technology tracks them down"[55]. The visual conceit of surveillance video displaying the timecode was actually inspired in the *Los Angeles Department of Transportation* surveillance cameras. The immediacy of digital is expressively represented through the webcams feed visual interface together with the interchangeability of multiple perspectives in a pulsing rhythm throughout episodes.

Furthermore, interactive experiences engaged with the use of technologies are increasingly embodied in video based environments. Initial steps in this direction have been made by the French collective *Pleix* in *Netlag*, a project that showcases their subversive view, displaying the videos of webcams found all

---

53   By Jonathan Nolan and J.J. Abrams » http: / / www.imdb.com / title / tt1839578 /

54   "'Person of Interest': TV review", *Los Angeles Times*, by Mary McNamara » http: / / articles.latimes.com / 2011 / sep / 22 / entertainment / la-et-person-interest-20110922

55   "'Person Of Interest' Creator Jonathan Nolan Isn't Paranoid—Or Is He?", by Susan Karlin, 2012 » http: / / www.fastcocreate.com / 1679107 / person-of-interest-creator-jonathan-nolan-isnt-paranoid-or-is-he

around the world captured through snapshots every ten minutes during 24 hours with custom software (*Picksucker*). This video piece generates a living world view of videos synchronized and placed on a geographical map, as it creates an overview on the rhythm of life due to the presence of the sun and to the earth rotation [Pleix04]. *SurveillanceSaver screensaver* displays surveillance cameras content of places from around the earth in real-time, and *SurveillanceShaker* is its corresponding mobile version [Zoeliner10]. *Fabrica* [Stanza05] displays surveillance cameras content of places from around the earth in real-time, and it acts like a VJ system mixing and re-collaging the images as they are captured from live CCTV and webcams.

In several artistic works to date, such as *Third Person*, an interactive display by Lozano-Hemmer [Lozano-Hemmer06], and *Les Voisins* by Ricardo Jacinto [Jacinto06], the video is being captured *in situ* and is integrated in a predefined screen, then filters are applied to the streaming video.

Hand from Above is an experience inspired by the mythical story *Land of the Giants and Goliath*, displaying on a screen a giant hand that plays with pedestrians on the street, who are "tickled, stretched, flicked or removed entirely in real-time by a giant deity" [O'Shea09]. *Hand from Above* playfully challenges our perception of spaces and objects, by enabling virtual and real to coexist in real-time. This interactive installation presented in public space not only demonstrates participants' immediate engagement, but also evidences how determinant scale is.

Ethical considerations were addressed in *Rara Avis* and teleportation experiments by bio artist Eduardo Kac and the controversial movie *Faceless* by film maker Manu Luksch. The inversion of the observer to that of the observed in *Rara Avis* is achieved through the viewer being watched by the video cameras that are the eyes of a robotic bird, then occupying the position of the caged bird. This approach undermines the traditional construct for viewing in which the observer maintains a powerful control over that of the observed [Paul03, Kac96]. On the other side, by using only footage from CCTV, Luksch subverts the system by investigating and exploring the *UK Data Protection Act and EU Directives* that give people "the right to access the personal data held in computer databases", which included the CCTV recordings used as raw material in the *Faceless* movie [Luksch07].

At *The Artist is Present*, Marina Abramovic proposes new concepts for performance anchored on the use of video: as videoart, as documentation, and as live video for performances [Abramovic10]. This multimedia setup is not limited to the Museum space, expanding to an online platform. With *Sousveillance*, Steve Mann brings awareness of this "inverse surveillance" as a counter to organizational surveillance issue [Mann03], and Wafaa Bilal has chosen to implant a camera on the back of the head – *The 3rd I* – that during a year automatically captured photos every minute, and transmitted them to a website [Bilal11].

2.5 Computer Vision and Physical Computing – Sensors and Devices

The projects designed and developed in the scope of this practice based research were both influenced and challenged by the use of computer vision and physical computing [O'Sullivan04] in other recent research proposals and the perspectives for its further use.

Free, Libre, and Open Source Software (*FLOSS*) tools are valuable not only for enabling creative work, but also for learning and community sharing [Goriunova08]. Furthermore, they are essential for contemporary artistic practice [DeValk09].

The *openFrameworks*[56] framework is a set of open source libraries in C++ with the aim of simplifying and encouraging experimentation with programming and allowing the development of creative, high-performance applications that combine graphics, video, and audio with interactivity. *Cinder*[57] is a similar toolkit, also in C++, initially created as an internal tool for professional work by the *Barbarian Group*. *Processing* is a popular tool for creative programming, written in Java [Reas07]. *PureData*[58] is an open source dataflow programming tool similar to *Max MSP*[59]. *OpenCV*[60] is a library of programming functions for real-time computer vision, with hundreds of optimized algorithms. Uses range from interactive art, to mine inspection and stitching maps on the web on through advanced robotics. *GStreamer*[61] is an open source C library for manipulating real-time media streams, especially video, by combining them into dataflow graphs at runtime. Open source hardware is also an important component of this research. The *Arduino*[62] platform provides an accessible entry point into electronics and microcontroller programming for artists and designers.

Another relevant concept is the so called "Internet of Things" [Ashton09]. Online platforms like *Cosm*[63] (formerly know as *Pachube*[64]) and *Thingspeak*[65] are successfully building vibrant communities around the applications of worldwide network accessible objects and their data. However, higher bandwidth data, like audio and video still presents a scalability problem in these emerging platforms. An additional reference in this field is *SemSorGrid4Env - Semantic Sensor Grids for Rapid Application Development for Environmental Management*[66] (2008-2011), a recently concluded research project that involved the UK, Greece and Spain. The project consists of a semantic sensor web (combination of sensor network, Web and seman-

---

56   *OpenFrameworks* (– Open source C++ library for creative programming » http: / / www.openframeworks.cc

57   *Cinder* – Community-developed, free and open source library for professional-quality creative coding in C++ » http: / / libcinder.org

58   *Pure Data* (PD) – Real-time graphical programming environment for audio, video, and graphical processing » http: / / puredata.info

59   *Max MSP* – Visual programming language for music and multimedia » http: / / cycling74.com

60   *OpenCV* – Open Source Computer Vision » http: / / opencv.org

61   *GStreamer* – Open Source Multimedia Framework » http: / / gstreamer.com

62   *Arduino* – open-source electronics prototyping platform » http: / / www.arduino.cc

63   *Cosm* platform – "Where the Internet of Things is being built" » https: / / cosm.com

64   "Pachube is now Cosm!" » http: / / blog.cosm.com / 2012 / 05 / pachube-is-now-cosm.html # more

65   *Thingspeak* – "An open application platform designed to enable meaningful connections between things and people" » http: / / thingspeak.com

tic technologies to bridge the gap between computing applications and the physical world in which they are embedded)[67] with a distributed database and real-time data to integrate the datasources in a meaningful manner. It has a strong focus on emergency response in the context of environmental management. Tested with environmental monitoring and management use cases, the project includes a demonstration of fire risk monitoring and warning applied in Spain. Combining fire detectors in a sensor network topology and earth observation from satellites, the aim is "to support the activities to be performed in three main stages: planning, fire monitoring and fire extinction"[68].

Regarding the tasks of data capture, data analysis and decision making included in environmental management and assessment, the experience reported in the study on air quality monitoring and management in Lisbon [Ferreira00] brings relevant insights that must be taken into account when it comes to the implementation of both the ARTiVIS online platform and the monitoring station in the form of DIY video surveillance kit, especially regarding the proposal of using time within a spatial data framework.

Electronic surveillance of the forest made with the *Vigília open design* [Ribeiro04] is a project that was developed throughout ten years, led by Luís Botelho Ribeiro. The idea underlying Vigília was to open the entire project so that whoever wanted to could organize a working group and build a system to monitor the forest in their region. Several kits were setup on the forests, enabling successful results that got to the point of detecting fires 35km away from the station with more than one hour in advance of the first alarm triggered by the conventional system of human guards. This project has been an important reference for the design of the *DIY forest surveillance kit* (as further described in 4.2).

2.6 Community Building and Local Culture

Community building and local culture has been a driving force for the project since the start. Participating in the *International School of Digital Transformation* (ISDT)[69], a visionary project conceived by professor Gary Chapman, has also been a relevant source of references, especially on the social aspects, activism, and community building. The thoughts and work presented by faculty such as Leslie Shade, Marlon Parker, Daniela Silva and Pedro Markun, and Eric Gundersen, among others, have provided insights for

the research proposal towards a more proactive and activist approach, which is significant when future plans include entrepreneurship with social responsibility.

In order to contribute to a social justice agenda, "We need to be proactive and reactive at the same time when policy opportunities present themselves", as Leslie Shade points out, also remarking that "The ability to actively shape policy – or make a slight dent in policy proceedings – is a necessary and timely research intervention" [Shade99]. Michael Gurstein's work in *Community Informatics* is an important research especially in what relates to how to make information technology accessible to rural and impoverished populations [Gurstein07]. This is relevant for the current investigation because we are researching how to deploy the ARTiVIS surveillance kit to this kind of population, also because they are the ones closest to forests as well as the most directly affected by forest fires. This approach can be seen in the successful work of Marlon Parker in directly building communities in South Africa [Parker12].

Eric Gundersen of *Development Seed* is a reference for the online platform, considering his development of federated web tools like *OpenAtrium* and *ManagingNews* that empower communities and help share computational resources and infrastructure costs [Gundersen10]. *HiperBarrio*, a project awarded at *Ars Electronica*, was also a case study on community creation harnessing technology and local culture to effect social change [Gómez11].

One of the goals of the project is to eventually pressure the local government so that existing forest surveillance infrastructures are open for public use. The balance between the activists need to access public data and the policy maker's role of protecting sensitive information from being disclosed is a delicate one. Daniela Silva and Pedro Markun's *Transparency Hackday*[70] open data initiative highlights the former [Markun12]. Sunil Abraham's exercise of drafting a CCTV policy highlighted the latter in his talk "India's Unique Identity Number: The world's largest biometric database" [Abraham12], an issue that raises big questions regarding the risks to individuals' privacy [Bowe12].

Collaborative systems research projects involving volunteer environmental monitoring through information and communication technologies state that "Public participation within environmental monitoring may contribute to increasing the knowledge on the state of the environment at the same time it promotes citizens' involvement in environmental protection" [Gouveia04, p.135]. However, limitations had to be overcome due to a lack of confidence in data collection procedures. Intending to promote the use of volunteer collected data, information and communication technologies were applied to develop a system for environmental collaborative monitoring that incorporates tools and methodologies to facili-

---

70   *Transparency Hackday* » http:/ / startupi.com.br / en / 2009 / transparency-hackday-an-event-for-creating-web-apps-and-mashups-with-public-government-data /

tate data collection, access and validation of voluntary collected data. Further insights from this comprehensive research are analyzed in the concept and design of the online platform (cf. 4.1).

One of the references explored during the *LCD Residency*[71] is Clay Shirky, considering his writings and presentations on the cognitive surplus that have to do with participative culture and also with the questions regarding civic value versus community value. The proposed solution is oriented towards creating participatory tools [Shirky08] enabling "design for generosity". "Share" and "communication" are recommended for civic participation, instead of individual exploration and usufruct. Cognitive surplus from crowdsourcing and individual expression are the tools given to people to work towards society[72].

Finally, we must mention the *AZ Labs* network[73], constituted by *LCD*, *altLab*, and *xDA*. The *AZ Labs* have been crucial to the development and implementation of the interactive installations accomplished in the scope of this research. On the one side, as a source of references embodied in its members multidisciplinary interests and practices, and on the other side through the effective participation in the development of the installations of this ARTiVIS research. The foundations and purposes of the labs network are summarized in a publication within the scope of mapping the media labs in Europe [Mota11].

Social entrepreneurship is yet another important dimension for this project, especially for the future. In the context of both an entrepreneurship course by Dana Redford and Nuno Silva[74] and the *Korsakow*[75] workshop by Matt Soar and David Reisch[76], a non-linear video was produced. It combined inspirational views on the topic made through *VoiP*[77] recorded interviews to TMS Ruge from *Project Diaspora*[78], Juliana Rotich from *Ushahidi*[79] and *iHub*[80], John Brennan from *OpenAction*[81], and Pedro Ângelo from the *AZ Lab LCD*[82]. The interactive video and the interviews are further described and analyzed as part of the evaluation section (5.3.2).

---

71   *LCD* artistic residency outcomes, Guimarães, March 2012 » http: / / lcd.guimaraes2012.pt / index.php?
     option=com_content&view=article&id=39%3Aresidencia-lcd-guimaraes-marco-de-2012&catid=1%3Ageneral&lang=en

72   In "How cognitive surplus will change the world", *TED talk* by Clay Shirky, 2010 »
     http: / / www.ted.com / talks / clay_shirky_how_cognitive_surplus_will_change_the_world.html

73   *AZ Labs – Audiência Zero* Cultural Association: *LCD* in Porto and Guimarães, *altLab* in Lisbon, and *XDA* in Coimbra » http: / / audienciazero.org

74   Personal Strategic Plan for the *UL Entrepreneur course* » http: / / www.monicamendes.info / entrepreneurship

75   *Korsakow:* dynamic storytelling – open source software using non-linear editing for the creation of database films » http: / / korsakow.org

76   Organized by Luís Frias and Nuno Correia with the support of UT Austin | Portugal – COLAB »
     http: / / immaterialmedia.wordpress.com / interactive-documentary / korsakow-workshop /

77   *Skype* was the *Voice-over-Internet Protocol* service and software application used » http: / / www.skype.com

78   *Project Diaspora* – "motivate. engage. mobilize" http: / / projectdiaspora.org

79   *Ushahidi Platform*, a tool to easily crowdsource information using multiple channels » http: / / www.ushahidi.com

80   *iHub* – "technology, innovation, community" http: / / ihub.co.ke

81   *OpenAction* – "Engage your online audience" http: / / openaction.org

82   *LCD* – "Laboratório de Criação Digital" (Digital Creation Lab), the *AZ Lab* in Porto » http: / / labcd.org

2.7 Summary and Discussion

The work described in this thesis is situated in an area of research that has been explored in a number of disciplinary contexts, to which this chapter made summary references. The state of the art acknowledged covers the areas that are interconnected in this ARTiVIS research. Throughout the current chapter we have gathered a selection of references that form the basis to build upon the research work.

Whereas real-time video has been mainly used as a functional tool for surveillance, targeted for informational and safety purposes, the use of this resource has an enormous potential for artistic exploration as demonstrated by some significant art works herein described.

The lessons learned through the case studies of use of real-time video encompass issues of CCTV for safety purposes, the application in artistic contexts, and its controversial deployment and use. Aiming to take the best of both worlds, ARTiVIS is exploring the green facet of *Big Brother* that proposes to protect the forests through surveillance. Controversies around the theme of surveillance, the power of art in activism and social responsibility were expected – and are desired as input for healthy discussions evolving into better, flexible and creative proposals, rather than rigid solutions. In ARTiVIS, Art as a territory of experimentation, contestation, and transgression is also undertaken as an effective approach for environmental sustainability.

Under the crossfire of surveillance purposes and social consequences where privacy is also questioned, and the creative use of real-time video in artistic contexts, ARTiVIS has its own place. The proposal that follows this chapter will make it clear when describing the goals and the means to achieve them. Overcoming controversies, the ARTiVIS proposal aims to be meaningful to help "Big Brother go green".

The case studies discussed in this chapter strengthen the theoretical and practical basis for the next steps. Additionally, work that is specifically related to the concepts and technologies involved in the ARTiVIS outcomes are presented in the corresponding sections. Those references constitute a relevant complement of the current chapter and are included in each of the related work sections of the online platform (cf. 4.1), the *DIY forest surveillance kit* (cf. 4.2), and the interactive installations (cf. 4.3 to 4.5).

3. RESEARCH CONCEPT AND METHODOLOGY

The current investigation combines practice-based research with project development based in design methods. Integrating research techniques of both art and science fields, this hybrid approach also embodies the so called third culture: "Because our work and tools are in constant flux, we are forced to articulate the reasoning and meaning informing the art we produce, which has traditionally been the role of art critics and historians. This creates room for an active dialogue with both humanists and scientists. Thus we are placed in between these 'Two Cultures', which creates a triangle and promises the emergence of a third culture" [Vesna01, p.121].

The ARTiVIS research was accomplished through an iterative process, applying design a methodology [Munari97, Laurel03] in a multimedia context. The development of the project ranged from experiments with real-time video monitoring the natural environment, to the design and deployment of the interactive installations *B-Wind!,* Hug@ree and *Play with Fire* that make use of real-time video streaming as raw material to help bring awareness and change the current behavior regarding environmental protection.

Using real-time video was a key challenge that required technical skills in a collaborative approach in order to enable real-time processing. The process included research, design, and deployment of the three interactive installations up to completion and public presentation, and also the conceptualization of an online platform and the prototype design of the hardware of a *DIY forest surveillance kit* in order to later enable artistic and scientific use of streaming video.

In this chapter, we describe the concept of the ARTiVIS research project and we reflect on the practice-based approach, followed by the presentation of the methods used throughout the whole process. Furthermore, we present early and complementary work that explores the trees and forests, the use of real-time video as raw material, and future entrepreneurship opportunities.

3.1 Concept

To be sure, an ordinary passerby would think that my rose looked just like
you – the rose that belongs to me. But in herself alone she is more important
than all the hundreds of you other roses: because it is she that I have watered;
because it is she that I have put under the glass globe; because it is she that I
have sheltered behind the screen; (...) Because she is my rose.[83]

This research project considers the use of real-time networked video monitoring and surveillance by people that potentially "adopt"[84] featured forests, as *Little Prince*'s relationship with his rose. This interactive system proposes to connect a community of users and exhibition visitors that enjoy the forests through their real-time videos, whether provided by the ARTiVIS online platform, or experienced in interactive installations. With these assumptions in mind, the outputs are meant to be a trade-off between an artistic contemplative, fascinated observation of video interfaces presenting forests, and a tense functional monitoring for fire prevention through surveillance.

ARTiVIS is therefore a participatory platform that aims at making a contribution that matters. We foresee that these interactions provide artistic explorations of contact with nature, contributing to a feeling of belonging, strengthening the relationship with the forest.

3.1.1 *Art or Science?*

"Both!" is what *Sci|Art Summer school*[85] students enthusiastically replied, realizing they could follow their two passions – Art and Science – after all the inspiring examples and activities accomplished during such a learning experience.

So is ARTiVIS. Whilst the acronym stands for *Arts, Real-Time Video and Interactivity for Sustainability*, the ARTiVIS' operational meaning can be described as the exploration of artistic experiments enabled by technology in order to protect the environment. Involving digital media, the natural environment, and real-time video, the ARTiVIS research combines references, procedures and outcomes at the intersection of Art, Science, and Technology. Mapping these conceptual territories, the diagram herein presented displays ARTiVIS at the intersection of these three main areas.

---

83   In "Little Prince", by Saint-Exupéry.

84   The idea to adopt a forest was created in the scope of a proposal submitted to *80+1 livebits* » http: / / monicamendes.info / livebits / proposal.html

85   *Sci | Art Summer School 2011, UCLA*. The motto question pleased everyone, for the examples shown proved the compatibility of both Art and Science.
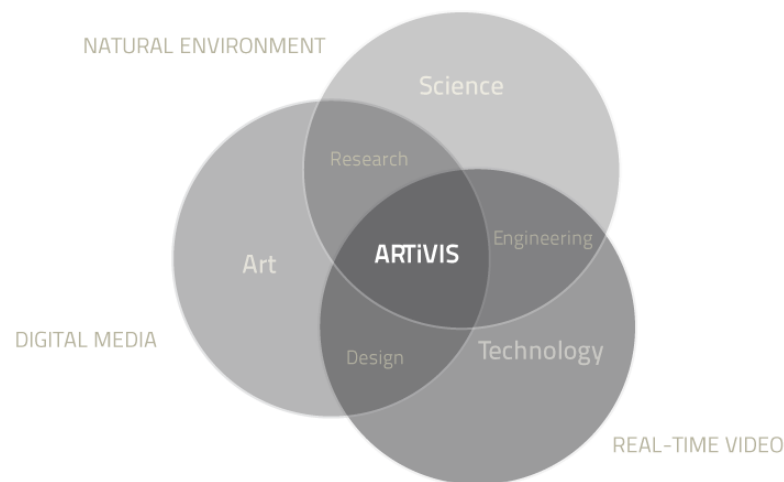
Figure 3.1. The ARTiVIS research lives at the intersection of Art, Science and Technology.

The intersections show Research as a common concern of both Art and Science, and as Engineering bridges Science and Technology, so does Design makes the connection of Art and Technology, involving new tools and media in broader aesthetic and social implications.

3.1.2 Real-Time Video: both Information and Contemplation

Real-time video is a fundamental part of ARTiVIS, used both for fire prevention purposes and for aesthetic fruition.

The question of real-time in the context of art is pertinent. In the anthology "Real Time + Art", Søndergaard presents a series of descriptions and definitions by some of the most influential theorists, historians and artists that work within the field of real-time, including the real-time definition by Björn Norberg adopted in the context of this project: "Real time cannot be questioned. Even if you cannot grab hold of it, the moment exists. It doesn't offer a static situation or something you can observe like a frozen image, but it is always there. This is the kind of truth I believe all artists want to achieve" [Søndergaard05, p.106]. Real-time, when seen as the aesthetic capture, performance or experience of an ephemeral moment, can be mesmerizing, and this is the raw material of ARTiVIS.

A critical issue to work with is the "real-time" as a "new" dimension to explore [Virilio00] in the construction of real space, with its territorial problems, geometrical and geographical constrains. There is also to consider the new constraints of the order of immediacy and ubiquity of real-time, with its access protocols, transfers, viruses and chrono-geographical networks.

We are dealing with time at the speed of light. From the moment we have a real-time representation system, the intensive duration of the "real instant" overwhelms the duration, that extensive and relatively controllable time of history, the long expression that still involved past, present and future. It is what Virilio would name a "time commutation", that also presents a kind of "commotion" of the present duration. In ARTiVIS, we can add the feeling of anxiety associated with nature randomness and the present being a concretization of possibilities of the future.

What becomes critical in this project is not the three dimensions, but the fourth one – time – especially in what concerns to the present, once it is not opposed to deferred, but competes with the present itself, by isolating from its here and now. The risk here is, as Paul Klee would say, "to kill the present by defining it separately" – in fact, it is not our presence anymore, but "a discrete telepresence" [Virilio00]. Further thoughts arise from Virilio's considerations on the paradoxes revealed by "meeting at a distance" or "to be telepresent", simultaneously here and there, where the pretense "real time" is not more than "real space-time", once the events happened in fact, they took place, even if that place is the non-place of the tele-transmissions.

3.1.3 The Places: Here and Everywhere

Forest protection is part of the main concerns of the project. Beyond user and government streams, we are looking to provide ARTiVIS video streams of particularly endangered forest locations.

This presents a curatorial challenge: the forests are selected by its environmental and aesthetic values, bringing visibility to these forests, aiming to contribute to their conservation. The ARTiVIS overall project selection of the places to cover proposes to follow a poetic framework based firstly on its relevance, as "lungs of the world" that have suffered serious fires and remain in constant threat. *So how can we use the current technologies to give a meaningful snapshot of forests of the entire planet?*

The idea is to use a range of webcams with wireless access, transmitting real-time video of forests distributed in the whole world, represented by two locations in each continent. Based on the highest forest fire rates published in the *Le Monde Diplomatique Environment Atlas* [Durand08] and in *NASA*'s world maps online database on forest fires [NASA12], a pre-selection of sites to cover includes: in Europe – Portugal and Italy, in America – Amazon and California or Texas, in Africa – Congo and Angola or Mozambique, in Asia – Indonesia and India or Thailand, in Australia – Sydney Blue Mountains or Melbourne and New Zealand. The following map shows the diverse locations covered in the ARTiVIS presentations and the ones proposed for the nuclear structure.
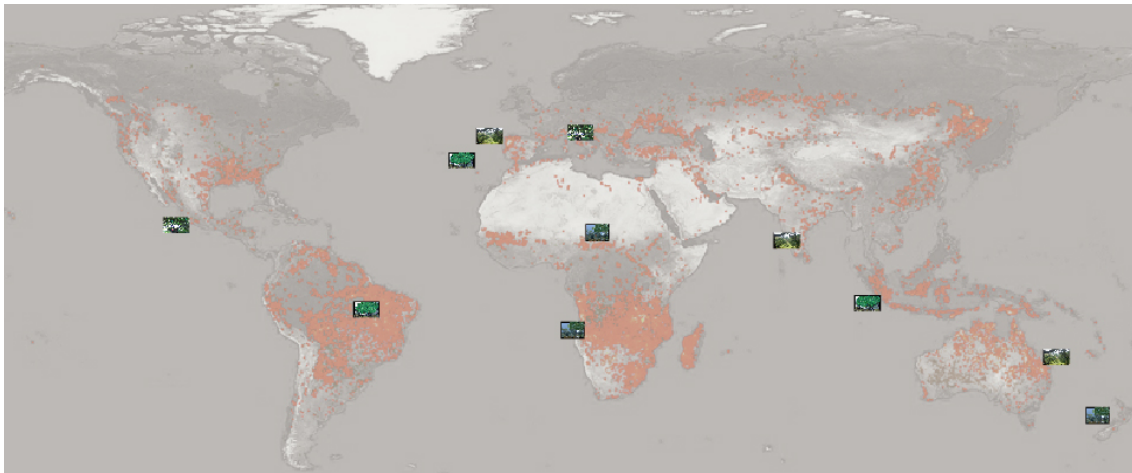
Figure 3.2. ARTiVIS places aimed superimposed on the NASA world map of forest fires as of October 2011. This visualization displays the correlation of areas affected by forest fires (colored orange) and the online platform nuclear structure proposed (green spots).

So far, the ARTiVIS concept has been presented in several contexts and venues: Lisbon, Porto, Madeira, Guimarães, and Maçal do Chão in Portugal, Florence in Italy, Los Angeles in the USA, Vancouver in Canada, Istanbul in Turkey, and Newcastle in England. In the scope of the current research, the ARTiVIS interactive installations presented were implemented with the selected and available resources. Covering five places in Portugal, one in the United Kingdom(UTC 0), and one in the United States (UTC -8), the ARTiVIS interactive installations showcased:

» Tree in the village center and forest in Maçal do Chão for *Hug@ree* and *Play with Fire* (c);

» Tree at Santa Catarina lookout in Lisbon for *Hug@ree* (f);

» *Saudação Convent* courtyard trees and the *montado* forest in Montemor-o-Novo for *B-Wind!* and *Play with Fire* (b);

» UCLA courtyard trees in Los Angeles for *Hug@ree* (e);

» *Laurissilva* forest at Fanal, Madeira, for *Play with Fire* and local implementation tests (d);

» *Penha* forest in Guimarães for Play with Fire (a);

» *Hancock Museum* courtyard in Newcastle University for the *Play with Fire* demo.

Figure 3.3. Views of the trees and forests as displayed at the exhibitions and demonstrations at: (a) Guimarães, (b) Montemor-o-Novo, (c) Maçal do Chão, (d) Fanal in Madeira, (e) Los Angeles, and (f) *Adamastor* lookout in Lisbon.

The ARTiVIS places "wish list" includes further places to cover. Globally, the proposal is to go forward with the world coverage selection presented, starting with the implementation in the inescapable Amazon[86] in Brazil (UTC-4), the largest rainforest in the world – paradoxically robust and fragile, one of the countries in tropical areas where the deforestation concern is responsible for one fifth of the worldwide carbon emission[87]. Locally, further locations in Portugal (UTC 0) still include places with a great potential for enhancing the connection of Art and Culture, such as Sintra, a *UNESCO World Heritage* site near Lisbon also recently affected by forest fires, with its exuberant forests that enchanted 19th century romantic writers, and *Serralves Park*, a privileged landscape in the courtyards of Porto's cultural icon, for its indoor-outdoor relationship of nature and art in the *Serralves Contemporary Art Museum*.

The biodiversity of the forests is a subject to be further studied and documented, a process that was already triggered by the interactive installations[88] and included in the *Play with Fire* mobile application information section.

---

86   "Why the Amazon is important", by James Painter, May 14, 2008, *BBC Latin America* online »
        http: / / www.bbc.co.uk / worldservice / programmes / 080508_why_amazon_important.shtml?s

87   "Forest and Climate", in *WWF* » http: / / wwf.panda.org / what_we_do / footprint / climate_carbon_energy / forest_climate / | "Understanding
        Climate Change", The Moorcroft lab, Harvard University, Organismic and Evolutionary Biology Department » http: / / rc.fas.harvard.edu / case-
        studies / understanding-climate-change /

88   ARTiVIS online information on the forests and tree species covered » http: / / artivis.net / places.html

3.2 Methods

In theory, there is no difference between theory and practice.

But, in practice, there is [89]

The rich cycle of interaction between practice and theory – to learn and to go further through design processes – is the greatest motivation for the practice-based methods carried out in this research. This approach is reinforced when Peter Lunenfeld states that "design research creates a place to braid theory and practice to make the work stronger" establishing "a demilitarized zone between makers suspicious of discourse and critical intelligence disdainful" [Lunenfeld03, p.10].

Regarding practice-based and practice-led research in the arts and humanities fields, intense discussions have been generated on the paradoxes of its various manifestations [Durling02, Scrivener00], especially when it is argued that art-making or design-making is research. The debate goes back to Sir Christopher Frayling's Royal College of Art's paper on research in art and design – in which he proposed three models of design research: (1) research by design, (2) research through design, and (3) research for design [Frayling93]. In this scope, controversy has been raised from the interpretation that the artifact is the goal of the research as the embodiment of new knowledge. Durling *et al.* and Scrivener bring further reflections and understanding on these issues around practice-based doctoral projects in art and design. The model that Lunenfeld describes as the most difficult to characterize, "as its purpose is to create objects and systems that display the results of the research and prove its worth" [Lunenfeld03, p.11] is research for design, among all three the closest to this research.

When introducing the foundations of practice-based research, Michael Biggs stated that "practice-based projects are those which include as an integral part the production of an original artifact in addition to, or perhaps instead of, the production of a written thesis" [Biggs00]. In the specificity of this research, the practice-based approach that was carried out complies with Scrivener's concerns as "Design research that is intended to effect change" that is more connected with technological research than it is to the humanities research [Scrivener00].

Bringing humanistic values into computer-based media is an optimal combination for ARTiVIS that interactive designer and researcher Brenda Laurel advocates in her approach to design research methods with sustainability in mind [Laurel11]. In her teaching in the course *Design Research: Shades of Green*, the quest is "to discover the meanings of 'green' afoot in California culture and discover through research how to reframe 'green'" [90].

---

89   By Jan L. A. van de Snepscheut / Yogi Berra (also attributed to computer scientist Jan L. A. van de Snepscheut and physicist Albert Einstein)

90   At CCA – California College of the Arts | Curriculum: Design » http: / / www.cca.edu / about / sustainability / design

The framework and methods used in this ARTiVIS research also meet the ideas discussed at the *International Conference Research in Art* (2009)[91], of which some reflections on project and practice-based research are highlighted as follows.

Issues that are common to the current investigation note that research must be speculative, associative and non-linear. As stated by British artist and *Planetary Collegium* founder Roy Ascott, cultural tendencies are being re-aligned by a global community of online users through associative structures, thus cultivating new hybrids. Moreover, by challenging traditional methodologies, we also agree with artist and researcher Paulo Bernardino when questioning the arts in society and proposing alternatives for practice based-research; subjectivity and interdisciplinarity through project are then able to develop cultural capital within a critical interventionist context, thus contributing to generative models. Further interesting reflections raised in the course of the presentations were the antinomy "Creation-Investigation" raised by Mário Bismarck, reinforcing that knowledge is built from practice, and the alert to "the simple act of speech on art as self legitimation" in academia as an issue of appreciation of speech over the art work. In this investigation, we assume the role of the artist researcher who is self reflecting processes that combine writing and making, as previously illustrated by artist and Media Art and Science professor Kathleen Rogers with Paul Klee's self documented working process. Furthermore, we agree that interconnectedness and shifting hybrid domains is achieved through insightful conceptual work, and in ARTiVIS we have also defined the values we want to deliver through research. On the other side, in the research outcomes we have dealt with the process of illusion, an aspect emphasized by media art researcher Claudia Giannetti who approached the research in the arts and new technologies subject through the relevance of the *simulacrum*. Our practice-based approach also converges into the specification that instruments can facilitate the artistic process, as stated by Sílvia Chicó during the conference, reiterating the adequacy of this approach in the area of multimedia art.

Later on, during the *GEAR seminar* (2010)[92], examples were presented through the sharing of experiences of the creative labs. Practice-based research collaborative projects in dance, visual arts, music, theater and robotics, physical computing, software and hardware hacking were presented by collaborative media groups such as the *AZ Labs* hackerspaces. The presentations and discussion in this scope not only informed the ARTiVIS research in its practice-based development, but also encouraged to plan for the creation of a research group, whether independent or institutional.

In the "Dematerialization of Screen Space" Jessica Helfand describes an experiential aspect that is relevant when transposed to this practice-based research: "The qualitative difference between hyperspace and more passive screen environments lie in the celebration of the journey itself. In interactive environ-

---

91   *1º Congresso Internacional – Investigação em Arte* (I International Conference – Research in Art), Lisbon, May 18, 2010, Calouste Gulbenkian Foundation » http: / / www.i-arte.pt / programa.html
92   *GEAR – 1st Workshop for Practice Based Research in Art and Design*, 7-17 April 2010, UBI, Covilhã, Portugal » http: / / gear-up.info

ments, the promenade – and its implicit digressions – are as important as the destination" [Helfand01, p.38]. ARTiVIS required an iterative development process that included the research, conceptualization, creation and presentation of diverse articulated working prototypes. A methodical, objective and collaborative approach was developed by a multidisciplinary team and several collaborations.

The research process involved methods such as concept mapping, sketching, task analysis, information architecture, prototyping, interaction design, collaborative development, field work, public presentation, user experience evaluation, usability heuristics, redesign, optimization, results analysis, documentation and archiving. These methods were not used in a serial pipeline, but rather formed an interconnected network where the result of one process can feed new iterations of several others. ARTiVIS outcomes were iteratively developed as work-in-progress along the whole research. The interactive installations features were developed and deployed until reaching a mature proof of concept feasible for public exhibition and testing.

3.2.1 Concept Mapping

The goal of using this method was to define and map the correlation of the fundamental concepts involved and its application in the scope of the research. As "innovation requires divergent thinking before convergent thinking" [Rhea03, p.148], this divergent approach through brainstorming to facilitate creative idea generation was the first part of each of the creative exploration phases. Concept mapping was used to structure the resulting ideas, followed by convergent pre-selection of hypothesis to implement in the scope of the project.

The work process involved creating distinct visual representations[93] in diverse stages and scales. Concept mapping was important in this research because we were brainstorming first ideas as an open series of possibilities of interrelated concepts [Buzan06]. In the first presentations, the research was presented as a concept map, as shown in the following figure.
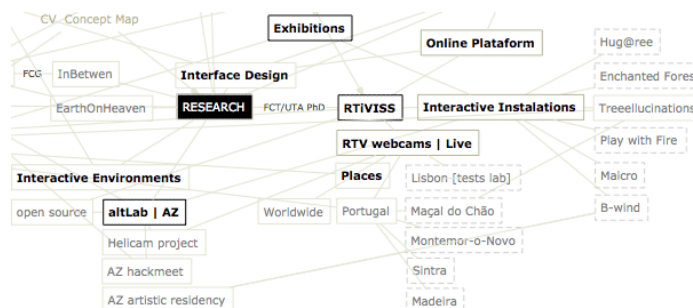
Figure 3.4. Detail of the ARTiVIS concept map, places and process, included in the first poster presented in the scope of this research (*ACM Multimedia 2010*).

---

93   Created using free and open source software *VUE* (*Visual Understanding Environment*) » http: / / vue.tufts.edu

This method was especially helpful in initial phases of subprojects to be developed. Later in the project development, information architecture diagrams helped not only to structure ideas, but were also relevant for communicating between team members from different areas and to keep track of the work to be done in multidisciplinary settings.

3.2.2 Sketching

Sketching and prototyping helped significantly in the process of designing the experience [Buxton07]. By taking the input from the concept mapping process, ideas for user experience and interaction design were then iterated upon. These provided an effective communication tool for design discussions, prototype blueprints for further development and visual work in progress documentation.
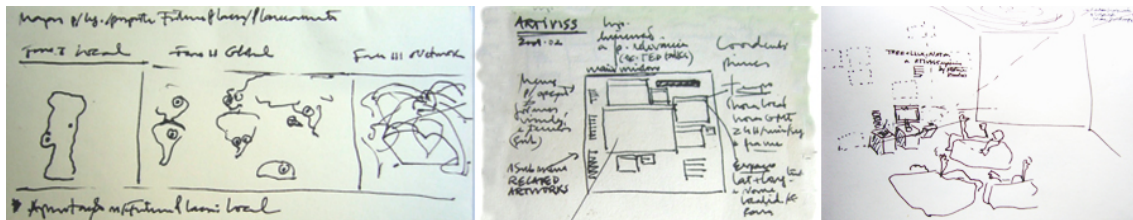
Figure 3.5. First sketches of the ARTiVIS concept of places, online platform interface, and participants interaction in an installation.

This design method was also applied in the collection of ideas and concepts by maintaining sketchbooks, where multiple loose notes were taken regularly with the goal of registering thoughts, insights or unexpected ideas for further exploration. Some of the spontaneous records that were done since the project start can still later be combined and lead to further project developments or research topics.
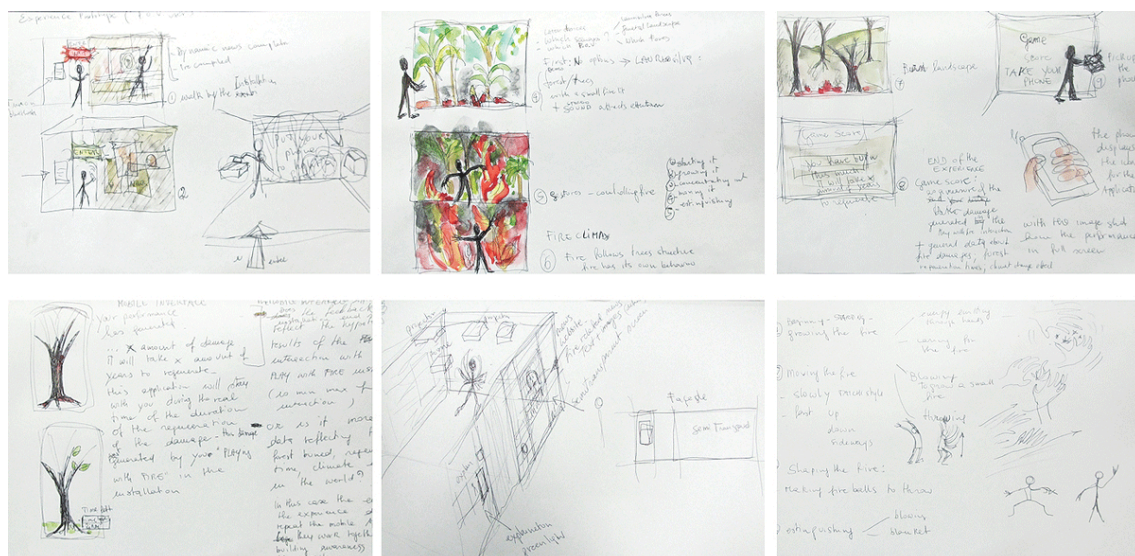
Figure 3.6. *Play with Fire* experience storyboard and gesture mapping by Valentina Nisi.

Different types of sketches were done in the diverse stages of each of the projects. In a collaborative setting, technological systems and user experience sketches were done by other project members according to their expertise, as shown in the set of sketches (cf. Figure 3.6).

3.2.3 User and Task Analysis

In the diverse phases of the project, User and Task Analysis [Hackos98] were performed in order to assess the adequacy of the purposes regarding the motivations of the project and to help clarify the users' role in the interactive installations. This was done through interviewing local populations, providing ethnographic data for validating the research theme, for a deeper understanding of selected locations, and storytelling explorations – with the goal of adding strength and subtlety and to the works' message.

The local context for the deployment of the interactive installations was an important factor to analyze previously. We looked at forests from an artistic point of view in order to collect material – photos and videos – regarding the outcomes, and to help decide where wireless cameras would be installed in the selected forests. This entails an ongoing process of selection of forests that have suffered serious fires (described in the previous section), which form the basis for the quantitative and qualitative data. To date, the mostly urban locations of the interactive installations presented (specially *Hug@ree*) were chosen to provide contrast, to provoke people to experience the beauty of nature, and inspire them to take action.

Task analysis is essential and has also been applied in the experience design of the interactive installations and the tests elaboration. Preliminary user experience tests were done in 2010 at *Pop-up* festival in Lisbon regarding the *Hug@ree* installation and at the *AZ hackmeet* in Guimarães for the *Play with Fire*, then analyzed and upgraded for application in future presentations, as described in chapter 5.

3.2.4 Requirements and Technical Specifications

As technology changes fast, technical requirements were very likely to vary over a prolonged research period. Defining them at the outset would have been prone to error, so technical choices were made throughout this research informed by field work and according to the following criteria regarding both hardware and software: open source, well documented, affordable and easy to repurpose.

Together with information gathered from an initial survey of related work (cf. 2.4 to 2.6), this process informed the requirements and technical specifications that defined the ground basis to establish the most appropriate artistic framework and computational configuration for real-time video streaming and real-time editing. This included both the software components developed within the scope of the project, and the hardware devices that were integrated. These devices, that are mainly wireless webcams

streaming to the servers to be deployed in selected locations, and mobile devices for access, have different presentation requirements and different technical tradeoffs that had to be weighted and are further described in the corresponding ARTiVIS outputs description of the technical issues.

3.2.5 Field Work

Following the conceptualization phase, intensive work was applied in the development of the working prototypes that were presented in the interactive installations, so that it could be implemented in its final form and accessed and tested for adjustments in an iterative process.

Compelling visuals that formed the poetic and aesthetic point of view – real-time videos with attention to scale, rhythm, color, and soundscapes – were the outputs of the artistic exploration of the forest in the interactive installations presented so far. This was done keeping in mind that "All objects have a poetics; they make the world and take part in it, and at the same time, synthesize, block or make possible other worlds" [Fuller07, pp.1-2].

Local implementation of the real-time video streams involved experiments with wireless cameras in a local lab – the *Tecnolopolo* of M-ITI in Madeira. Real-time video of trees and forests were used in public events, such as the presentation of the interactive installations in demonstrations and exhibitions. The different places where streaming was done from were previously described in section 3.1.3.

3.2.6 Experience Design

The concept and design of the interactive installations overall experience followed the interactive arts approach as well as experience design guidelines [Shedroff01]. As digital artists Bolter and Gromala point out, it is our task to fascinate, exhilarate and criticize reality and its status quo as well as provoke and inspire our public; "Appliances on the other hand, don't fascinate us, they brown our toast" [Bolter05, p.2]. This approach stands out against a more pragmatic vision of technology offered by HCI (*Human Computer Interaction*) experts and some interaction designers. Furthermore, as interaction and experience designers, we are aware that to design a digital artifact including an art installation is to choreograph the experience that the user will have [Bolter05].

In the era of experience economy and intangible design of services, designing a digital art intervention as a transformational experience [Nisi10] seems particularly timely. In this light, to design an art installation becomes a challenge in terms of designing an experience that will eventually promote and lead to a transformation of its own audience [Pine98].

With the ARTiVIS installations we are promoting interactions and experiences that invite the users not only to reflect on the proposed themes (such as fire hazards in forest settings) but also to act in such a setting, in order to gain understanding and accountability for the generated results. Quoting Bolter and Gromala: "If there is one reason that digital art is important for digital design is this: digital art reminds us that every interface is a mirror as well as a window" [Bolter05, p.26] – in our case, the installations act as a mirror of our actions placed in context and a window into the real world endangered by our unsustainable acting.

The application of the method in the research is summarized in table 5.2 and further developed in each of the interactive installations description (cf. 4.3.4, 4.4.3, and 4.5.3).

3.2.7 Collaborative Work

This research embraces the community's participation both in the research process, distributing technology development in a collaborative way [Mota11], and in the future, by improving the outputs with new video streams and reinterpretations taking advantage of crowdsourcing dynamics. This would be accomplished by setting new nodes on the forests, and participating in community monitoring by creating artistic explorations through the use of real-time video.

Not only the technical aspects were accomplished as team work with the collaboration of AZ Labs members, but also the writing of papers submitted to several conferences and media art events (cf. 1.3) was done in a collaborative multidisciplinary setting. This was especially the case of *Hug@ree* with Pedro Ângelo (whose background is in Computer Science), and of *Play with Fire* with Valentina Nisi (whose background in Fine Arts and Experience Design), that collaborated as co-authors. The references from multiple areas and the discussion of ideas throughout the process expanded the scope of the research and consolidated the concepts.
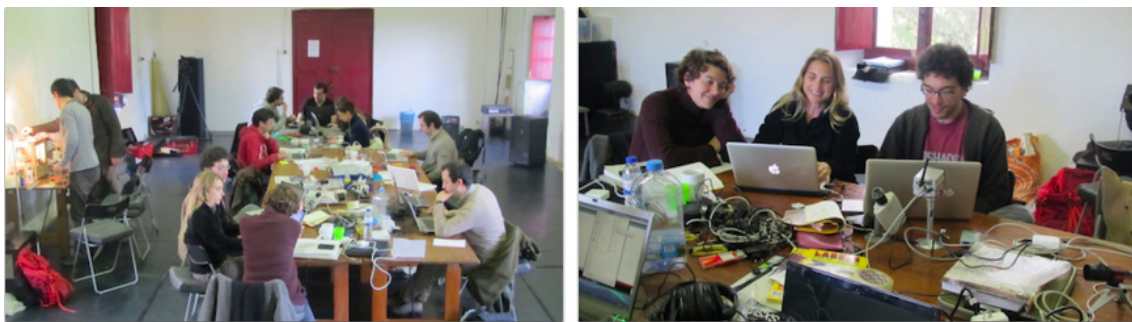
Figure 3.7. Collaborative work during the *AZ Labs* residency at *O Espaço do Tempo* for the development of the *Play with Fire* installation.

3.2.8 What about Evaluation?

Through the use of real-time video, ARTiVIS is proposing to have a positive impact in global environmental awareness for sustainability purposes. Evaluating this impact was a challenge considered since the beginning of the project. Most of the project's implementation was done through interactive experiences, and evaluating them presented the challenge of bridging concrete HCI evaluation practices and the subjective experience of interactive art. Throughout the evaluation process, general recommendations from Lazar *et al.* in their textbook specialized in research methods in human-computer interaction [Lazar10] and from Preece *et al.* in "Interaction Design: Beyond Human - Computer Interaction" [Preece11] were very helpful, from the design to the final analysis. Moreover, approaches specific to this area of research combining digital arts and HCI were especially helpful, such as the recently created *CHI Digital Arts Community*[94]. "Evaluating User Experiences from Interactive Art Installations" [Aasbakken11] is a work that deals with this topic combining several methods in user experiences evaluation study. This issue will be further explored and developed in Chapter 5.

The first round of tests was done during the *Pop Up Lisbon 2010* exhibition, in an initial phase of the *Hug@ree* interactive installation, that were used for the subsequent development.

Technical issues matured, and the second version of the tests was focused on the essential questions that would allow us to enhance the possibility of measuring the desired variable: from this experience, what is the engagement with nature?

Data recording was used together with interviews and observation to help the researcher when doing the analysis afterwards. The tools used in this research were written notes, audio recording, photographs and video recording, and they were often combined. In chapter 5 we also summarize the methods used for evaluation.

3.2.9 Documentation and Archiving

Aware of the work that is being done in contemporary arts conservation, our goal is also to preserve the participants' experience, more than just keeping data about the research and installations. *Botaniq* and *SemsorGrid4Env* are two of these relevant platforms already described as related work (cf. 2.6).

The whole research process and presentations history has been documented and recorded through photos[95], videos[96], observation notes and news report in a research blog[97] that works as a live public memory of the project. The research iterations have been reported in the blog since the beginning. This continu-

---

94   *CHI Digital Arts Community* » http:/ / chi2013.acm.org / communities / digital-arts /

95   ARTiVIS research photo collections online » http:/ / artivis.net / archive / photos / (cf. appendix D).

96   ARTiVIS videos online » http:/ / artivis.net / archive / videos / (cf. appendix E).

97   ARTiVIS research iterations blog archive as presented during this research » http:/ / artivis.net / archive / blog / (cf. appendix F).

ous process helped in the discipline of providing a regular written report of the ongoing research. This approach was also essential to keep the multimedia documentation up to date and extremely helpful in bringing the live memories when looking back for further details to report in the dissertation, such as the *Hug@ree* sprint and the exhibition history.

Along with the exhibitions, we are building the ARTiVIS online database to archive the video footage and installation data. So far, recorded video and data constituted the raw material for video demos, interaction analysis, exhibitions, cataloging, timelapses and artistic exploration (cf. appendices D, E, F).

3.3 Early Work and Beyond

Participation in workshops and residencies has contributed to broaden the scope of knowledge and activities of the research. The outcomes generated were mainly directed towards the research framework, and were structural in the subsequent creation of distinct media contents for the final research.

This section presents early work undertaken throughout the investigation first exploratory phase, when testing the concept to define an effective proposal. By experimenting with the theme and the form, the works developed during the first stage of the research helped to further define the research theme and components, and to acknowledge some practices required for the development.

In the cases of working with video, the idea was to create and show examples of artistic experiments that could be developed using resources of the ARTiVIS open archive, as if mixing real-time video that had been recorded and made available in the online platform. Whatever the context and the theme, there was always the possibility of bringing elements related with nature, especially trees and forests, whether presented or suggested. By providing a look at natural scapes from multiple perspectives, we were promoting closer looks at nature, with the goal of contributing to engagement and awareness.

Previous explorations preceding the ARTiVIS project include (1) the interactive documentary *Insight Out*, (2) the interactive video *Spinning Trees*, (3) the one minute long videos *In Between*, *Earth on Heaven* and *Insides Fine Arts*, and (4) the *LOEV* online platform.

Further experiences beyond this research are also examples of the use of real-time video in the broader scope of the ARTiVIS project. Although not fully developed within the scope of this research, (5) *Treeellucinations*, (6) *The Enchanted Forest*, and (7) *MAicro* are interactive experiences also explored as part of the ARTiVIS project. This complementary work done during the research is also here presented, and the correlation with the ARTiVIS project described.

3.3.1 *Insight Out* Interactive Documentary

A sensitive and thoughtful look from the inside to the outside – the Museum's architectural solid plain shapes, torn by windows that link to the environment of the Park – contemporary art being explored by ephemeral inhabitants as in a choreography. Surrounded by the landscape, playful memories are aroused and suggest an escape from the city...[98]

Insight Out was the first example created in the scope of the ARTiVIS early works. This first work with video resulted from participating in the *Interactive Documentary* workshop by Karen Kocher, the first of a series in the scope of the UT Austin|Portugal Digital Media program (2007)[99]. The privilege of participating in a workshop with the city of Porto as the subject organized in close connection with *Serralves*, one of the intended places for the implementation of ARTiVIS, was very stimulating.

The *Insight Out* documentary aimed at bringing awareness on the relation between the art exhibition indoors and the contemplative landscape outdoors. This experimental video was an introduction to the duality of spaces where the green natural elements are the protagonists. *Insight Out* also influenced the poetic and metaphoric approach to consider in future videos.
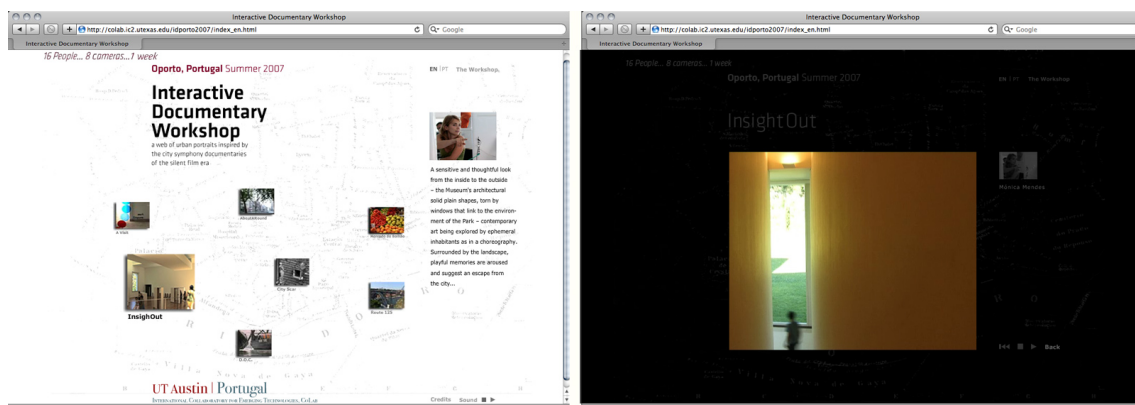
Figure 3.8. Screenshots of the *Interactive Documentary* workshop website, showcasing the homepage and the *InsightOut* video created.

---

98   *Insight Out* description – published in the workshop website » http: / / colab.ic2.utexas.edu / idporto2007 / insight.html

99   *Interactive Documentary* workshop website » http: / / colab.ic2.utexas.edu / idporto2007 /

Figure 3.9. *Interactive Documentary* workshop mobile version: home, list menu, and access to the *InsightOut* description and video.

The workshop website was also created, by a small team including workshop participants. Designing the visual interface was based on the space distribution of the projects according to their geographic location, which was a first approach to the idea of designing a spatial distribution of the future ARTiVIS events in the online platform.

3.3.2 *Spinning Trees* Interactive Installation

Spinning Trees is an environment that make us look up and meet the top of trees that move around according to the activity detected through a webcam; playful memories may arouse and suggest an escape in time and space[100]

The interactive video *Spinning Trees* resulted from the participation in the *Webcam Lab* workshop led by Massimo Cittadini[101] at the Faculty of Fine Arts, University of Lisbon (FBAUL).

In this interactive video, we worked with *Serralves* park footage recorded during the *Interactive Documentary* workshop in Porto. This part was filmed while looking up in the park, and rotating with different speeds. The interactive application featured three previously edited sequences of video, each rotating at a different speed, that were displayed according to the activity level detected by the webcam.

Although with limited video resolution due to software constraints, the visual effects resulting from the videos rotation increase were already surprising – almost becoming abstract and simultaneously resembling the planet with its shades of green and blue.

---

100   *Spinning Trees* project online » http: / / monicamendes.info / lib / MMendes_spinningTrees.swf

101   *Webcam Lab,* Massimo Cittadini » http: / / www.mutoto.org / webcamlabs.htm | FBAUL outcomes » http: / / areas.fba.ul.pt / pm / projects_en.html

Figure 3.10. *Spinning Trees* rotating at increasing speed in reaction to the activity captured by the camera sensor.

The interactive installation was set up and presented at the workshop final showcase – as users passed by in the hall, a projection in the ceiling was activated and displayed, thus generating different visual effects that entertained participants' perception, sometimes to the point of giddiness.

This work was the precursor for the interactive installation *Treeellucinations* (presented in 3.3.5). The *Spinning Trees* interaction concept was also the first experience to symbolize the "butterfly effect" motto that inspired the *B-Wind!* interactive installation (cf. 4.3) – although in a different limited form when compared to *B-Wind!*, where a participant's activity can have an unexpected effect.

3.3.3 *In Between*, *Earth on Heaven*, and *InSides Fine Arts* Videos

In Between[102] was done in the first year of research, in the sequence of the participation in *The One Minutes PT* workshop by Anja Masling and José Biscaya that is part of the broader scope of *The One Minutes* global network[103]. The resulting video represents the colors and shapes of trees *in between* representation and abstraction, with a variety of lights. The video was also created as an abstract contemplative screensaver provided its cyclical continuous change throughout the whole one minute.

In Between was screened during *World One Minutes* exhibition opening at Calouste Gulbenkian Foundation (FCG)[104] and was part of the film projection in the scope of *ABC Cineclube* "Novíssimos do Cinema Português", at *São Jorge* cinema[105].

Images of this abstract approach to the theme of the forest have since then been used as section breaks in the ARTiVIS research presentations and also in the ARTiVIS website header. The images used as backgrounds have also been a consistent framework throughout the visuals presenting the research.

102   MENDES, Mónica, 2008, "In Between", *The One Minutes Workshop*, Fundação Calouste Gulbenkian, Lisboa » http: / / vimeo.com / 4656551

103   *The One Minutes* – videos precisely one minute long » http: / / www.theoneminutes.org

104   Film projection at *World One Minutes*, FCG Lisbon, 2008 / 11 / 08 » http: / / www.gulbenkian.pt / index.php?article=1224&format=404

105   *ABC Cineclube* "Novíssimos do Cinema Português", Lisbon, 2008 / 12 / 27 » http: / / abc-cineclube.blogspot.pt / 2008 / 12 / novssimos.html
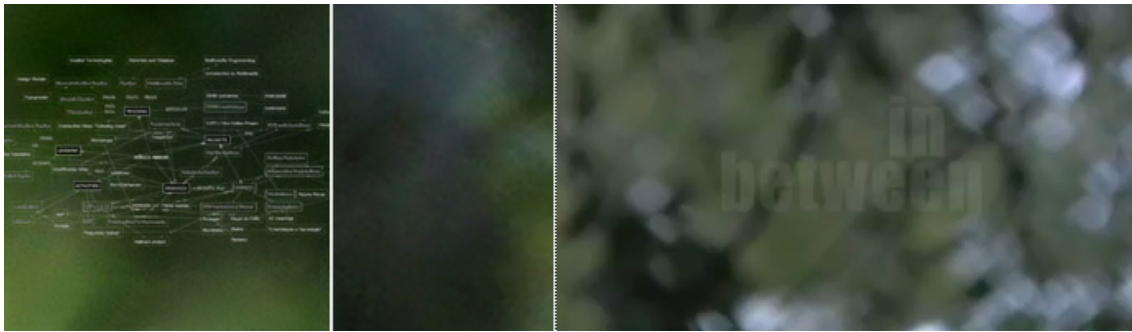
Figure 3.11. Screenshot of the ARTiVIS website header making use of the one minute video *In Between*.

Figure 3.12. Screenshots of the video *In Between* used as section break in the ARTiVIS presentations.

In the Intro to *Digital Documentary Production* workshop by Nancy Schiesary in the scope of the UT Austin|Portugal Program *Digital Media Summer Institute*[106] we had the opportunity to become familiar with the language of *cinema verité*[107]. Examining current documentary forms and practicing with exercises with short cuts was very enlightening regarding the power of narrative and the relevance of the shooting phase in order to accomplish interesting results.

Later on, when the documentation of the research and the interactive installations was done, every stream was shot with the awareness that each short piece of narrative had the potential of a story with a beginning, middle and end in itself. The outcomes of this workshop included *InSides Fine Arts*, a one minute video where the short video sequences filmed and edited revealed green parts of trees that were present in all the clips.

Figure 3.13. Screenshots of the one minute video *InSides Fine Arts* displaying the green elements presented throughout the sequence.

---

106 *Intro to Digital Documentary Production* workshop by Nancy Schiesary, New University of Lisbon (FCSH / UNL), 2009 »
    http: / / utaustinportugal.org / news / digital_media_summer_institute_2009 /

107 *Cinema vérité* as "a technique to closer approximate the recording of 'truth' (…) The debate central to *cinema vérité* is the notion of remaining an
    unobtrusive observer", in *Cinema Vérité: Defining the Moment, Senses of Cinema* » http: / / sensesofcinema.com / 2000 / 11 / verite /
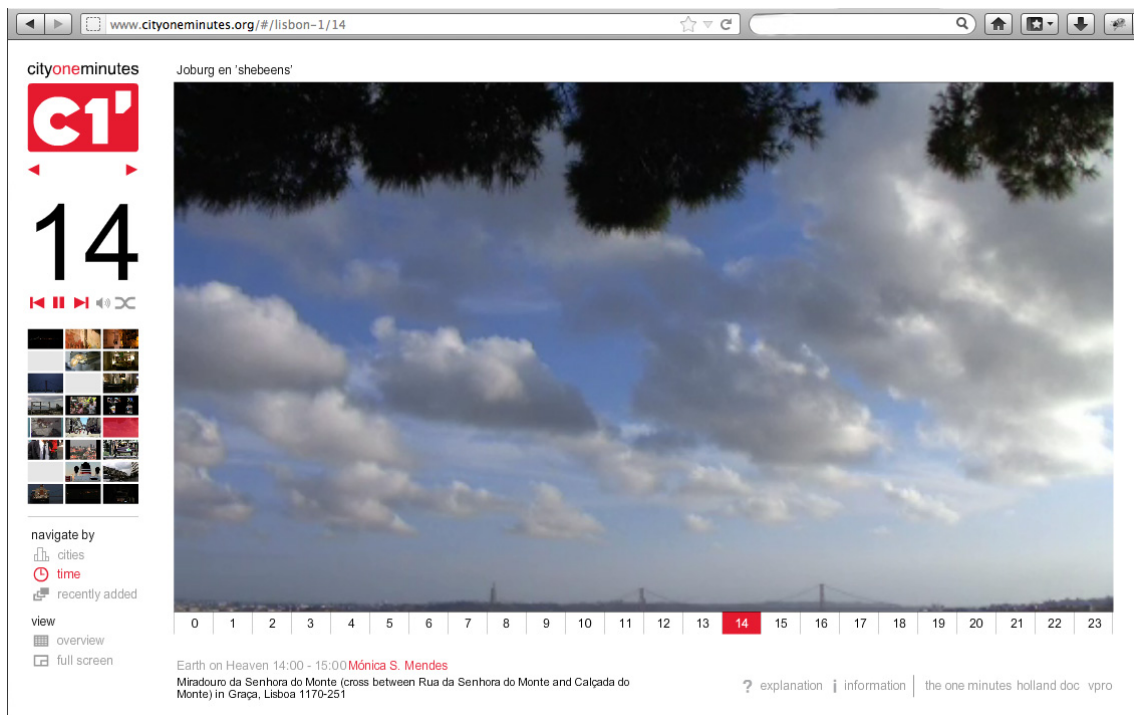
Figure 3.14. Screenshot of the *Earth on Heaven* video, as exhibited online at cityoneminutes.org in the scope of the *City One Minutes Lisbon*.

This approach also inspired the one minute movie that ended up being selected for the Lisbon showcase, *Earth on Heaven*. The cognitive break by the inversion reflected in the title aimed at bringing awareness on the natural elements like trees that, although its ubiquitous existence in urban environments, are frequently unnoticed. This was a poetic proposal to, in a reflective way, highlight and contribute to generate awareness and good will towards nature.

The one minute video *Earth on Heaven* brought an unconventional look at trees and the natural environment around us in the city, and was selected to become part of the 24 videos that presented Lisbon's 24 hours in an international context, the *City One Minutes*.

The film was integrated in the *City One Minutes The Movie*, by Joe Houweling and Sophie Leferink, a project that was conceived by The One Minutes Foundation and Holland Doc, and screened at the *One Minutes* annual awards in Shanghai[108] and *Pop Up City Nimas*[109]. *Earth on Heaven* was also presented at the opening exhibition of the STAM Museum in Gent, *Enlightened City*[110], as part of the *City One Minutes* video installation.

The challenge here was the to bring awareness on the natural environment in urban scapes. This opportunity was further explored with the ARTiVIS installation *Hug@ree* being exhibited in the scope on an

108 *City One Minutes* – Lisbon series » http: / / www.cityoneminutes.org / # / lisbon-1 / 14
109 *Nimas Pop Up* screenings program » http: / / www.popup-city.com / lisbon-2010 / en / cartaz / nimas /
110 *Enlightened City*, STAM Museum, Belgium, October 9, 2010 - May 1, 2011 » http: / / www.stamgent.be / en / activities / detail / p / enlightened-city

urban art showcase, *Pop Up City*, in Lisbon as "an interactive installation that provides a bond between urban beings and the forest".

The context of the creation of the *In Between* short movie also led to the participation in the *Longa Noite de Curtas* (*LNC*) short movies showcase, with *Insides Fine Arts* (2009), followed by the ARTiVIS interactive installations one minute teasers of *Hug@ree* (2010) and of *Play with Fire* (2011)[111].

Participating in side events such as the *LNC* and *One Minute Videos* was very rewarding as it also gave an insight of how the ARTiVIS proposals result in different contexts, and what kind of reaction we get from the makers in parallel artistic areas.

3.3.4 *LOEV* Online Platform

Precursor of the work on the ARTiVIS online platform, *Loev – Live Online Events*[112] is a multidisciplinary group project that was triggered in the framework of UT Austin – Portugal Program *Online Journalism* workshop[113] by Rosental Alves, who emphasized the *LOEV* potential and also encouraged to move forward with such an idea.

The project is currently in standby and may be later reactivated. *LOEV* was an ambitious project proposing to provide users with a revolutionary state-of-the-art platform in order to give free access to online, live events from every part of the world. What *LOEV* proposed was to enable a new way of conceiving knowledge – as a live community, creating strong ideas in real-time by remote participation in seminars and conferences, where *LOEV* would enable live online broadcasting events.
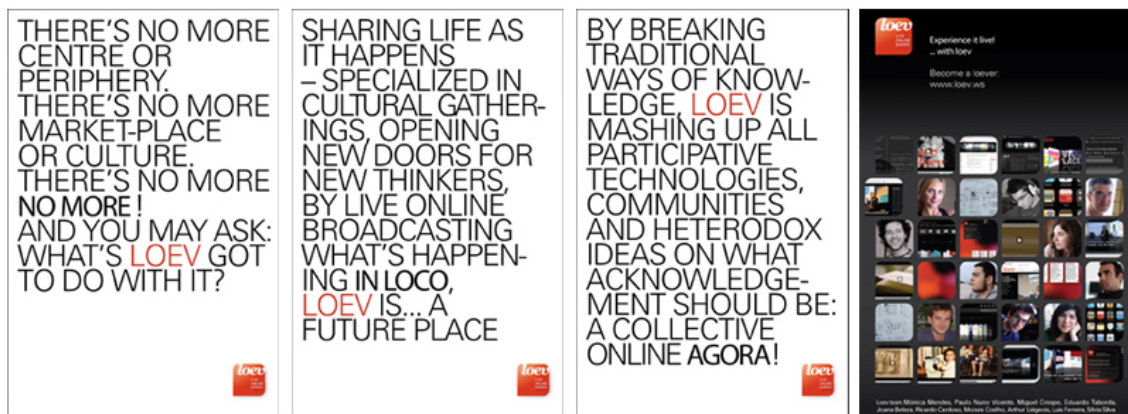
Figure 3.15. *LOEV* printed postcards presenting concept teasers in the front and the team and contacts in the back.

---

111   *Longa Noite de Curtas* (Long Night of Shorts), by Gonçalo Robalo, coord. » http: / / longanoitedecurtas.blogspot.pt | The showcase includes a score and having been a favorite in the narrative track and in the image track is a good hint regarding the potential of *Play with Fire* in other venues.

112   *LOEV* online prototype » http: / / monicamendes.info / loev /

113   In the scope of the *Digital Media Summer Institute 2008* » http: / / utaustinportugal.org / news / digital-media-summer-institute-2008 /
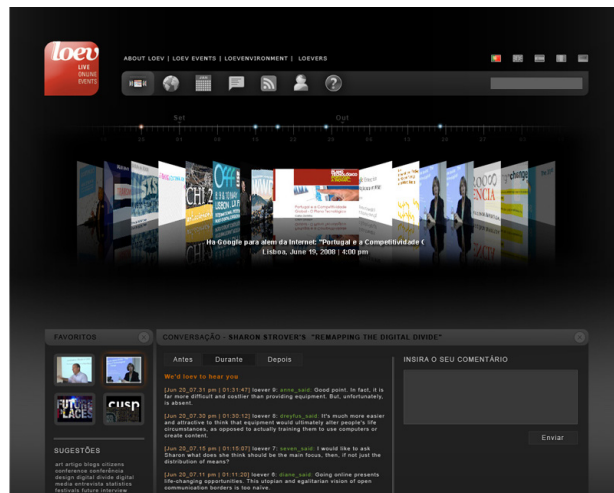
Figure 3.16. *LOEV* online platform Web 3.0 prospective prototype.

Moreover, *LOEV* proposed to also provide "loevers" with the ability to interact with such events, discuss on the fly every idea at any given time, and act through a privileged question and answer (Q&A) original format. Redesigning journalism conventions was part of the method, by generating a virtually unlimited newsroom and anticipating Web 3.0: multimedia, multilingual, timeless and decentralized – an ubiquitous and open *LOEV*.

The initial framework when first ideas came to life enhanced the possibility to present *LOEV* – mainly its educational or scholastic characteristics – through an installation that was selected for the Future Places digital media festival exhibition (2009). We then presented the concept of the project in the form of printed material, videos, and a website that included first outcomes of identity and the proposal look & feel of the multimedia application. In this event, the *LOEV* project proposal was commended by the jury for its "commercial potential"[114].
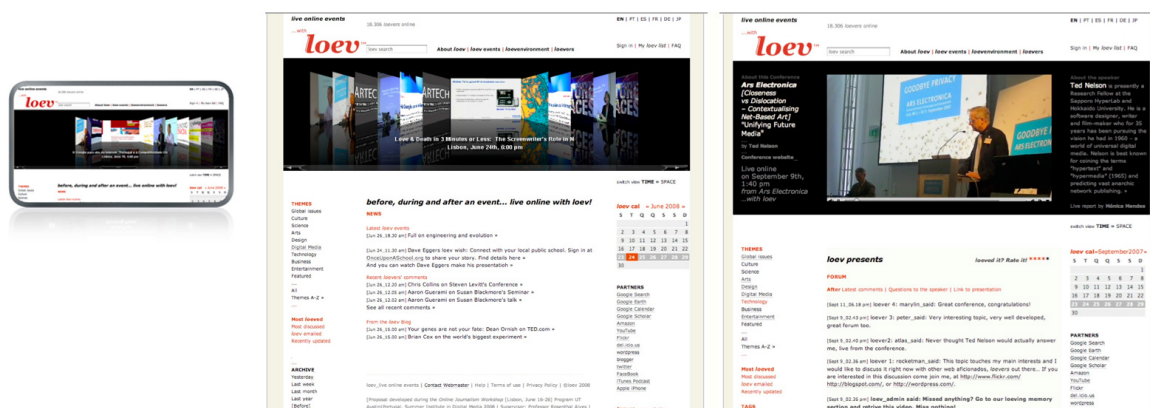
Figure 3.17. *LOEV* prototype displaying a specific event. The interface was designed as a template and applied in the ARTiVIS project websites.

114   *LOEV – Live Online Events*, in *Future Places Digital Media Festival* exhibition, Porto, Portugal, 2008 » http: / / futureplaces.up.pt / 2008 / doku.php? id=exhibition:monica_mendes_paulo_vicente_and_silvia_silva

This work was very helpful for the team coordination experience with the integration of knowledge from related areas such as journalism and programming.

The *LOEV* website remains as a work in progress, to be continued in future endeavors. It contributed to the knowledge and experience acquired in the *LOEV* process that later informed the requirements for the ARTiVIS online platform structure and design. Moreover, the ARTiVIS research blog report that followed was very much motivated and empowered by the *Online Journalism* workshop experience.

3.3.5 *Treeellucinations* – A Preliminary Interactive Installation

Can trees become hallucinations? Will spinning perceptual reactions trigger your senses?... Let's "treeellucinate"![115]

When first presented in a public exhibition, the ARTiVIS concept was no more than a set of sketches and ambitious ideas for implementation. As the first interactive installation to showcase the ARTiVIS concept and use of real-time video, *Treeellucinations*[116] is both early and complementary work.

The need to explain the online platform through its use in a public event inspired *Treeellucinations*, the first interactive installation created to present the ARTiVIS general concept in an exhibition.

Treeellucinations is an ARTiVIS experience where visual perceptual reactions are triggered by empowering users to influence the natural environment displayed in the video through interaction. The video contains footage of trees at different times of the day and it rotates. Rotation acceleration is controlled by users' participation detected by the webcam through activity levels. The aims are to perform artistic experiments that combine this interactive visual setup of trees with music, reaching a broad target of users that get to know ARTiVIS through their love for music, and to explore interactions regarding the combination of real-time video of forests and synchronized audio.

References include the music and dance videogame *Headbang Hero* [Martins09] and the audio-visual improvisation *Memory Tunes*[117], presented at *Ars Electronica* (2007 and 2009).

---

115 In *Treeellucinations* research online » http: / / treeellucinations.artivis.net

116 ARTiVIS | *Treeellucinations* – Interactive installation, in *Future Places Digital Media Festival* exhibition, Porto, Portugal, October 7-19, 2009
» http: / / futureplaces.up.pt / 2009 / doku.php?id=exhibition:monica_mendes

117 By Ran Slavin at *Ars Electronica Festival*, September 2007 » http: / / 90.146.8.18 / en / archives / picture_ausgabe_02_new.asp?
iAreaID=448&showAreaID=448&page=2&pagesize=10&order=name

Figure 3.18. *Treeellucinations* presentation at AZ residency and screen captures of the videoloop at Future Places.

The first prototype was presented at *Future Places Digital Media Festival* (2009), representing diverse sights and day times of the forests of the ARTiVIS local implementation in the small village Maçal do Chão, including some unusual moments captured during footage in place. The video loop projected in the ceiling contributed to the engagement and immersion of the participants, invited to lay down to experience the forest video progressive rotation as "hallucinations". Simultaneously, a screen in front of the users displayed the real footage, offering the possibility of a perceptual pause.

Second version was presented at the closing event of the first *AZ Labs* residency, combining real-time video captured locally with the forests videoloop, this time as an overlay on the participants dancing.

Further work was done at the second *AZ Labs* residency, testing the real-time video input and real-time 3D graphics, that were tried and are used to augment the video.

Current research work is focused on real-time video input from diverse places displaying a range of day times in the same place. Infrared cameras to detect activity allow for effective responsiveness in darker environments. Combining this development with a large projection scale contributes to a truly immersive environment. Sound is designed to emphasize the psychedelic associations indicted by suggestive physiological response to visual perception. Hypnotic effects may happen, reinforcing its potential.

Further approaches will be designed as VJ sets, presented to a broader public in entertainment arts contexts. Visuals will be displaying interchanging real-time video forests with real-time footage of the audience, timecode displays including accelerated rates, sketched drawings, and typographic elements regarding places captions and ARTiVIS keywords.

3.3.6 *The Enchanted Forest* – Getting Physical

Once upon a time, little electronic beings left their old mobile devices and became inhabitants of (ssshhh... can you hear? do you see? Oohh, trees have ears and eyes...)[118]

The Enchanted Forest is a world "populated" with mysterious trees inhabited by mobile phone components repurposed in surprising ways. In this *Enchanted Forest*, "walls have ears, and trees have eyes".

Exploring the possibilities provided by mobile devices, this installation also takes advantage of the technological limitations derived from low resolution, which are rich in aesthetic potential. Robotic creatures made from repurposed cell phone components are placed on the trees. The visual input is acquired with mobile phone cameras, while the sound input is captured with microphones. The output is then showcased on the mobile devices' disassembled screens and loudspeaker exhibited at the gallery. The (re)constitution of the enchanted forest happens through the audiovisual outputs that stimulate imagination. Light effects with visual suggestions, and echo spatial effects with sound amplification through space are perceived through mobile devices components. These capabilities are augmented by the use of sensors for expressivity and for prevention: temperature, smoke, and wind.

The scintillating magical images, sounds, and other resulting data (such as temperature) of this world of fantasy also work as clues for forest surveillance, as "benign agents – The Good ones" that protect the forests – against "human evil action" of putting fire, for example. This interactive environment is a fertile ground for storytelling, a potential to develop by crossing fantasy and reality on a platform inspired in open models for free creation and open connectedness.
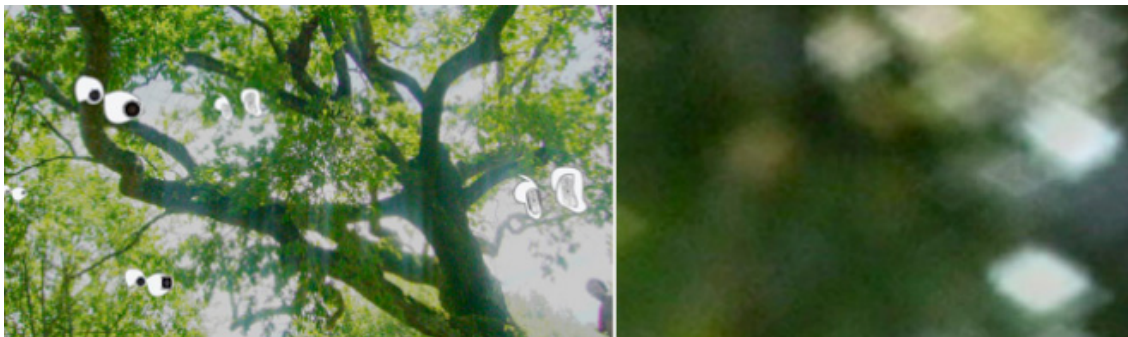
Figure 3.19. *The Enchanted Forest* concept art: the video and audio input devices placed on trees outdoors and a suggestion of a visual output in reused screens to be displayed in the installation indoors.

118   Metaphor of the *The Enchanted Forest* concept, first presented in *Artech* [Mendes10]. Research website » http: / / enchanted.artivis.net

The cameras and microphones hanging on trees are live weird eyes and ears as in Kusturica's playful and colorful movies like *Black Cat, White Cat* [Kaufman99]. This approach, as well as the creative robots family [Martins10], are inspirations for unleashing creativity and to be open to experiments with devices that promote the tinkering process. Another relevant work is the project *ReWare* by Hans-Christoph Steiner, where PDAs are recycled to create musical instruments [Kirn09]. *Mobile Mobile* [Théophane09] is also noteworthy for the setup and use of mobile phone components in an interactive installation.

3.3.7 *MAicro* – Connecting to Further Dimensions

MAicro Water Flow integrates biology and surveillance, an aesthetic experience of the movement of water in tree leaves through time and distance, from MACRO to micro[119]

MAicro[120] is an approach that recalls generative art through the exploration of the dimensions of the forest – from the microscopic effect to the macroscopic presence on the universe. The *MAicro Water Flow* installation is an ARTiVIS experience beyond the scope of this research – the concept has been explored through a microscopic approach to the flow of water in tree leaves and its development is presented in Victoria Vesna's *Waterbodies* platform[121]. The *MAicro* concept in its broadest sense is inspired by the work of the designers Eames in "Powers of Ten – The World at Different Scales"[122], where the images of distant (10^{17}) reveals an absolute similarity with the one that is close (10^{-11}). This visual resemblance is in great contrast with the movement perceived: as we get closer we realize the frantic ceaseless movement of life, and as we move away a sense of calmness and emptiness is experienced. Extreme views like these suggest moments of unutterable beauty and perfect harmony – *will we ever be able to observe that in nature?*

Functionalities like the creation of video data with a magnification of around 100 to 400x of biological elements in movement recalls the frenzy of life "as it is" and embody a great potential for presentation.

---

119 *MAicro Water Flow* specific developments integrated in the *Waterbodies* project » http: / / maicro.artivis.net / waterflow.html

120 The *MAicro* concept was first presented in *Artech* [Mendes10]. Ongoing iterations are documented in the website » http: / / maicro.artivis.net

121 *MAicro Water Flow* in the Waterbodies platform » http: / / artscicenter.com / waterbodies-ex / node / 161 | MAicro project gallery online » http: / / cargocollective.com / waterbodiespt / Monica-Mendes

122 EAMES, Charles and Ray, MORRISON, Philip and Phylis (1982) *Powers of Ten –The World at Different Scales.*

MAicro Water Flow put this advantage into practice by allowing us to contemplate the water flow effects after the water having travelled through the soil to the roots and the stem, up until when it evaporates into the atmosphere through the surface of the leaf. Timelapses were created using the same streaming tools used during the *B-Wind!* exhibition video surveillance, also recorded for observation (cf. 5.4.1).

The microscopic visualization of water pathways in tree leaves was enabled through DIY digital microscopes made from standard webcams with adjustable focus-lens, a hack inspired by *Hackteria.org*[123] whose online resources were shared in a workshop at *altLab*[124].
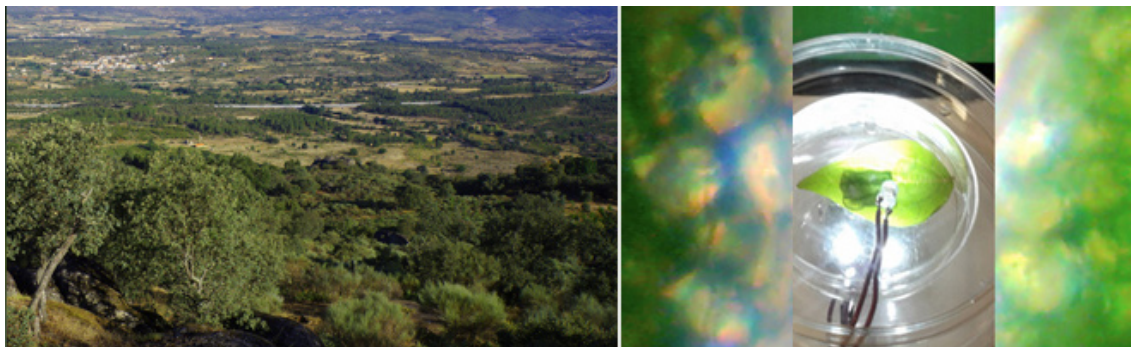
Figure 3.20. *MAicro Water Flow* concept images displaying the forest macro scale and the microscopic view of the water in a tree leaf.

The *MAicro Water Flow* microscopes were customized for holding water and tree leaves for long periods of time. In order to do so, Petri plates traditionally used by biologists to culture cells were hacked into a water and leaf sample container, thus achieving a transparent structure with a minimalistic look while saving on resources.

Combining biology and surveillance in time and distance, the *MAicro Water Flow* installation creates an aesthetic experience by moving through diverse scales, from "MACRO" to "micro". In exhibition setups, *MAicro* is remotely maintained from the artist's site, streaming live video to the exhibition site. The experiment generates a continuously growing record, showcasing the water flow in the plant in real-time and in the timelapse during the exhibition. The microscopy setup is replicated in site, this time to enable awareness of the reverse process – inhibited of water, the progressive dryness brings evidence on the need of water for survival.

Beyond its relevance as an aggregator of artistic and scientific approaches to the states of water where *MAicro Water Flow* is included, Waterbodies is also a reference for ARTiVIS by involving issues like the scalability of the online platform and the blend of art and science on the theme of natural environment.

---

123 *Hackteria.org* – Open Source Biological Art » http: / / hackteria.org / wiki /

124 *AltLab* events list including the *DiY microscopia* workshop by Filipe Cruz, November, 2011 » http: / / altlab.org / ?s=DIY+Microscopia
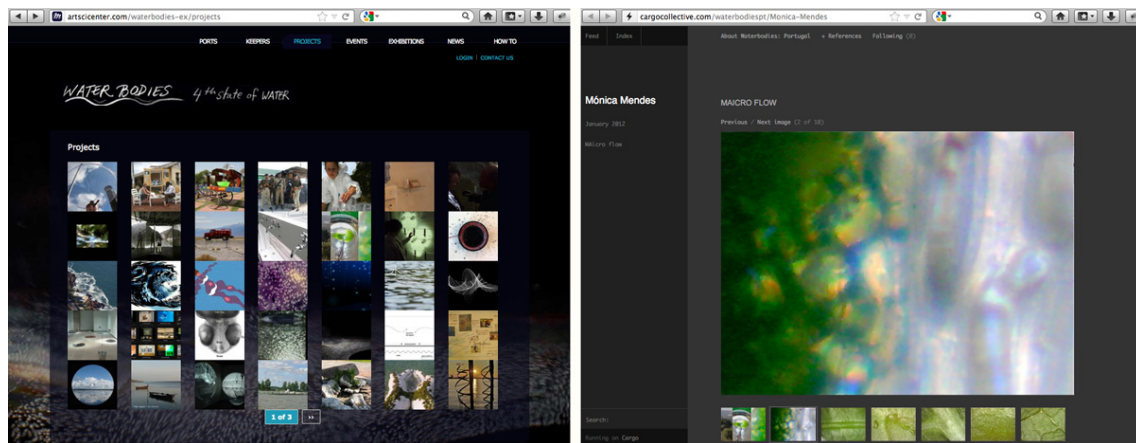
Figure 3.21. *Waterbodies.org* online platform with *MAicro Water Flow* included in the projects menu, and in the *WaterbodiesPT* website created to collect water related works from Portugal.

Additionally, the role of the curator from each country – so called "waterkeeper" of the *Waterbodies* project – was an approach considered. Regarding the ARTiVIS project, each of the locations will have its own local coordinators who will have the essential role of contact with the population and maintenance of the forest surveillance cameras. First collaborations in Maçal do Chão have started during the *Hug@ree* sprint (cf. 4.4) with a local computer technician and a forest engineering, and in Madeira dur-ing the *Play with Fire* artist in residency program (cf. 4.5) with local researchers.

4. ARTIVIS DESIGN AND IMPLEMENTATION

The ARTiVIS interactive system designed in the scope of this research comprises an online platform in its conceptualization phase, a *DIY forest surveillance kit* that feeds the platform in a prototype stage, and the interactive installations *B-Wind!*, *Hug@ree* and *Play with Fire* making use of the platform resources, that have been implemented and publicly presented. The outcomes of this exploratory research include:

I) The concept and initial interface design of an online video streaming platform prototype optimized for access with different devices, displaying the real-time forests videos and corresponding artistic exploration, processed in real-time, and open for use as raw material in art and research contexts.

II) The prototype design of a forest surveillance hardware and software DIY kit that will be common to all the ARTiVIS interactive installations. The kit will upload the resulting video streams and collected data to the online platform as open media for further explorations. The hardware – webcam, wireless communication, microcontroller, sensors – and the software actuators will be provided to enhance community participation and later be expanded to a global scale.

III) The design and implementation of interactive installations for public exhibition and participation using real-time video of the forests as raw material and experimental approaches regarding its manipulation. *B-Wind!*, *Hug@ree* and *Play with Fire* provide the experience of contact with nature and becoming part of it, contributing to a feeling of belonging and strengthening the relationship with the forest. These interactive installations – *B-Wind!*, *Hug@ree* and *Play with Fire* – were conceived, developed, deployed, and evaluated within the scope of this ARTiVIS research, herein presented according to the chronological order of their development.

The following diagram outlines the interactive installations and ARTiVIS platform in relation with each other, and the table summarizes the ARTiVIS system components and their characteristics.

B-Wind!

Hug@ree

Play with Fire

INTERACTIVE INSTALLATIONS

Interactive Installations
can make use of video streams
from the online platform

Announcements, documentation
and data from the installations
are archived on the online platform

DiY kits can also
stream video directly
to the installations

Ranking View

Space View

PC interface   ONLINE PLATFORM   Mobile interface

Each DiY kit streams video
to the ARTiVIS online Platform

Information about curated forests
is placed on the platform.
This might include already existing video feed

DiY Forest Surveillance Kit

DiK Kits are placed in forests
by members of the ARTiVIS community

PLACES

Figure 4.1. Diagram of the ARTiVIS system components, their correlations, and user experience.

ARTiVIS Outcomes CHARACTERISTICS	Online Platform	Surveillance Kit	B-Wind!	Hug@ree	Play with Fire
What it is	Web portal	Hardware & software DIY kit	Interactive installation	Interactive installation	Interactive installation
Development status	Concept and interface design	Hardware prototype	First public presentation	Mature – Several public presentations (6) and evaluation (3)	Mature – Several public presentations (5) and evaluation (4)
Real-time video streaming	Delivers	Enables	Consumes	Consumes	Consumes
Relationship with Nature	Visual feed	Placed / nested	Affects creating wind	Physical contact	Visual feed
Interface	PC, mobile device	Tangible	Projection	Touch screen	Projection, Mobile web
Software tools	PHP, HTML, CSS, Javascript, Icecast, WebM	GISS.tv, GNU / Linux, GStreamer	openFrameworks, Arduino	openFrameworks, Arduino	OpenFrameworks, PHP, Javascript
Hardware	PC, mobile device	Webcam, SoC (System on a Chip), Power supply	IP camera, PC, kinect, fans, projectors	IP camera, PC, Arduino, XBee, battery, sensors, touchscreen	IP camera, PCs, kinect, projectors, transparent screen
User Interaction	Visualization of forest videos, alert suspicious events, access information on forests, download videos for creation	Assembly – DIY / workshops, development, deployment in tree / forest, maintenance – power, safety, nature	Full body: silhouette and position effect wind effects on the screen + fans activation and rotation	Full body: arms around the tree+ finger dragging the videoloop	Full body: silhouette and position effect fire on the screen
Duration of the experience	From seconds to years – providing real-time video feed available 24 / 7	From seconds in tests, to hours in demos & exhibitions, or years when deployed for the online platform to provide real-time video feed 24 / 7	From seconds to minutes	Seconds hugging the tree and minutes to reach the installation and place the videoloop	Seconds to minutes burning the forest and the extension of years through the mobile application
User role	Community member: Monitoring, Potential participant of experiences and workshops	Workshop participant, developer, ARTiVIS nodes expansion – creating + maintaining	An invisible force – the wind	Tree hugger, tree friend	Arsonist turned into forest caretaker
Places where presented or deployed	Online	Madeira (tests and ongoing development)	Montemor-o-Novo (exhibition)	Lisbon, Porto, Madeira, Santiago de Compostela, Los Angeles, Maçal do Chão (exhibitions & demos)	Montemor-o-Novo, Lisbon, Guimarães, Maçal do Chão, Madeira, Newcastle (exhibitions & demos)
Places "wish list"	Online, TV personal channel	Lungs of the world – two locations in each continent	Presentations in schools for storytelling, in performance for scenario	Nodes creation in hackmeets, exhibitions, communities, waiting rooms	Places extremely affected by forest fires

Table 1. ARTiVIS outcomes and corresponding characteristics – what they are, and how they complement each other.

4.1 Online Platform | Prototype and Interface Design

Real-time video news: Big Brother went green – and so can you.[125]

The online platform was initially conceived as the core output of the ARTiVIS project, under the general concept of participative video surveillance [Mendes10]. This platform output combines existing technologies that are customizable and provide the needed resources for fast prototyping, enabling a proof of concept to evaluate the structure proposed. ARTiVIS is conceived towards a *libre* and open framework, with open data free for use and development, using open formats (such as WebM), and with open content to enhance creative explorations with the real-time video stream or video archives of the forests.

The platform is designed to link forest video streaming nodes provided by members of the community with consumer nodes like art installations or community surveillance users. The goal is to achieve a fully distributed peer to peer platform for forest video streaming. This openness is becoming a mainstream approach in the design of interactive environments and was adopted as an effective setting for fast prototyping, to become familiar with the technologies involved, and to empower community sharing.

As with contemporary development methods in digital media, ARTiVIS also explores the potential of experimental approaches in local contexts where mobility is crucial for its implementation, like real-time video connectivity, contributing to local communities growth and empowerment. Moreover, "mobile devices and network infrastructures open the possibility for new forms of information access or storytelling while visiting physical places" [Correia09, p.47].

Creating an original platform from scratch able to support streaming data from forests in different places of the world is a challenge in what concerns to information architecture, programming and design. Communicating with potential institutional partners, setting the guidelines for the structure and design, and programming a dynamic structure for increasingly complex connections, are also tasks for later development. Anticipating connections with existing forest surveillance infrastructures in a world scale, the final version will be able to support several feeds of streaming data from forests in different places simultaneously.

Although initially planned for implementation in the scope of this research, the development of the online platform remains at the proof of concept stage. Early on, while researching the technical infrastructure requirements it became clear that the implementation needs were beyond the resources available.

---

125   ARTiVIS website » http: / / artivis.net
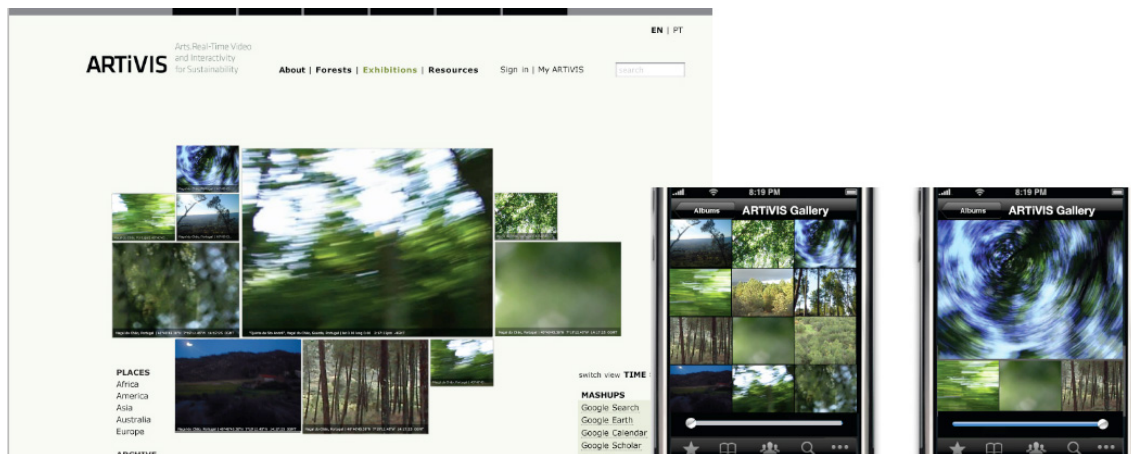
Figure 4.2. ARTiVIS online platform web and mobile interface design.

In order to respond to this challenge, the research focus was shifted from a bottom-up approach (first develop the infrastructure and then the applications) to a top-down approach (first develop applications and then extract the requirements for future infrastructure). The ARTiVIS interactive installations are the applications which allowed to validate the research questions.

4.1.1 Related Work

"One has to be conscious of the information overflow and develop a philosophy in relation to handling large amounts of data" [Vesna07, p.10]. Concerning to community participation and crowdsourcing dynamics, *Ushahidi* and *OpenAction* (*cf.* 5.3.2) are two very good examples of projects that use data aggregation to involve communities in shared narratives. However, this ARTiVIS component involves specificities to be reflected upon. Development and implementation can still benefit from further references from areas so diverse as mapping, interface design, video, server streaming and archiving and its technological and implementation issues that we outline in this section.

The rise of web video and the strain it is causing on the Web's infrastructure has prompted recent advances into *Peer-to-Peer* (*P2P*) streaming strategies to offload streaming costs to all the consumers. This is not by itself a new development, since mature projects like *Bittorrent*[126], *Skype*[127] and *Joost*[128] have been successfully using *P2P* structures to offload bandwidth costs for data, real-time audio and video streaming, respectively. The *P2P-Next*[129] project, supported by the *EU 7th Framework Program* (*FP7*), is investigating these ideas to extract a common open infrastructure for online media streaming – and we are fol-

---

126 *BitTorrent* – Content delivery system » http: / / www.bittorrent.com
127 *Skype* – Free internet calls and cheap calls to phones online » http: / / www.skype.com
128 *Joost* – Internet TV service » http: / / www.joost.com
129 *P2P-Next* – Shaping the Next Generation of Internet TV » http: / / p2p-next.org

lowing the project's development to be able to integrate their results with the ARTiVIS online platform research. A parallel development is *GoalBit*[130], a free and open source project that implements a functional *P2P* video streaming infrastructure that is being evaluated for integration with the ARTiVIS forest surveillance kit.

Mapping forest resources is an important part of the platform's function and interface. Video streams will be geo-referenced in order to allow communities to map and showcase their forests for the world to see. The technical infrastructure for integrating maps into web applications has been growing with the advent of geodata resources like *Google Maps*[131] which offers a simple open API for experiments and applications. *OpenStreetMaps*[132] presents a solid alternative, with crowdsourced, public-domain map data that can rival with better databases in terms of map quality. These maps can be integrated into web applications through the use of *OpenLayers*[133], a comprehensive Javascript toolkit that allows flexibility of map output aesthetics and overlay design when combined with tools like Stamen's *Polymaps* library[134].

Regarding the interface design, the *TED talks*[135] website has been a reference for its clear homepage design displaying videos categorized in different sizes, and for its architecture dealing with huge amounts of video. As for unconventional patterns, *FUI – Fantasy User Interfaces for film –* by the designer Mark Coleran are innovative futuristic representations [Coleran11]. In terms of information visualization, the *Videosphere* prototype[136] by the collective *Bestiario –* a sphere of videos that enables navigating through their semantic relations – has the potential for further developments, especially considering the geographical distribution of videos online planned for ARTiVIS. *Netlag*, the video piece by the *Pleix* digital artists from snapshots of 1609 webcams [Pleix04], is also a reference for the ARTiVIS visual interface design in the space view, for the representation of the world into a scalable 16:9 grid that integrates the videos side by side. The work done by the designer Aaron Koblin is also remarkable, with examples such as *Flight Patterns* and *New York Talk Exchange*[137] that bring evidence on real-time data, the planetary scale, and its day and night cycles [Koblin11].

Pattern collections such as the *Mobile UI Patterns*[138] website archive and the supplement to the *Mobile Design Pattern* book[139] are sources of selected case studies that will be the starting point for the ARTiVIS mobile interface design. Considering further uses of the online platform in the context of mobile devices

130 *GoalBit* – "video streaming platform distributing high-bandwidth live video content preserving its quality" » http:/ / goalbit.sourceforge.net

131 *Google Maps* » http:/ / maps.google.com

132 *OpenStreetMap* – The Free Wiki World Map » http:/ / www.openstreetmap.org

133 *OpenLayers* – Opensource javascript library to load, display and render maps from multiple sources on web pages » http:/ / openlayers.org

134 *Polymaps* – free JavaScript library for image and vector-tiled maps using SVG for dynamic, interactive maps in browsers » http:/ / polymaps.org

135 *TED* – Ideas worth spreading » http:/ / www.ted.com

136 *Videosphere*, by *Bestiario* » http:/ / www.bestiario.org / research / videosphere /

137 *NYTE – New York Talk Exchange*, a project by the *Senseable City Lab* at MIT for the MoMA » http:/ / senseable.mit.edu / nyte /

138 *Mobile UI Patterns* » http:/ / mobile-patterns.com

139 "Mobile Design Pattern Gallery: UI Patterns for iOS, Android and More", by Theresa Neil, O'Reilly Media, 2012 »
http:/ / www.mobiledesignpatterngallery.com

and wireless networks, ARTiVIS will build on the work done in the *InStory* interactive narratives project, where the user accesses information through spatial storytelling "that can enhance the participants experience in a significant way" [Correia05, p.102]. This storytelling paradigm can also be used to allow users participation as information providers.

Finally, as the online platform is in its prototype phase, further references regarding later developments are presented in the future work section of the ARTiVIS research (cf. 6.2).

4.1.2 Design of the ARTiVIS Online Platform

The concept of a multiplatform global structure has been defined, and interface design sketches and mockups were done in the scope of the current research. From the description and concept mapping, a system architecture structure has been drafted, and will be followed by the creation of a working prototype. Further work is needed regarding the implementation of the prototype.

ARTiVIS has diverse target audiences – designers, visual and media artists, performers, curators, technologists, environmentalists, urban and rural areas citizens of every age. We aim for users to visit and return to the interactive environments. These environments should be accessible from multiple remote locations through devices with Internet access, and in interactive installations.

The ARTiVIS project demands a consistent design and information architecture to face all its requirements. The platform will initially be accomplished as a website optimized for online access with different devices, mainly computers and mobile phones. ARTiVIS will provide a robust and versatile structure to handle huge amounts of data, enabling scalability and evolution though a flexible customizable interface. The interface design of the online platform is based on the idea of providing users with the deepest immersion experience, combining a futuristic look and feel with usability. A guideline for the visual interface structure is the display of an organic flow inspired by nature, able to adapt to users' preferences.

The design involves new forms of interaction and content communication. A key component of the dynamic platform creation – as well as maintenance and expansion – is the database for real-time video. The visual interface integrates the display of real-time videos showcasing the forests, processed visual interpretations, and exhibitions. Part of these contents have been created and published in each of the ARTiVIS projects sites (cf. appendix G) and in the research iterations blog (cf. appendix F). User registration and photo or video input submission, community forum, statistics and "adopters" database are also part of the content to be provided in the online platform.
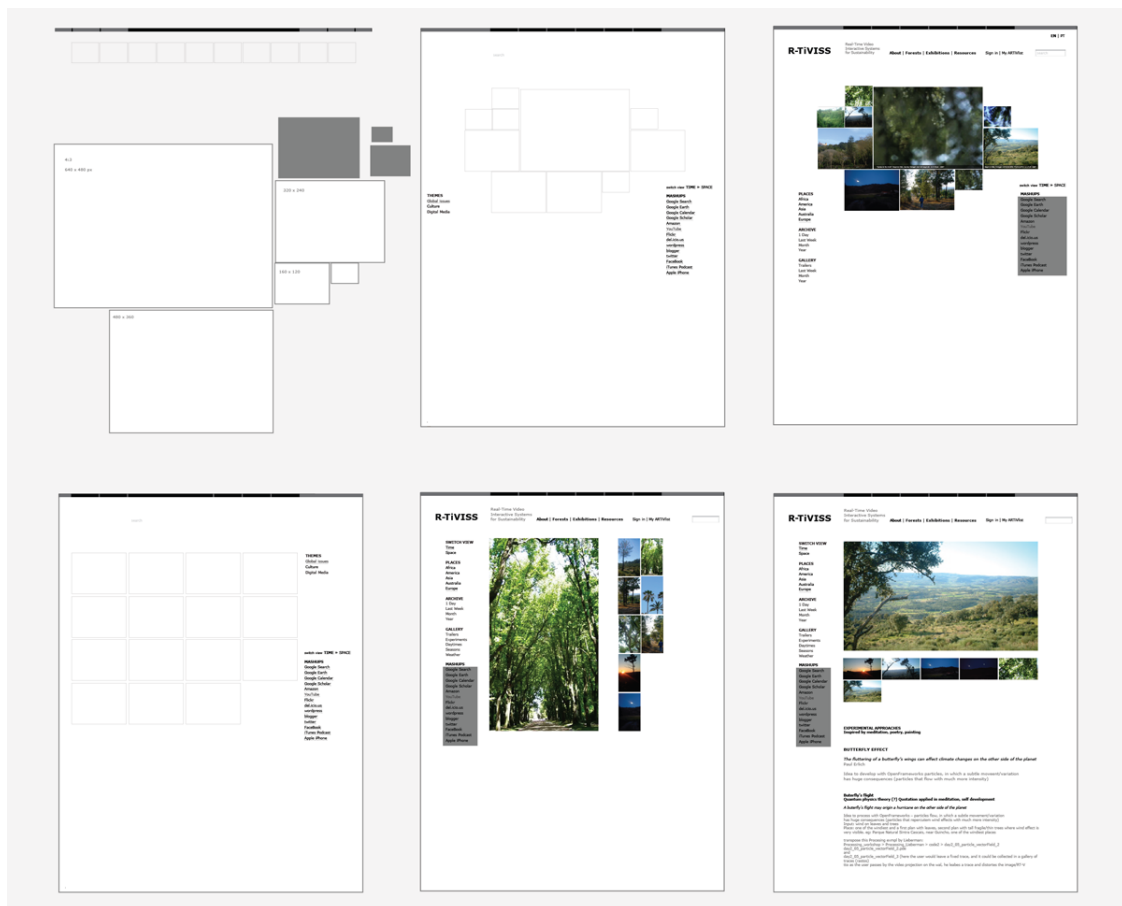
Figure 4.3. ARTiVIS online platform interface design – grids and mockups of the homepage and 2nd level pages displaying live video and an image gallery of the covered forest.

The number of video displays varies, but the videos appear recursively. The criteria for the tile size of the homepage video mosaic is based on three different size classes:

(I) The most popular videos will be the largest ones, so this proposal displays the "favorite" adopted forests in a highlighted size;

(II) Medium size videos correspond to the most recent ones, providing an opportunity for new data;

(III) To encourage diversity and novelty, the smallest videos to be displayed will be selected randomly among the least seen, that then gain more visibility.

The videos are displayed as an eco-system – the strongest consume more, so they grow more – but this criteria can also provide diversity and raise feelings of care for the weakest, given the random behavior and surprise of these systems. The idea is to provoke curiosity and avoid the "filter bubble" [140] – when results are too dependent on ratings, one looses serendipity.

---

140   "The Filter Bubble – What The Internet is Hiding From You", by Eli Parisier » http: / / www.thefilterbubble.com

Figure 4.4. ARTiVIS online platform category cloud (left) and space-based interface (right), including past events and future places.

A space-based map interface is being designed to locate live online events and the context of local cultures. Linearity in chronological time [Virilio00] is confronted with non-linearity of the structure of a networked system in a world-scale project. The time based and the space based interface is where the whole diversity of past, present and upcoming events are mapped, including webcams implementation, interactive installations exhibitions, and participation in events such as conferences, demonstrations, and workshops.

Figure 4.5. Sketches for the ARTiVIS online platform home interface. The concept map views on the top show a dynamic interface of the projects interconnected by theme. The maps below display the projects geographically distributed and in different times: early and current presentations on the left and center, and future work announcements on the right.

Figure 4.6. Mockup of the ARTiVIS online platform interface for mobile devices displaying a video gallery and video playback.

Optimization for mobile devices is an essential issue of the design plan. Several strategies are under consideration: (a) developing high performance native applications, one for each mobile operating system, versus (b) developing a cross-device web application as done in the *Play with Fire* installation or (c) developing a so called native web application which is also cross device but can achieve better performance by making use of device specific APIs.

A growing database will be constantly archiving the video footage. Archives are to be used as an information database, and also as a source for artistic creation. They will be used both as a broad source of raw video regarding nature for artistic experimentation and for rapid prototyping, providing access to diverse resources, such as footage to be compressed, and also for diverse educational and research purposes related to the theme.

Dissemination videos are essential – beyond displaying the project's main content to the users, they will present the concept, the context of the real-time video, the implementation process, the community and the potential for social networking development. Videos also appeal to the use of recorded forests as raw material, such as the examples previously created (cf. 3.3), and the interactive installations that will be described in the following sections (cf. 4.3 to 4.5).

4.1.3 ARTiVIS Platform in Future Exhibitions

The plan for the ARTiVIS online platform when presented in exhibitions, is to showcase a video installation constituted by one or all the following setups: (1) a wall of screens displaying the ARTiVIS network forests in real-time video to greet visitors to the exhibition; (2) a corridor with five large scale projections corresponding to the world's continents, and (3) clouds of screens thematically grouped and then organically distributed in the exhibition space.

The screens range from large high resolution screens for the main data to reused low resolution mobile device screens for the processed data.

Starting from the metaphor of a monitoring wall in a control room, significant interfaces to consider as a reference start with Nam June Paik's video installations with walls of TV monitors [Paul03]. Also the monitoring wall in *Sliver*[141] is a reference due to its surveillance room style with big screens side by side, and *The Architect's room* screen in *The Matrix Reloaded*[142] with its walls entirely filled with screens that show different videos displayed in one small screen or larger scale videos divided into several screens.

Each of the screen clouds proposal includes the place to be presented with a high resolution screen with the "original" real-time video and optional superimposed layers with users' input (like registering to their chosen forest to monitor by uploading a photo to the selected forest interface), and secondary screens set up nearby for experimental data processing approaches. Examples of generative work with video include the reinterpretation of specific visual elements, such as color (day time, fire clue) and motion (the wind effect) done in the interactive installations Play with Fire and B-Wind!, respectively.

Interactivity is also feasible in layers superimposed to the running real-time videos: beyond uploading their snapshots or videoloops, visitors would be able to write messages on their mobile phones, and send it to their chosen forest to be added to the platform and displayed in real-time.

Figure 4.7. ARTiVIS live forests videos exhibition proposal, including a monitoring wall at the entrance, and walls with several displays.

In another area, a sequence of five screens in a large human scale would showcase simultaneous real-time views of forests on the different continents and time zones, thus bringing evidence on the global scale through the daylight and night views[143]. A reference for the setup was the four screens audio-visual installation *Fantôme Créole* by Isaac Julien, as exhibited in *The Cinema Effect*[144], for the simultaneous view of four videos playing in large scale screens.

141 *Sliver* (1993), by Phillip Noyce » http: / / www.imdb.com / title / tt0108162 /

142 *The Matrix Reloaded* (2003) – Images of The Architect's room » http: / / thematrix101.com / reloaded / meaning.php

143 Day and Night World Map showing which parts of the Earth are in daylight and which are in night » a map generated map based on images from NASA » http: / / www.timeanddate.com / worldclock / sunearth.html | World Time Zone Map » http: / / www.timeanddate.com / time / map /

144 Exhibition at CaixaForum, Madrid, February 2011 » http: / / press.lacaixa.es / socialprojects / view_object.html?obj=816,c,13704
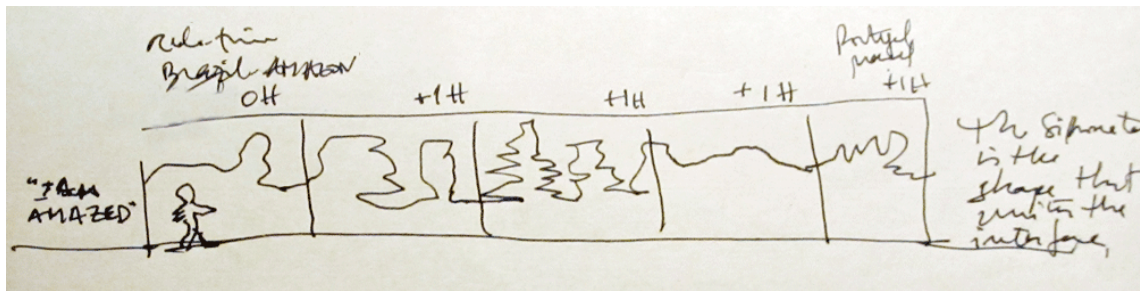
Figure 4.8. Panoramic large scale screens displaying a sequence of forests in real-time. The order follows the world time zones, evidencing day and night cycles.

4.1.4 Future Work

With the work on the interactive experiences coming to a close, the online platform requirements are now clearer. The ARTiVIS kit will integrate the interactive experiences with the online platform using it as the source for video stream. Furthermore, the kit and the online platform will provide a coherent framework for research and development within the context of future ARTiVIS project endeavors.

Regarding the ARTiVIS values and guiding principles, the overall development of this project is planned to be done with self sustainable, local support collaborative activities – where participants contribute to the proposed development challenges. Close possible perspectives can take place in residencies and sprint projects in Maçal do Chão or in the scope of the *AZ Labs* or *O Espaço do Tempo*, and workshops integrated in events such as *TEI* or *ISEA*.

4.2 *DIY Forest Surveillance Kit* | Design and Prototype

Keep an eye on your forest and share it with the world...[145]

One of the ARTiVIS project outcomes is the design of an open source hardware and software *DIY forest surveillance kit* common to all the projects' interactive experiences. This kit design aims to repurpose surveillance technology to bring people and their communities together to protect their forests [Mendes11a]. Resulting video streams and collected data are expected to be uploaded and then become part of the online platform network for crowdsourced surveillance and artistic manipulation purposes.

The kit will also be a seed for community workshops to provide the skills and resources[146] to help deploy new ARTiVIS nodes regarding artistic experimentation in research centers, festivals, hacklabs and local landmarks.

The contents of this section are the result of the ongoing collaborative research effort that is documented with more resources and technical details in the project website.

4.2.1 Related Work

The *Refarm the City* project is a good example regarding the design of the ARTiVIS hardware kit for surveillance. Their work is based on community developed open source hardware sensor nodes for urban farmers [RefarmTheCity11]. Additionally, their field work strategy of knowledge dissemination is by organizing workshops in local communities in areas with good potential for becoming new urban farms.

Another reference and collaboration departing from the lessons learned is the *Vigília Open Design* project to create more accessible and efficient equivalent components. This system involves the development of new sensors that enable the automatic capture of a wide variety of field data including images in real-time, which allow "to draw tables with indices of fire risk, to detect fires in the shortest time, to act faster and in coordination in case of fire, and to accurately evaluate the real impact of fires already extinct" [Ribeiro04]. *Vigília Open Design* has some overlap with the ARTiVIS kit – we are in contact with the project's authors and paving the way for future collaboration.

Out of the commercial video streaming hosting providers considered when researching the possibilities for the infrastructure of the online platform, *Yayastream*[147] is worthy of mention because of the tight integration between their platform and a proprietary portable hardware streaming kit. The interest in open-

---

145   ARTiVIS *DIY Forest Surveillance Kit* website » http: / / diy.artivis.net

146   ARTiVIS DIY kit Open Source repository section » http: / / gitorious.org / artivis / artivis-diy-kit

147   *Yayastream* – "Streaming System – Hardware, Software, Player, and Bandwidth" » http: / / yayastream.com

ing up imaging hardware is not new. While the *OpenIPCam* project[148] provides a solid Linux-based replacement firmware for some popular models of commercial IP surveillance cameras, the *Apertus* project[149] goes one step further and hosts a community developing a high-definition professional quality digital video camera from the ground up.

In the future, we expect to explore crowdfunding opportunities to implement the kit's hardware design and have it deployed in more locations. Out of the crowdfunding platforms that currently exist, *Goteo*[150] is worthy of mention for being specially tailored to support open source community projects, allowing projects to request support beyond financial funding and requiring that projects give back something to the community.

4.2.2 DIY Kit Components and Functionalities

An ARTiVIS kit is composed of a series of hardware modules that can be chosen from common off-the-shelf parts depending on cost, power, network bandwidth or infrastructure restrictions. These hardware modules are controlled by a set of software modules connected to the ARTiVIS online platform. In technical terms, the kit is provided as:

» an open specification for building hardware compatible with the platform.
» an open hardware reference implementation that can be used for community workshops
and for the interactive experiences.
» open source software that runs on the kit and interfaces with the platform.
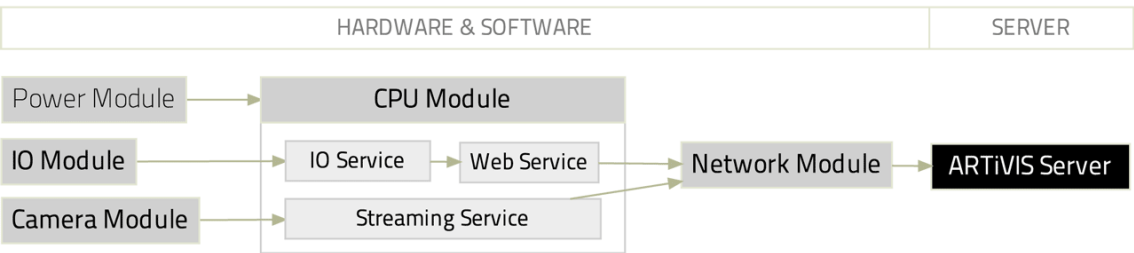
Figure 4.9. ARTiVIS *DIY forest surveillance kit* system architecture.

HARDWARE COMPONENTS

The Power Module provides power to the whole kit. For the kits intended function in remote forest locations it is important that it is autonomous in terms of power. This can be accomplished by using a

---

148   *Open IP Camera* – ARM7 and ARM9 embedded ARM device IP Camera Wiki » http : / / www.openipcam.com | http : / / wiki.openipcam.com

149   *Apertus* – Open Source Cinema » http : / / apertus.org

150   *Goteo.org* – Crowdfunding the commons » http : / / www.goteo.org

rechargeable power supply, such as a lead or solid state battery[151] coupled with a generating power source like a solar panel[152], a small wind turbine[153] or a fuel cell[154].

The CPU Module connects to all the other hardware modules and runs the ARTiVIS node software. Since the kit's design should take into account both portability and energy efficiency requirements, our first prototypes were based on the *Raspberry Pi*[155], an ARM-based single-board Linux[156] computer.

The Camera Module connects to the CPU (Central Processing Unit) Module and provides the images to the CPU for live video streaming. At its simplest configuration, the Camera Module can just be a good USB webcam connected to the CPU Module, but for a more integrated solution we will test interfacing high quality image sensors like the *1080p Leopard image sensor*[157] directly to the CPU Module.

The IO Module interfaces the CPU Module with a set of sensors and actuators that can be read and/or controlled remotely. For this we can use an *Arduino* board or a similar microcontroller-based IO hardware like the *TI Launchpad*[158] or rely on the CPU module's native GPIO (General Purpose Input/Output) functionality. This module was not yet developed since it is not essential for the kit's video streaming functionality.

The Network Module provides an interface to the Internet for the CPU Module. In the first prototypes we used any network connectivity available to the test machine, but for the final reference design we will make use of external USB modems that provide 3G or 4G/LTE connectivity as these are more likely to be available in remote forests than wifi or wired Ethernet.

Figure 4.10. Prototype of the ARTiVIS surveillance kit showing the CPU module based on the *Raspberry PI* platform, using a USB HD camera as camera module, and a USB mini wifi adapter as network module.

151 A custom high capacity rechargeable battery can be built from a simple support circuit and Lithium Polymer cells like these »
      http: / / www.yokenergy.com / product / 2
152 *Home Solar and Wind Info* – "DIY Solar Panels – A Step-By-Step Guide" » http: / / www.homesolarandwindinfo.com / diy-solar-panel /
153 *RenewableUK*, the voice of wind & marine energy – "Build Your Own Wind Turbine" » http: / / www.bwea.com / you / byo.html
154 *EFOY*, energy for you – "EFOY fuel sells by SFC energy" » http: / / www.efoy.com / en / fuel-cells-products.html
155 *Raspberry Pi* – "An ARM GNU / Linux box for $25. Take a byte!" » http: / / www.raspberrypi.org
156 *The Linux Kernel Archives* – "What is Linux?" » https: / / www.kernel.org / #whatislinux
157 *Leopard Imaging* – BeagleBoard-xM Camera Boards | Development Kit » https: / / www.leopardimaging.com / Leopardboard_Accessories.html
158 *Texas Instruments* – "Microcontroller projects" E2E Community » http: / / www.ti.com / launchpad

Figure 4.11. Prototype of the ARTiVIS surveillance kit showing the CPU module based on the *CuBox* platform, using a USB HD camera.

SOFTWARE COMPONENTS

The kit's CPU Module runs a set of software applications that allow the kit to perform its task and interface the hardware with the online ARTiVIS server.

The Streaming Service is the heart of the system. At its core there is a video processing pipeline based on the *GStreamer* framework that captures the live images from the Camera Module, encodes them using a free lossy codec like *Ogg Theora*[159] or *WebM*[160] and streams them to the ARTiVIS server for online distribution. It could also optionally record the video locally for backup purposes.

The IO Service interfaces with the IO Module hardware, multiplexing access and providing to applications an API that abstracts the underlying hardware, thus permitting access to the sensors and actuators connected to the IO Module.

The Control Service is a web application that runs on an embedded web server on the CPU Module and provides a simple way for the kit's owner to control and configure it. It also provides a *REST* API[161] that would allow for external control and connectivity to and from the ARTiVIS server to allow uploading of sensor data to the platform and the downloading of actuator commands.

The Development of the Server Software Components is beyond the scope of the hardware kit's development. When prototyping we used *Icecast*[162] as a streaming server and explored the use of open data syndication platforms like *GISS*[163] for video and *ThingSpeak*[164] regarding sensor data.

---

159   *Theora* – "video for everyone" is a free and open video compression format » http: / / theora.org

160   *WebM* – "an open web media project" , dedicated to developing a free, high-quality, open video format for the web » http: / / www.webmproject.org

161   *REST* – Representational State Transfer is a methodology proposed by Roy Fielding for designing consistent HTTP based APIs for Web applications » http: / / www.ics.uci.edu / ~fielding / pubs / dissertation / top.htm

162   *Icecast* – Free server software for streaming multimedia » http: / / www.icecast.org

163   *GISS* (Global Independent Streaming Support) – "Free streaming tools for free media" » http: / / giss.tv

164   *ThingSpeak* – Internet of Things, "open application platform enabling meaningful connections between things and people"» https: / / thingspeak.com

4.2.3 Ongoing and Future Work

Early development work on the kit's design was performed throughout the development of the ARTiVIS interactive installations. These included field tests of commercial streaming hardware and network connectivity, such as the forest surveillance tower at Montemor-o-Novo during the Play with Fire residency with mobile Internet access using UStream[165], and camera tests at the *Laurissilva* forest in Madeira.

The design of initial hardware prototypes was done during the first part of an artist in residency program in Madeira[166], to connect with the *SINAIS* project[167], and are being further developed for testing during a second residency period in order to become part of the ARTiVIS project's final setup.

Power supply is currently being prototyped and tested for independence and sustainability. Limitations to overcome include telecommunications issues related with network signal, strength and speed.

Further iterations will allow the registration process for the ARTiVIS online platform and the implementation of this open source hardware and software surveillance kit, together with its broad dissemination. Moreover, we foresee growing a developer community around the project that helps maintain, improve and adapt the kit to specific environments and for other purposes, such as replacing expensive hardware[168] setups for remotely watching animal behavior[169].

Recognizing that "to prevent and control destructive forest fires, the involvement of communities is crucial" [FAO04], we propose to foster people's participation from the project's outset, involving the ones who wish to participate to expand the raw material database through a workshop on ARTiVIS DIY Forest Surveillance (cf. appendix I). The workshop consists of assembling an open hardware kit for forest surveillance and experimentation with real-time video. By promoting the ARTiVIS community workshop, we teach participants how to assemble and setup their own ARTiVIS node and explore with them the possibilities offered by real-time video streams of forests.

---

165 *Ustream* – free live videostream, online broadcasts » http: / / www.ustream.tv

166 Artist residency in Madeira: framework, work in progress and outcomes » http: / / playwithfire.artivis.net / madeira /

167 *Sustainable Interaction with social Networks, context Awareness and Innovative Services,* Univ. of Madeira » http: / / sinais.m-iti.org / ?page_id=2

168 *Sandpiper Technologies Video Cameras and Surveillance Systems* » http: / / www.sandpipertech.com / index.php [Retrieved 2011 / 08 / 15].

169 C. Rizkalla, J. Therien, A. Savage, "Observations of Nesting Short-Tailed Hawks in Central Florida", *Florida Field Naturalist,* vol. 37, no.1, pp.1–32, 2009.

4.3 *B-Wind!* | Concept, Development and Presentation

What is the feeling of becoming the wind, an invisible power with a visible physical effect on trees? Will you cherish the leafs, or will you trigger a hurricane? B-Wind![170]

B-Wind! is an interactive installation where users perform as an invisible character, the wind, triggering visual effects on the onsite projected footage of the forest and at the remote forest itself [Mendes10b]. It aims to bridge the physical and the digital world, connecting users to the forests and raising awareness on environmental sustainability.

This section describes the concept, methods and technologies underlying the B-wind! interactive installation and the results of our first implementation and user tests on an exhibition context. As this was the first interactive installation to be developed, the discussion is especially focused on the system and interaction design issues related with the challenge of working with an interface based on real-time video.

4.3.1 The Concept: an Invisible Force with a Physical Effect

In *B-Wind!*, users experience the feeling of becoming the wind, an invisible power with a visible physical effect on trees, whether cherishing the leafs, or triggering a hurricane. *B-Wind!* embodies a choreographic approach to raise awareness on nature and the poetry of movement, engaging its public by demonstrating a real immediate interaction effect between their actions and the chosen natural setting. Additionally, *B-Wind!* couples participant's movements effects with the projected installation footage – user's physical presence is subtracted from the visual interface, and the result of the actions is presented in the real-time video through emphasized visual effects.

The installation is implemented as two connected spaces. One is the projection of a video stream of a forest space where the user motion controls the rendering of visual effects. The other, at the remote location, is where software controls wind fans that influence the real trees.

The main challenge for our work was how to make this interaction happen in a remote place in a meaningful way. This proposal is connected to Edward Lorenz's metaphor on the "butterfly effect" [Dizikes08], in which the wind waves are provoked by the subtle flickering have the "hurricane effect" in a remote place. A prototyped component includes the power to apply the wind effect to the forest – the motion tracking in the installation having a real amplified effect on the real trees and in real-time.

---

170   Motto created for the *B-Wind!* concept, first presented in *Artech* [Mendes10] and also highlighted in the project website » http: / / bwind.artivis.net

Figure 4.12. *B-Wind!* concept art: participant interaction with visual effects indoors and fans activation .

Confronted with such possibilities, multiple questions arise on the user experience: is this pleasant, is it strange? Will the participants "spread the wings" and feel the freedom to cherish the trees? Will they explore the superpower of generating wind? Or, as children, exploding in energy, will they join the celebration of nature without processing causes or consequences – just being?... the wind!

4.3.2 Related Work

The "butterfly effect" metaphor [Dizikes08] transversely applies to all the interactive installations. "The fluttering of a butterfly's wings" having an effect on climate changes "on the other side of the planet" catalyzes the metamorphosis that empowers the user when interacting in the various experiences of the project. The whole series represents the small actions symbolizing significant potential on the ecological consequences of the users' participation.

As an interactive experience where users perform the wind, an invisible character, *B-Wind!* is triggering effects on site and at the remote forest. In this scope, the interactive virtual environment *Trans Plant* is remarkable regarding the feeling of immersion created for the user, who becomes part of a virtual scene of computer generated plants that are created and changed through body gestures [Sommerer00]. Furthermore, the developments towards the *MIC Exploration Space* research project emphasized the communication between remotely located participants, enabling them to share a common virtual environment [Sommerer96]. *Will.o.W1sp* [Woolford07], an interactive installation exploring our ability to recognize human motion without human form, was also inspiring because of the visual effects generated from body interaction movements that are very expressive as energy metaphors. Kirk Woolford's cross-disciplinary photography project exploring how the observation of nature experienced through performance "changes our understanding of our local environment" and ways in which "we are touched and moved by our environments" [Woolford11] is also a sensitive approach close to the *B-Wind!* experience.

Regarding the fans activation through a physical computing system, the *Arduino* microcontroller communicating with wind generator machines was a departure point for accomplishing this behavior. Although in completely different contexts and scale, previous work had been essayed with *Blow Me*, an interactive performance installation that has the goal to recover the sensuality of the 50s [Costa07]. In this installation the slight human blow of an exhibition visitor on a small computer fan had the effect of activating the wind that would lift Marilyn Monroe's white dress. *I Thought Some Daisies Might Cheer You Up* [Gonçalves07] was another project that triggered fans with the wind effect on the real world, this time also integrating natural elements – a vase of daisies – in the interactive setup.

4.3.3 Project Development

B-wind! was developed throughout the two terms of the first artistic residency, in a collaborative process with members of the *AZ Labs* in Portugal[171]. The interactive installation premiered at the residency's showcase and exhibition (2010) at the transdisciplinary arts center *O Espaço do Tempo*.

We set out to build a real-time video interface, addressing the challenge of capturing and visualizing movement and giving the participants the idea that they are, in fact, in control of the outside world. In order to accomplish this challenge, we started to build a prototype to test the concept of activating a fan through body movements. The electronic setup included the *Arduino* microcontroller, a DC motor and a servo to activate and rotate a fan[172]. Schematics of the fan pan and tilt control circuit were done using the *Fritzing*[173] interactive electronics software.
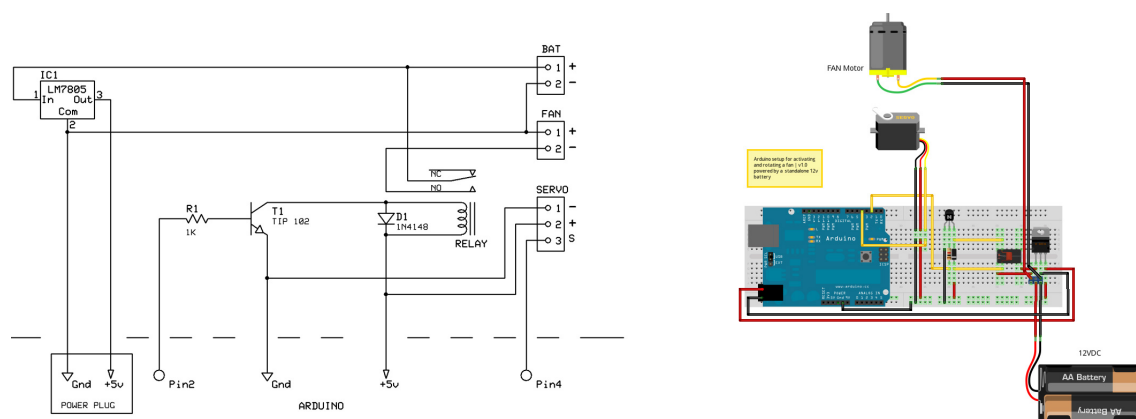
Figure 4.13. Electronic circuit schematics (left) and interactive electronics representation (right) of the B-Wind! early prototype.

---

171 *AZ* residency 2010 website and online catalog» http: / / audienciazero.org / espacodotempo /

172 See *B-Wind!* original post "B-wind is blowing" on the ARTiVIS research blog » http: / / monicamendes.wordpress.com / 2010 / 03 / 06 / b-wind-is-blowing / and futher *B-wind!* iterations reported » http: / / monicamendes.wordpress.com / category / b-wind /

173 *Fritzing* is an open-source tool that allows users to document their prototypes, share them with others, teach electronics in a classroom, and to create a pcb layout » http: / / fritzing.org
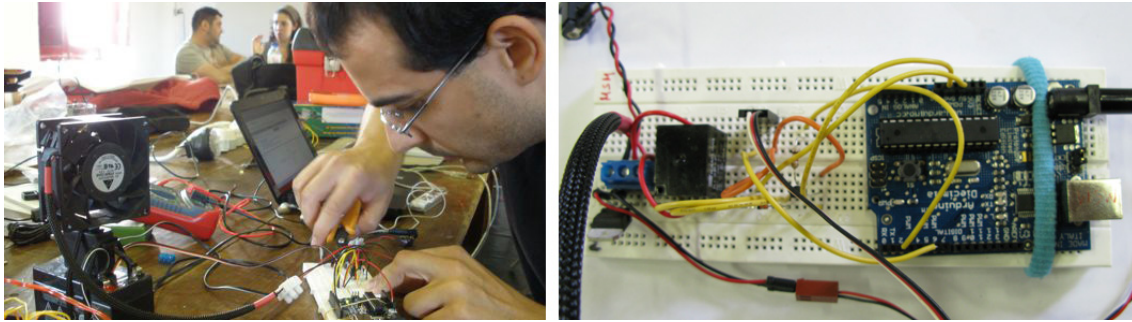
Figure 4.14. Prototype of the *B-Wind!* fan being created during the first phase of the *AZ* residency.

Video tracking was developed later on, using a *PS3 Eye* as a webcam and the open source software open-Frameworks.

In the final setup, the outdoor webcam required field work at the surrounding area with trees, and experiments on short distance wi-fi communication. In the end, we took advantage of location proximity and installed a wired network between the installation and the live video camera in the forest to reduce latency, improving the feeling of immersion.

Figure 4.15. *B-Wind!* fan prototype, test in a small scale projection, and role play for computer vision tests.

Another aspect we implemented and intend to develop in further exhibitions is to broadcast the installation live in an online platform. This has already been very helpful for tests, remote control, and feedback analysis (cf. 5.4.1). Recorded video contains material for video presentations, interaction improvement, cataloging, and timelapses.

4.3.4 System Architecture and Interaction Design

The components in the project have to do with telepresence in what refers to the interaction movements having a real effect in a remote place. In *B-Wind!* we also had to deal with the standard requirements for real-time games applications, such as lag compensation. What *B-Wind!* proposes is, in fact, close to the concept of telematic experience, which was technologically very demanding. However, the ultimate challenge of the *B-Wind!* interactive environment, was to be responsive and able to provide an immersive experience that make us abstract from reality, close to the magic circle [Hall10, Huizinga55] evasion from reality.
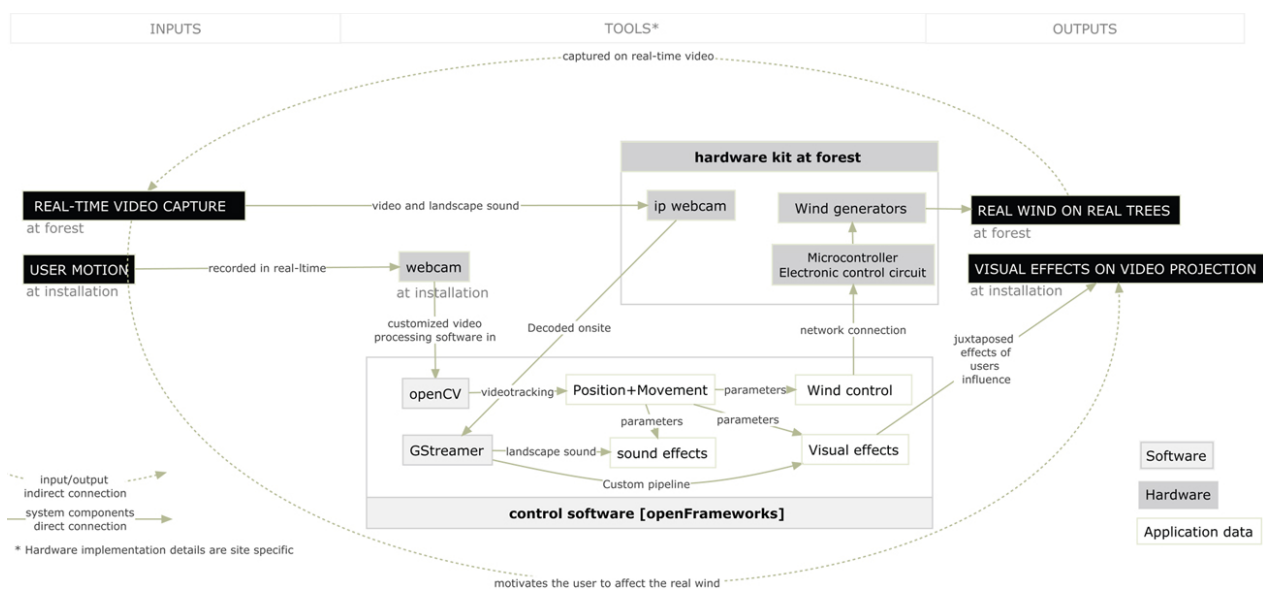
zigure 4.16. *B-Wind!* system architecture.

4.3.5 Technical Achievements

In the scope of the ARTiVIS project, *B-Wind!* was the first time that real-time video was used and applied in an interactive installation. Technically, *B-Wind!* is realized as two interconnected installation spaces. The first one presents the user with a projection of a live video stream of a remote forest space. A camera records the user's body motion in real-time and a custom video processing software written using *open-Frameworks* and *OpenCV* analyses this motion data and uses it to render visual effects showing the user's influence over the live video stream. Simultaneously, it sends control signals to wind generators in the remote forest location. At the remote location, custom software also based on the openFrameworks library receives the network control signals and forwards them to an Arduino-based electronic control cir-

cuit that controls the power and motions of an array of fans. A video stream is captured at the remote location and is streamed in real-time to the installation space and decoded on site using a custom *GStreamer* pipeline. *openFrameworks* was the chosen tool to work with computer vision and real-time video manipulation, because it provides more responsiveness than other frameworks. In order to use the video tracking as input data for the visual effects, movements and gestures were mapped as wind actions. Mapping instances of wind was iteratively done throughout the development of the project. Drawing storyboards for movement indexing and mapping was part of the method – cataloging processes that can be similar to choreographic notation. Lexical explorations – breeze, hurricane, gust, gale – and correspondences create visuals and sounds in response to motion. Generically, these motion inputs were analyzed and informed the system of the changes occurred, then activated the creation of the corresponding desired output.

Figure 4.17. First test of the real-time video lag (left) evidencing the delay between reality and the projected output. Real-time video tests (right) showing the user interaction and video effects already synchronized.

The challenging idea here was to create wind in the forest, generated by the motion visual tracking in the installation that triggered a real amplified effect by triggering an array of fans producing the visual effect of wind on the real trees and in real-time, that is then made visible in the video display. Previous work with wind fans had been tried in different contexts and scale. The prototype with the physical computing was the first step for the transition from a first working version to an intermediate standalone setup able to deliver a more powerful output. Reinforcing the wind visual effects with real wind in the installation is a feature we are considering, in order to enhance the user experience and visual impact.

The first major release of the ARTiVIS experience *B-wind!* at the *AZ Labs @ O Espaço do Tempo* exhibition reflected the work done over the two residency periods. This first version included multiple projection screens, inviting visitors to move across the installation space. It used available wired local network to cut back streaming video latency and an updated fan control code to use an Arduino-based DMX controller for the array of fans. We also set up a camera to capture the installation space and broadcast it online for project documentation and remote maintenance.

Figure 4.18. The *Saudação* convent window where the IP camera was placed seen from outdoors (left) and from indoors (right).

Since the exhibition space was part of a convent surrounded by trees inside the walls of a castle, we managed to set up the remote location part of the installation just outside the exhibition space. This allowed to optimize resource use – wired Ethernet, power cables and DMX control equipment — and to make sure that sensitive equipment, like the IP (Internet Protocol) camera, was kept inside the exhibition space. Having the two spaces so close together had a double effect: the fans rotating outside aroused curiosity that brought people to experience the interactive installation, and the experience of controlling a space so close by, encouraged people to go outside and see the trees and the fans working.

Figure 4.19. Outdoor fans setup and calibration. The fans were placed within sight of the installation.

4.3.6 Current and Future Work

The first major version provided a good picture of how all the different parts that make up the system are related, and allowed to simplify a lot of the complexity shown on previous system architecture diagrams. To complement our heuristic evaluation of the system we performed preliminary user experience assessment by direct observation and video recording of installation participants.

Figure 4.20. *B-Wind!* Interaction effects both indoors on the real-time video projection and outdoors on the fans activation on the trees.

The goal now is to work from this version on and evolve it to respond to our ongoing research work and to adapt it to the challenges of new exhibition spaces. Given the constraints, how can we design the *B-Wind!* interaction for meaningful purposes? Can we inspire users on the real power of their interaction? Currently, there are three main drives for our research work: expressiveness, flexibility and efficiency.

Expressiveness Making someone feel like being the wind requires good action feedback, low control latency and expressive visual cues. In this context, good action feedback means we will be making the wind generators' work at the remote location in more expressive ways. For this to happen we need to focus on the wind generator design and control. We will search for better and more powerful fans and look into how we can adjust the number of fans and their placement to get more expressive motion from the trees on the video stream. Low control latency is also key to a good feeling of control. B- Wind! has a complex control feedback loop where we can minimize latency. We will also look into making the visual cues presented at the installation more expressive. Participants have found the current fluid based distortion too subtle for the desired effect of power and control, so the graphics will be improved.

Flexibility The *B-Wind!* setup has to adapt to different exhibition spaces. We learned from our experience what are the parts that need to be more flexible, both at the hardware and software level. *B-Wind!* hardware support needs to adapt to different room sizes and projection surfaces. This means using more than one camera for user input and more than one projector for graphics output.

Efficiency *B-Wind!* has several independent components. Getting all of them to work together was a challenge, and now that a fully functional installation was created, we need to optimize it towards responsiveness. Modern hardware has a huge computing power both in the CPU cores and the GPU. We did not get to use it in all its potential yet, so we will work to better separate parts of the code that can be threaded effectively and to make better use of the graphics and stream processing power of the GPU.

Additionally, we will instrument the system to collect data on the users' input when experiencing the interactive installation. Video recordings of the interaction, processed inputs from the computer vision

system, fan commands sent to the remote location, latency timings - all this valuable information will be processed and used to assess users' engagement and effectiveness of the results. This will inform our research for the fan movement patterns and the visual effects.

We are also evaluating the use of affordable and programmable, whole body gesture control hardware used in devices such as *Microsoft's Kinect*[174].

Furthermore, the idea is to present the interactive installation to younger audiences where this poetic approach can be both inspiring and empowering. The aim is to motivate children to become closer to nature, to feel and enact the natural elements. This idea is the result of two key events in the course of this practice based research: I) The user experience tests of *B-Wind!* with an eight year old child to create a broad and original wind gesture lexicon and mapping, and II) The Play with Fire interactive installation experience (cf. 4.5), when explored at a public exhibition by an experienced children theater tutor when he was speaking out loud and in the brainstorm discussion afterwards. In I), the surprising performance of the child was very exciting, confirming the idea to carry on with this proposal, especially for younger ages, providing the opportunity of freedom of movement and imagination. II) was a confirmation of the idea of a theatrical approach to be conducted through storytelling. After all, *what could be more engaging for children than the power to change the world from any place? B-Wind!* is the starting point that would enable this metaphor to be experienced.

Further developments are underway to gather the resources to improve the sense of immersion and expand the installation with institutional support.

---

174   Kinect 3D camera » http: / / www.microsoft.com / en-us / kinectforwindows /

4.4 *Hug@ree* | Concept, Development and Presentations

Hug@ree and engage into a playful symbiotic relationship with nature,

for everyone should hug a real tree every now and then.[175]

Hug@ree is a real-time video recording setup combining real trees with physical computing and a users database in an interactive installation [Mendes11]. This immersive experience provides the interaction with trees and videos of trees in real-time, raising environmental issues in urban culture. Its implementation aims to express new values regarding sustainability in the present and the future.

Figure 4.21. Hug@ree concept art: tree hug outdoor and touch interaction indoors.

4.4.1 The Concept: Hug a Real Tree

The ARTiVIS interactive installation *Hug@ree* provides a bond between urban beings and the forest. This encompasses two distinct moments. In an outdoor space, an instrumented tree detects participant's hugs and transmits the information to the indoor space. While a camera continually records the tree outside, custom software captures and keeps the last few seconds of video. When a hug trigger reaches the wireless radio receiver, the software saves the video and sends it to an interactive tangible projection. Then, participants place the video loop of their own hug on the screen tree, becoming leaves of a collective experience in a videoloop hugs gallery.

The gallery of hugging trees serves to register users in the community to motivate active participation, and invite other participants to hug the tree, naturally expanding the ARTiVIS users database.

Online, participants will be able to upload a photo of themselves, but their hug will only be made part of the world when a participant hugs a tree for real.

---

175   Teaser created for the *Hug@ree* concept, first presented in *Artech* [Mendes10] and highlighted in the project website » http: / / hugatree.artivis.net

Figure 4.22. First *Hug@ree* mockup showing hugs from remote participants enabled when someone hugs the tree for real.

In the future, multiple *Hug@ree* installations around the world will upload their leaves to an online plat-form, creating a global shared embrace of nature (cf. 4.4.7).

4.4.2 Related Work

Hug@ree's playful metaphor of the symbiotic relationship between humans and nature through a hug to a real tree is also the interaction in *oneHug* [Praschak10] and in the *Treehugger Project* [Gradzik09, Vartan09]. The motto "Everyone should hug a tree every now and then" is commented by a user on this environmental art project installation presented during the *COP15*[176] with organic sculptures, where the first person in line is hugging the tree to show that standing for the environment is a communal effort with a deeper level of meaning.

Talking Tree presents the data that the tree is witnessing [EOS10] and is a specific example of a project that takes advantage of the "Internet of Things" [Ashton09], creating a powerful narrative from an Internet connected object.

Trees have an enormous symbolic power. But it is not symbolism alone that they enhance, trees have become the metaphor of environmental activism with the so-called tree huggers, who are themselves the protagonists of environmental actions such as tree sitting as a coercive measure for environmental goals. The case of Julia Butterfly Hill's two-year vigil, living in the canopy of an ancient redwood tree to help make the world aware of the plight of ancient forests [Hill12], is a successful and recognized example of the power of the contact with the tree as a form of environmental activism.

---

176   *COP15 – 15th Conference of the Parties to the United Nations Framework Convention on Climate Change*, Copenhagen, December 7-18, 2009.

From time to time, we find statements on the qualities of hugging trees: "From ancient times trees have been seen as symbols of spiritual growth. Their deep roots reach into the earth and their branches reach up to the sky, connecting the physical with the spiritual"[177]. Consistently, even *Hug@ree* tests participants commented that "it helps me to get rooted, to recharge", confirming statements like "feeling deeply rooted and in harmony with nature" (cf. 5.4.2.2 regarding further feedback reported). Research reports that hugging can be good for health, for it releases substances that influence the brain. If hugging people can have positive long-term effects, could it work with trees also? An intriguing prospect[178].

Concurrently, emerging research has also been bringing more trees to the urban environment through campaigns like *The Big Tree Plant*[179] which aims to plant one million trees in urban areas, based on the findings that "trees do wonders for our well-being", also claiming that "getting people involved in the planting process makes communities even happier"[180].

4.4.3 Technical Description and Interaction Design

The *Hug@ree* experience is composed of two distinct moments. In an outdoor space, a real tree is instrumented with several conductive wires ergonomically placed around its trunk. These wires form capacitive sensors that are used to detect the proximity of the participants' body. An *Arduino* microcontroller attached to the wires triggers a hug when most of the sensors detect the participants' contact and pressure, sending a signal through a *XBee*[181] wireless radio transmitter to the indoor installation space.

While a camera continually records the tree outside where the leaves rustle and flutter quietly, custom software built with the *openFrameworks* and *GStreamer* libraries captures and keeps in memory the last few seconds of video.

Figure 4.23. Instrumenting the tree at UCLA courtyard, the microcontroller and *XBee* emitter nested at the tree, *Sci | Art* participants hugging the tree activating the sensors and sending the signal to the receiver near the screen interface, where the videoloops are shown.

---

177 In "Hugging a tree", by oriental medicine practitioner Tom Ingegno, 2012 » http: / / acuguy.blogspot.pt / 2012 / 04 / hugging-tree.html

178 In "The Power of Love – Hugs and Cuddles Have Long-Term Effects", *NIH – News In Health, National Institutes of Health, Department of Health and Human Services*, February 2007 » http: / / newsinhealth.nih.gov / 2007 / February / docs / 01features_01.htm

179 *The Big Tree Plant* is a campaign by the British government "to encourage people and communities to plant more trees in England's towns, cities and neighbourhoods" » http: / / www.defra.gov.uk / bigtreeplant /

180 BARFORD, Vanessa (2010) "Do trees on the streets make people happy?", *BBC News*, Dec. 6 » http: / / www.bbc.co.uk / news / magazine-11889768

181 XBee – Wireless RF Modules » http: / / www.digi.com / xbee /
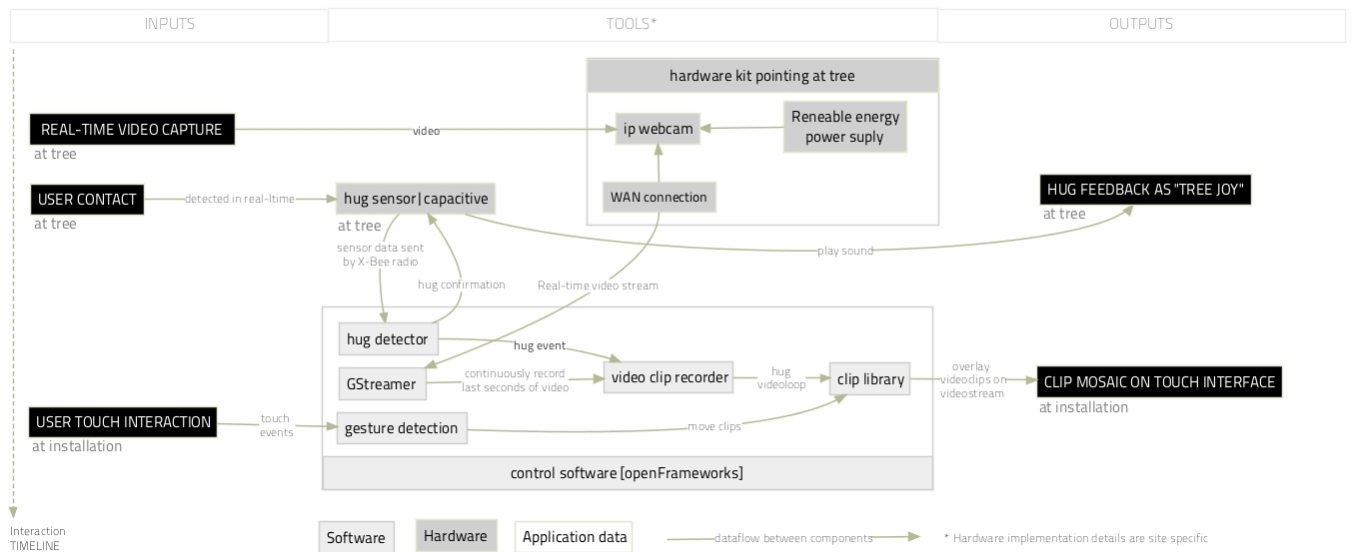
Figure 4.24. *Hug@ree* interactive installation system architecture.

When a hug trigger reaches the wireless radio receiver, the software saves the video and sends it to be displayed in an interactive touch screen, where participants gestures are captured and encoded using the *TUIO protocol* [Kaltenbrunner05] and sent back to the application. This decouples the application from the gesture detection technology used for a particular installation while allowing the participants to drag and place the video loop of their own hug on the displayed tree-like structure, becoming leaves of a collective experience.

4.4.4 User Interface and Experience Design

Exhibition visitors hugged the tree outdoors, and then went to the indoor installation showcasing the real-time video of the tree outdoors.

In the first exhibition at *Pop Up*, the interaction setup in the indoors installation was a touchscreen. Every time a visitor hugged the tree, a new small rectangle showing the recorded hug detail as a videoloop was generated. The video detail was added to the "ground" on the lower part of the multitouch interface overlaying on the real-time video of the tree outdoors. Then visitors participated in the indoor part of the installation by dragging the small videos in the touchscreen interface to become part of the greenish tree foliage. Additionally, participants could play around with the composition, and that was part of the fun of the interactions happening indoors.

Figure 4.25. *Hug@ree* caption hanging at the tree (left) and the tree being hugged (right).
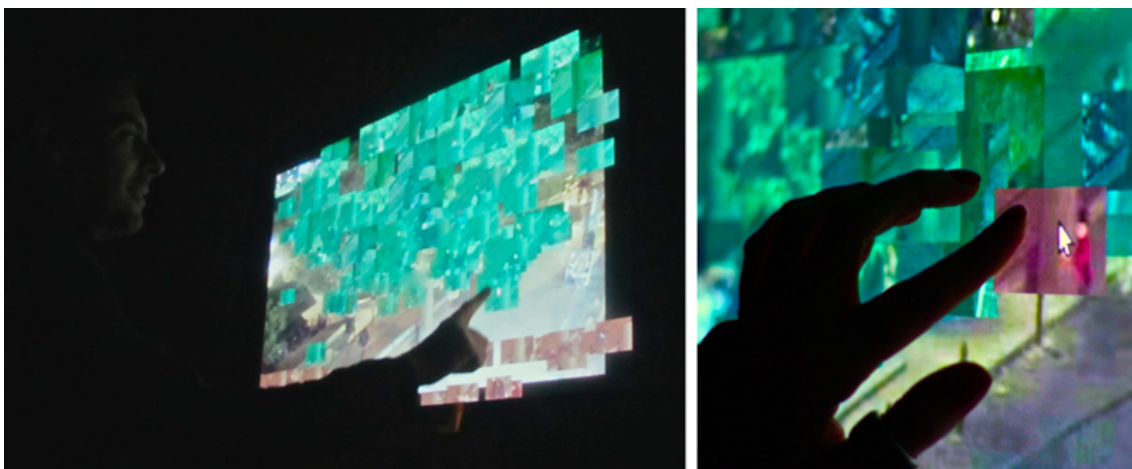
Figure 4.26. Interaction indoors showing the tree outdoors in real-time and the new videoloops on the "ground" generated from the tree hugs outdoors. Participants drag the small videos in the touchscreen interface, becoming part of the human hugs foliage.

The next presentation in exhibition was at *TEI Interactive Art showcase*, and a DIY touchscreen was used. In demonstrations, the computer screen was the interaction interface, so instead of using the fingers on the touchscreen, participants used the computer mouse to drag the videos and place them on the tree foliage. The initial idea was to use a projection, but space and sensors limitations made us postpone this setup. It is part of future plans to also use large scale interaction interfaces such as area projection screens using a video sensor such as *Kinect* for mapping the user interaction over the projection.

In the last public presentation in the scope of this research during the Summer in Maçal do Chão, the text input feature was added. From this version on, when users touched the videoloop on the ground, a transparent keyboard layer appears as an overlay on the real-time video of the tree on the screen. This interface enabled participants to optionally input a name on their video and leave their email address in order to be contacted for future *Hug@ree* updates. After these steps, the user is able to drag the videoloop to the tree.
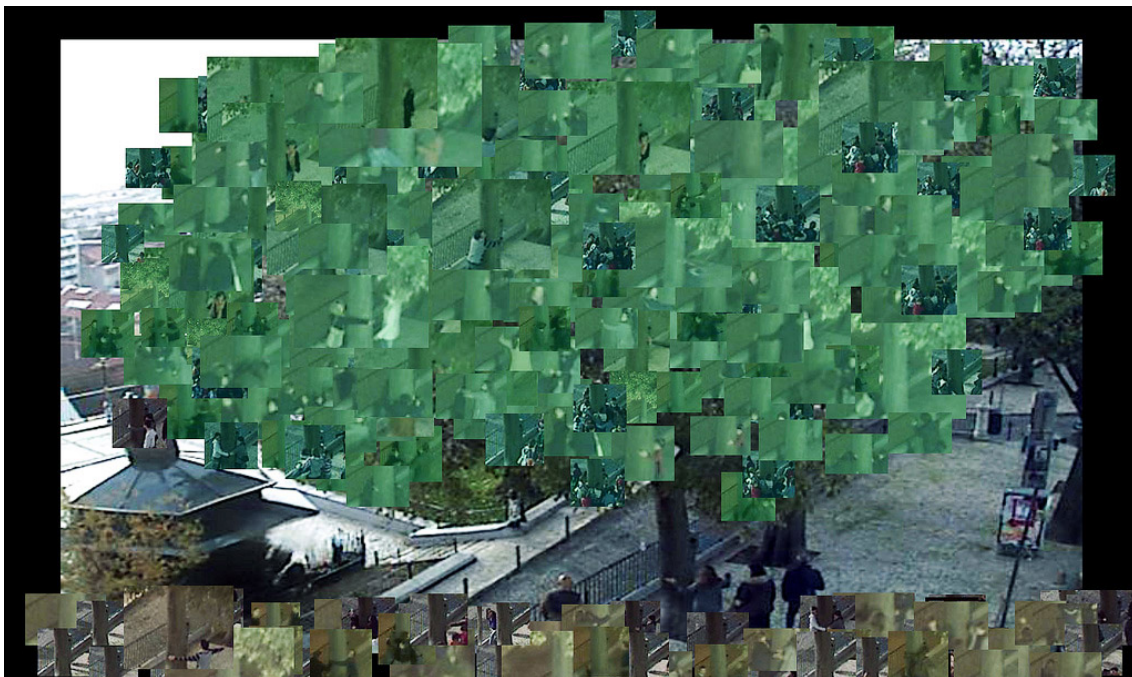
Figure 4.27. *Hug@ree* screenshot showing the visual result after three weeks of tree hugs at *Pop Up in* Lisbon.

This is another step towards the online platform registration, to which this feature will be connected by providing the participants input, so that they can be contacted to further access and participate in ARTiVIS activities. In practice, members will be able to register, by this symbolic experience of hugging a real tree, to join the ARTiVIS digital community.

4.4.5 Development Iterations

The development started by submitting a proposal for an *AZ Labs* sprint project[182], a two day focused work marathon where a team of programmers,hardware hackers and activists got together to build a working prototype of the installation.

The team was composed of *AZ Labs* members that had signed to collaborate on this project development event. The goal was to assemble a working prototype of the installation where people could hug a tree and have that hug recorded by a nearby camera for further interaction inside the installation space. The first day was devoted to designing and testing a custom capacitive sensor to detect hugs on a tree (cf. images in 5.4.2) while the second day was geared towards developing the base installation video handling software and to make physical mockups of the installation space to ascertain appropriate positions, distances and scales of all the elements.

---

182   *AZ Labs* sprint call for *Hug@ree* sprint, September 2010 » http: / / audienciazero.org / index.php?option=com_cct&task=view&id=135

Figure 4.28. Screenshot of the *Hug@ree* final days at *Pop Up*. A participant is hugging the tree outdoors as the videoloop is displayed in real-time on the ground. The "foliage" displays the individual and group hugs gathered during the exhibition.

There was still time left for some field work during the afternoon of the second day, allowing to collect video footage for later analysis and project documentation. At the end of the day, the whole team gathered for the Sprint's final demo.

Blog posts were published reporting the process and the results[183], in this case intentionally written in Portuguese to enhance communication with local cultures by sharing with the people at Maçal do Chão, where this event took place. Notes were taken reporting local culture and flavors – "Saberes & Sabores"[184] – that are described in a dedicated blog post. This is part of the overall ARTiVIS commitment to contribute to local cultures in all its activities developed in the framework of a rural environment.

After the initial prototype, development continued iteratively along a series of public exhibitions of the project, where necessary site-specific adaptations were performed and where data from user observation and testing was incorporated into the next development steps.

The timelapses frames selection worked as a document, where the first days were devoted to task analysis – tests done to realize the dynamics of nature and people in the space. One considerable visual effect was the times of day variations influencing the visualization in the screen. For example, from 5 to 7pm

183   Hug@ree AZ sprint » http: / / monicamendes.wordpress.com / category / az-sprint / (Archived version: http: / / artivis.net / archive / blog /).

184   ARTiVIS blog post » http: / / monicamendes.wordpress.com / 2010 / 09 / 27 / abracaumrvore-reportagem-paralela-%C2%BB-saberes-sabores-do-macal-no-sprint-az / (Archived version: http: / / artivis.net / archive / blog /).

in Maçal do Chão would be the worst visualization possible with backlight, while in the afternoon a visualization showed the intense sun "burning" the pixels of the camera sensor, appearing as a black hole.

The project was extensively documented throughout the development – video, photographic and installation output documentation was produced for later user experience analysis, project documentation and aesthetic compositions (cf. appendices D, E, F, and G.4).

4.4.6 Exhibition History

The interactive installation premiered in November 2010 at the *Pop Up* collective exhibition in Lisbon[185]. The venue for this international exhibition was Santa Catarina Palace, one of Lisbon's sightseeing highlights. Its implementation in this cultural and urban context aimed to express cities' new values regarding sustainability in the present and the future. The exhibition lasted for five weeks, which was very convenient for the necessary adjustments in its first presentation. The accumulation of hugs over this time resulted in a very expressive live recorded videoloops foliage in the multitouch interface[186]. The setup was also the context where the first two sets of tests were done, the first one with a focus on usability issues, and the following mainly dedicated to the environmental awareness issues. The overall results of the tests done are presented and analyzed in the *Hug@ree* evaluation section (cf. 5.4.2).

The project presentation included contributed photos and videos of people hugging real trees as part of the *350.org* and *Greenpeace* "10/10/10 Global Work Party"[187]. These resources were used for testing and the contributors were the first to populate the world of *Hug@ree* (cf. figure in 5.4.2.1).

Meanwhile, upgrading the online platform that links together all *Hug@ree* installations was the challenge tackled at the *Codebits* hackathon[188], where the *Hug@ree Virtual Hug*[189] also started in order to allow participants to virtually hug a tree.

A few weeks later, a bonsai "portable" version premiered at *AZ Labs* creativity hackmeet exhibition in Porto[190]. This option was created after a submission to a conference where hugging a tree outdoors would not be possible both for organizational and also weather constrains. The solution to overcome these limitations was to bring nature indoors, keeping the purpose of hugging a real tree.

---

185 *Pop Up City Lisbon,* International Festival of Urban Culture and Contemporary Art, Nov4–Dec1, 2010 » http: / / www.popup-city.com / lisbon-2010 / cartaz / laboratorio /
186 *Hug@ree* at *PopUp City Lisbon* » screen timelapse http: / / vimeo.com / 18009040
187 *350.org* International campaign » http: / / www.350.org | Hug@ree "10 / 10 / 10 Global Work Party", 350.org » http: / / www.350.org / en / hugree
188 *Sapo Codebits,* November 11–13 2010 http: / / codebits.eu
189 *Hug@ree Virtual Hug* research page » http: / / hugatree.artivis.net / hugatree_virtualhug /
190 *Hug@ree* portable version at *AZ Labs* hackmeet – screen timelapse » http: / / vimeo.com / 18268496

Figure 4.29. *Hug@ree* at UCLA: *Sci | Art* participants daily hug to the tree on their lunch break and a screenshot capturing a group hug.

Hug@ree was then presented at *TEI'11 Art Explorations* [Mendes11a] to foster locals' awareness of the rich natural beauty of Madeira island's *Laurissilva* forest endangered by recent forest fires. For this showcase we built a multitouch display with a flexible diffuse plastic sheet and lightweight metal profiles, infrared LED emitters and a modified *PS3 Eye* camera. In the end we had a DIY multitouch setup that would fit on a small plastic tube. When *Hug@ree* was showcased we had to contend with unexpected rain in normally sunny weather in Madeira. Our multitouch setup worked out well enough for demonstrating the concept. By the end of the showcase we did not have as many hugs as expected on our *unique* Madeira palm tree, but we got the surprise of a lightning triggering the sensors and getting captured on video.

A new *Hug@ree* node[191] was installed at the UCLA Court of Sciences in the scope of the Summer Institute program of the *Sci|Art NanoLab*[192] under the theme "Imagine the Impossible", and it was presented in the environment day subject sessions[193]. This interactive installation was part of the guest lecture presentation of the ARTiVIS research as an UCLA Art|Sci artist in residence[194]. The instrumented tree was a "Bidwill Brachychiton" (*Sterculia Family*), from Australia, and in the whole week of play it was our special tree. A questionnaire was sent to the participants ten months later to evaluate the long term effect of this approach regarding environmental awareness.

A version of *Hug@ree* combined with *Treeellucinations* was essayed during the first *Artropocode* meeting, where *Hug@ree* was presented as a demo[195] – this is a performative setup to further explore and present in nightlife events. *Hug@ree* was demonstrated during *ArtropoCode*, the first meeting of "libre code weavers"[196], a digital arts and open source software event organized by the collective Baleiro[197], and coordinated with *AZ Labs Audiência Zero* and *Olholivre*[198]. This mini-hackmeet took place in Santiago de

---

191 *Hug@ree* at *Art | Sci Nanolab UCLA* » screen timelapse http:/ / vimeo.com / 27435499

192 *Sci | Art Nanolab* (2011) Summer Institute, UCLA » http:/ / artsci.ucla.edu / summer /

193 *Hug@ree* at *Sci | Art* "Imagine the impossible– exploring Art and Science in Los Angeles" » http:/ / hugatree.artivis.net / hugatree_sciart.html

194 *Art | Sci center+lab* Residents list and bios » http:/ / artsci.ucla.edu / ?q=about / art-sci-residents

195 *Hug@ree* demonstration version at Artropocode hackmeet » screen timelapse http:/ / vimeo.com / 27435917

196 *ArtropoCode* Meeting, July 15-17, 2011 » http:/ / aderiva.net / tiki-index.php?page=artropocodemeeting01&bl

197 *Baleiro* – Free culture collective based in Santiago de Compostela » http:/ / www.baleiro.org

198 *Olholivre* – Galician libre software community » http:/ / olholivre.net

Compostela and was an intensive weekend dedicated to the possibilities of free tools for creative programming. The demonstration version of *Hug@ree* was improvised with fallen leaves and branches from the park of the University of Santiago de Compostela, where *Baleiro* is located. In the most playful part of the meeting, the different tools where used in installations, performances and DJ-VJ sessions. In the chill out extension, *Hug@ree* became an extra entertainment during the night, allowing to grab surprising screenshots with the VJ performance and the participants dancing scenario. Such *Hug@ree* and VJ unintended presentation led to the idea of combining the ARTiVIS experiences *Hug@ree* and *Treeelluci-nations* in the same setup – an idea for future development.

Another *Hug@ree* node has been set up in the Summer season at the small village where the first implementation took place, Maçal do Chão, for premiering the registration mode and performing tests through questionnaire with the rural inhabitants and the Summer visitors, mainly emigrants visiting home from all over the world.
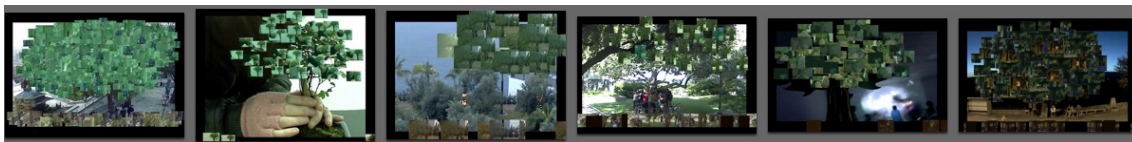
Figure 4.30. *Hug@ree* interactive installation presentations at *Pop Up* in Lisbon, *AZ* hackmeet in Porto, *TEI'11* in Madeira, *Sci / Art* Summer school in Los Angeles, *Artropocode* in Santiago de Compostela, and *Summer* in Maçal do Chão.

4.4.7 Conclusions and Future Work

Hug@ree addresses networking practices and actions that contribute to change the current behavior regarding environmental protection. The interactive installation was designed to be deployed in multiple places in such a way that all instances collect tree hugs that become part of the same virtual world. Further iterations will allow the use of the open source *DIY forest surveillance kit* (cf. 4.2).

The timelapses of the presentations done have been uploaded and are showcased online. We started working on the dynamic online version where users will be able to play with the *Hug@ree* videoloops as in the multitouch interface. So far, the videoloops and scenario of each of the presentations have been archived for use in this *Hug@ree* online component. This is both a dynamic way of archiving a real-time video experience, and an opportunity to bring visits from past users and future participants.

The *Hug@ree* virtual correspondent for a registration from a remote place is accomplished online: with the motivation "*Hug@ree* 'for virtual', someone will hug it for real"[199].

This feature already started to be developed in order to enable participants to upload a photo of themselves, and the hug only becomes part of the *Hug@ree* online world when a participant hugs a tree for

---

199   Motto created for the *Hug@ree Virtual Hug* concept highlighted in the research page » http: / / hugatree.artivis.net / hugatree_virtualhug /

real. In the future, when the user registers the email through an online platform, a video displays an avatar hugging a tree, while the camera of the user's access device is activated and shoots a photo that is uploaded to the database.

Also in progress is the integration of sound, which becomes an additional feedback channel, also working as a confirmation from the system that the signal captured by the capacitive sensors around the tree and sent by the wireless signal has been effective. Then, the resulting hug videoloop is displayed in the installation indoors to be placed by the participant as a live green leaf on the tree. This solution simultaneously solves the problem of lack of feedback to the participant, and adds expressiveness and emotion to the experience as an anthropomorphic suggestion. First approaches considered the micro sounds originated by the human body contact with the tree, but these did not express the feeling of joy that the tree should *vocalize* for being hugged. Then field recordings were done, capturing nature sounds in a pitch and rhythm that recalls the heart beat. This is the direction to follow in future iterations, to be combined with a suggestion of a sigh from the tree.

Collaboration is underway to integrate *Hug@ree* with the *SINAIS* project, which is researching how to make people aware of energy consumption [Barreto11]. Meanwhile, *Hug@ree* has already inspired the development of further installations by others, such as an apple version by Tiago Serra[200] (the *AZ Labs xDA* hackerspace founder) with whom the *Hug@ree* hardware kit has been shared for this experiment. The *Apple Hug@ree* is an instrumented apple tree that offers one of its fruits as a sign of gratitude for being hugged. A participant hugs the tree, and a mature apple falls as a symbolic feedback from the tree, a reward for the participant.

Future developments for the *Hug@ree* touch interface include experimenting with emerging technologies like a smart window[201] with a transparent screen. This would allow an exhibition setup that could be simultaneously closer to the tree, simpler and as immersive as if it were natural. This blend of the digital with the natural world would be suggested by overlapping the touchscreen projection on the transparent window with the real tree, so that the participant could have the feeling of placing the videoloop on top of the real tree.

---

200 Tiago Serra's projects video documentation » https:/ / vimeo.com / serratiago

201 Smart window by *Samsung* » www.youtube.com / watch?v=tE06ELPwrH4 | Multitouch films » http:/ / zaagtech.com / X-Series.html zaagtech x series links (b2b) http:/ / www.bytrade.com / factory-1 / supply-1 / 1607697-zaagtech-X-series-multi2-6-10pts-touch-overlay.htm | Online reseller http:/ / store.mesamundi.com /

4.5 *Play with Fire* | Concept, Development and Presentations

Challenging constraints, "don't play with fire" was the motive for this provoking experience, assuming both wild and innocent sides, rebellion and protectionism[202]

Play with Fire is an interactive installation calling its participants to ignite generative fires over live streaming video of selected forests [Mendes11c]. The experience is designed to raise awareness towards sustainability issues such as climate change and forest fires. Play with Fire as one of the ARTiVIS interactive experiences, is making use of the tension created by the installation itself, to foster control over danger and functional monitoring for forest protection in a surveillance system.

In this section we outline the concept, the installation development, the experience design we developed for this project, and its deployment. We also reflect on its underlying cognitive framework enhancing the consequences awareness, and close this section with the demonstrations and exhibitions where Play with Fire has been publicly presented.

Figure 4.31: *Play with Fire* concept art: the original landscape, user experience on site and consequences to carry.

4.5.1 The Concept: from Arsonist to Forest Caretaker

Play with Fire is a performative, immersive experience that invites people to interact with real-time video from selected forests by playing with virtual fires through gestural interaction. This interactive digital art installation was conceived and designed in order to stimulate activism and raise awareness in the area of sustainability and climate change, particularly related to forest fire hazards. With *Play with Fire* we propose acting in the setting of a performative art installation as a mean to understand the implications of forest fire hazards and its connection with sustainability and climate change.

The *Play with Fire* experience initially presents its audience (I) a mashup of forest fire news, followed by (II) the participants playful interaction with fire on the forest projection through a gestural interface. Finally, *Play with Fire* (III) connects to its audience mobile phones granting access to a user specific web

---

202 Introduction created for the *Play with Fire* concept, first presented in *Artech* [Mendes10] and also highlighted in the project website »
    http: / / playwithfire.artivis.net

application depicting the forest they burnt, regenerating in real-time. Depending on the user's performance, the forest will take from some months to years to return to its original state.

Play with Fire triggers controversial feelings by combining "the wonder and danger" of a forest on fire, effecting attitude change towards environmental protection. The experience paradoxically encourages playing with forests fires, in order to raise awareness towards its prevention. This duality becomes part of the experience, and raises concerns in the audience mind, such as the pleasure and excitement of playing with fire versus its effects on a natural resource such as a forest. The experience concludes with visuals of a forest virtual regeneration process underlining the message: *the forest will eventually grow again, but what is the price to pay?*

To promote the intended transformation (to be accountable for our actions in the world hence act sustainably) *Play with Fire* combines action and information in a unified audience experience, where the thrill of playing with fire, enhanced by aesthetically engaging graphics, is confronted with the informed results of such an action on the environment. At the end of the participants' performative act, information is delivered upon the graphic images that have been generated by the users actions in the installation – "Such a digital experience does not simply enhance the delivery of information, the information itself becomes an experience" [Bolter05, p.23]. In *Play with Fire* the participant is confronted with the information of the burnt forest together with the images of it. As a further reflective step, we conclude the *Play with Fire* experience by leaving each participant with a specific application on their mobile devices that will depict in real-time the regeneration of the forest they have virtually burnt. This application will accompany them with information and visuals for the real duration of time in which the forest (burnt by the participant during the interaction with the installation) will regenerate itself.

The *Play with Fire* installation (both at the exhibition space and the mobile application) should work at two levels. One is the aesthetic and surprising experience during the interaction (showing how some forest fires start off, engaging playfully with fire and losing control of the results). The other is the reflection on the information given at the end of the performance and the accountability for the action performed, generated into the *Play with Fire* audience.

Reflection and accountability should work on the audience by raising awareness and stimulating action to act sustainably in real life. In particular, participants should be encouraged to reflect upon fire hazards in forests, our natural resources, and eventually the effects of our careless consumption resulting in climate change and related disasters.

4.5.2 Related Work

Fire has always been a topic that triggered the imagination of many. Beyond the references presented in the state of the art chapter, in this section we present case studies as examples that are specifically related with the *Play with Fire* concept, its features and future developments.

The interactive installation *Play with Fire* take us deeper into the forest fires issues of distribution, detection, effects, causes, consequences, prevention, and forest surveillance [AFN12, Catry07, Forest09, Moreira05, Silva10, Stula12, Vieira11]. The selected environment for implementation of the prototype also required specific knowledge on Madeira's *Laurissilva* forest [Capelo04]. Further projects related with forest fire prevention are described in proposals such as robots instrumented with sensors and software for forest fire detection[203].

Regarding visual effects, we can find virtuous examples of fire effects with cellular patterns in Fedkiw's computational fluid dynamics [Fedkiw01], 3D graphics fire simulations [Ikeda10, Virolainen10], demos of generative fire in real-time – *Fairlight*[204], *nVidia*[205]–, and 3D tree models research for real-time generative applications [Doran09, Mondet09]. Vrellis' *Fire* installation[206] poetically displays the compositing of generative fire propagation and destruction effects over static backgrounds and *Float4*'s *FireFX* demo[207] shows how performative and responsive generative fire effects can become.

The *Games for Change* project hosts an archive with many good examples of the expressive power of the medium for environmental awareness [GamesForChange11]. The work of artists like *La Molleindustria* that appropriate and subvert videogames as an interactive medium for persuasive purposes [Molleindustria11] has also influenced our work. Blurst's *Minotaur China Shop*[208] is also an example of dichotomous gameplay tension related with the gameplay tension in Play with Fire. Devoted to exploring the playful side of digital art, other alternative narratives are entirely provocative, such as *Paper Cut*, a video game in the style of role-playing games investigating ethics and economics in silviculture. *Paper Cut* creates a main character "with a questionable morality", differently from traditional gameplay. The main character here is a lumberjack that must cut down trees, and obstacles are wild forest creatures. This virtual world combines exaggerated representations of the existing world with imaginary elements "Geographical obstacles, woodland creatures and hippies block your path. Trees fall like leaves of paper." [Moore09]. The challenge of these interactive environments, is to be able to provide an immersive experience inspiring the kind of evasion akin to the magic circle, when we abstract from reality and get into

---

203 *Robô de Detecção de Incêndios Florestais* (Fores fire detection robot), by Filipe Cunha, "Criatividade e Inovação Ano Europeu 2009" contest winner » http: / / videos.sapo.pt / bv8zVKVHvgTrh1O1cNkF?framed

204 *Fairlight* – example of generative fire in real-time » http: / / cdn.capped.tv / vhq / cncd_fairlight-ceasefire_all_falls_down.mp4

205 *nVidia Vulcan Demo* – example of generative fire in real-time » http: / / www.youtube.com / watch?v=tuj4bGc5ZTk

206 *Fire*, by Petros Vrellis, 2010 » http: / / www.youtube.com / watch?v=nKNm_VosA3M

207 *FireFX*, by Float4, 2009 » http: / / www.youtube.com / watch?v=DJ31zxr21Mc

208 *Minotaur China Shop*, online game by Blurst » http: / / blurst.com / minotaur-china-shop /

the game: it is "a fantasy world with its own rules. By stepping into that fantasy world, bounded by the magic circle, we agree to compete without lasting antagonism" [Hall10].

The inspiration towards acting rather than watching also comes from compelling and controversial movies such as Stanley Kubrick's *Clockwork Orange* (1971)[209], and David Fincher's *Fight Club* (1999)[210]. These works stand out as references, regarding the construction of experiences that subvert reality and common sense in order to convey a message.

Informed from all of the above, *Play with Fire* is an interactive installation conceived and designed as an experience to foster awareness and activism in the domain of sustainability, with particular regard to the effects of climate change and its correlation with forest fires all over the world.

4.5.3 Installation Setup and Experience Design

Play with Fire presents an artistic experience where participants start and control the spread of a forest fire. When the fire is finished, the participants are presented with the landscape of the damaged forest that slowly regenerates. The experience with *Play with Fire* considers different roles for its audience: engaged participant, spectators and passers-by. In this section we describe the installation setup, as well as the designed experience for its audience.

In *Play with Fire*, a surveillance camera is setup at a selected forest location, transmitting real-time video to the installation space, a room inside of which the performative gestural interaction is contained.

At the installation site, one semi transparent wall is where the mashup media and information about fire hazards and forests is displayed. This wall also functions as an attractor for the audience to enter the interaction space. When the participant enters the installation room, he or she activates a fire through presence or, alternatively, is encouraged to start of a fire, by lighting up a provided special "match".

The sound of crackling fire will sanction the start of the visual hazard. As the user is prompted by the screen text "Play with Fire" to act upon the virtual fire, *Play with Fire* will react through real-time generative fire animation graphics according to the gestures performed by the user.

After a certain amount of time of active interaction, the fire takes over from the user control and spreads over the trees and forest developing its own behavior. At this point, if the audience does not further intervene by performing gestures trying to extinguish the fire, the forest fire climaxes to a point of no return. Fire has developed its own behavior and spread through the forest.

---

209 *A Clockwork Orange* in IMDB » http: / / www.imdb.com / title / tt0066921 /
210 *Fight Club* in IMDB » http: / / www.imdb.com / title / tt0137523 /

Figure 4.32. *Play with Fire* at *Creative Algorithms* exhibition. Scenes 1–5 show the news mashup, user interaction and mobile application.

Fire flames follow the trees structures and leaves. The scene becomes a spectacle for the audience. Once the fire has climaxed, the amount of virtual damage to the forest will depend on how much the audience has played with the fire, how much it has watched the spectacle of burning trees continue, and if there was an attempt to stop the flames from taking over. A desolating burnt landscape is the resulting scenario.

The interactive experience ends with the participant being presented with a screen showing information of the resulting damage in the style of a game score. The information delivered to the user at this stage encompasses a measure (in hectares) of the forest area burned in the *Play with Fire* interaction along with a snapshot of the burnt landscape, forest regeneration times and possible effects on climate change.

At this stage, the participant is prompted to use his/her phone to scan a *QR code*[211] appearing on the *Play with Fire* screen. The *QR code* opens a *URL*[212] containing a *Play with Fire* mobile web application displaying the damaged forest the participant has just generated and its slow regeneration. Participants will carry it as a memento of their experience for a duration determined by the real-time interaction with the installation.

Play with Fire was designed as a digital art experience that happens over three different moments:

I) An introduction to the installation and its theme with an invitation to interact with it through a multimedia mashup consisting of news related to forest fires with online data – videos, photos, headlines and text content of the most recent and related news on forest fires are projected on a semitransparent wall, anticipating the interaction space (cf. figure 4.32, scene 1);

---

211 *QR code – Quick Response code* (official website) » http: / / www.qrcode.com / en /

212 *URL (Uniform Resource Locator)* of the Play with Fire mobile demonstrations online: First *Creative Algorithms* exhibition at Montemor-o-Novo demonstration – Portuguese version, October 2011 » http: / / playwithfire.artivis.net / demo / 0 / | *ACE 2011*, November 2011 – English version » http: / / playwithfire.artivis.net / demo / 00 / | *Creative Algorithms* at Knowledge Pavilion in Lisbon, February 2012 » http: / / playwithfire.artivis.net / demo / 0000 /

II) The performative active part where the participant interacts with fire and forest settings through the gestural interface. From the perspective of an audience member who is still outside the transparent wall, this audiovisual setup is cross referenced with the transparent screen of the mashup news (cf. figure 4.32, scenes 2 and 3);

III) Finally, *Play with Fire* connects to its audience mobile phones granting access to a user specific web application depicting the forest they burnt, regenerating in real-time. This reflective part takes the form of a mobile application, tracking the regeneration of the virtually burnt forest in real-time. The length of the regeneration time is calculated based on the length of the player interaction with the forest fire. Eventually the burnt forest will take years to regenerate hence the user specific webpage, available through the users mobile device, will stay with the participant for a long time after the installation experience. (cf. figure 4.32, scenes 4 and 5).

Figure 4.33. ARTiVIS news mashup from Play with Fire displaying a combination of text, image and video news focused on different locations: Serra da Estrela region in the North of Portugal, and *laurissilva* forest in Madeira.

News Mashup Design

Dynamic information on real forest fires is part of the *Play with Fire* experience, exhibited in the transparent layer preceding the user interaction. The content, including a dynamic news block and a dynamic video feed, is continuously updated with the news on forest fires in the form of texts, photos and videos, and is also currently available online[213]. This kind of news feeds aggregating related data has been used in platforms such as the *Waterbodies*[214] by Victoria Vesna, in that case covering the theme of water through the most diverse artistic and scientific approaches.

The mashup was firstly presented as a static page, simply interchanging with another static webpage. It uses news covered online, from diverse sources from news sites, to firemen blogs and *YouTube* videos.

213   *Play with Fire* news mashup online » http: / / playwithfire.artivis.net / mashup /

214   In online platform *Waterbodies* news section » http: / / artscicenter.com / waterbodies–ex / news

This initial version depicted Portuguese forests, specifically the Laurissilva of Madeira and the Serra da Estrela region that includes Maçal do Chão, where ARTiVIS has roots and demonstrations were done.

Each covered forest there will correspond to a news mashup with the contextual framework for the closest forest fires to that region. The main criteria for the design of the mashup news component was, in fact, that the news to be displayed could be selected according to the location from where it is accessed.
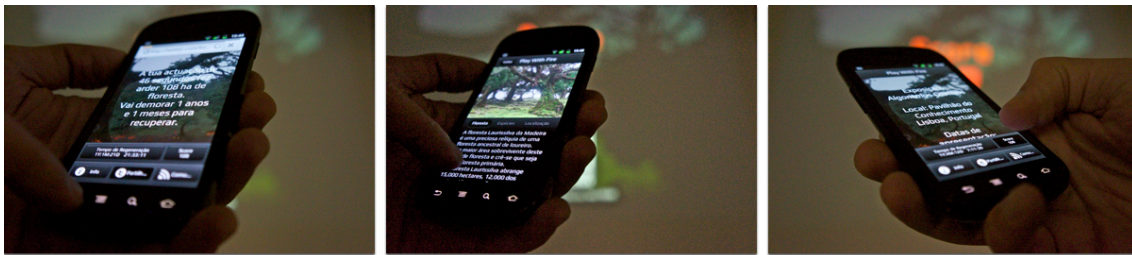
Figure 4.34. *Play with Fire* mobile application displaying the user results, forest information, and exhibition context.

The Mobile Application Experience

The participant can check the application right away or wait until later when he/she has an idle moment to engage with it and reflect on the recently occurred events.

Once the user scans the *QR code* and saves the *URL*, the *Play with Fire* mobile application icon displays on the screen of the phone. Upon a click, the burnt forest regenerating animation is displayed as well as the countdown of the time – years, months, days, hours, minutes and seconds – remaining as long as there is recovery time left. Clicking on the countdown button, a text explains how long will the application accompany the user: as long as the virtually damaged forest will take to regenerate itself, with an image of the burnt forest that is slowly growing again. The duration of the forest recovery and the length of time the application will play in the participant's mobile phone, will depend on the data generated during the performance. The mobile application also displays a reminder of the destruction in the form of game-like "score", through a score button displaying the context where the Play with Fire experience has happened – local, date, and total time for regeneration.

The menu enables access to the information on the context and characteristics of the forest such as GPS coordinates of the webcam that provided the live footage and the tree species of the burnt area. In this way we aim at motivating people to visit the real forest. The info button brings more awareness on the natural environment by enabling access to information describing the forest and the correspondent species of trees "so that the participants can be more sorrow for what they burnt", as explained in guided

visits to the students. This area also presents the location using *Google maps* embedded in the mobile interface.

Furthermore, the website offers its users, those who have tried the installation, to reflect on their experience and communicate by tweeting with the *Play with Fire* community. The two other buttons enable the users to share their *Play with Fire* status by tweeting the recovery time left to the community constituted by the participants in the *Play with Fire* experiences, and to access the site displaying the installation data with the presentations schedule and locations.

4.5.4 Discussion on Cognitive Aspects

Play with Fire as an artistic experience has been designed, from the beginning, to be ambiguous, even "wicked". Questions raised by the audience in public presentations have focused mainly on its paradoxical nature: "Won't Play with Fire inspire people to be arsonists instead of forest caretakers?"

In his book "Persuasive Games", Ian Bogost introduces the concept of procedural rhetoric to discuss how games and interactive simulations can be used to teach a point of view and contribute to effect attitude change [Bogost07]. This is accomplished by allowing users to experience a pre-made system, especially tweaked to amplify or de-amplify certain aspects according to the point that we are trying to get across. By playing with the system's rules, the users become familiar with it and gain a deeper understanding of its mechanics, allowing them to confront their assumptions and beliefs with this new understanding, through a process of cognitive dissonance conducive to changes in personal attitude [Festinger57]. In *Play with Fire*, participants are initially invited to experience a realistic model of something forbidden, usually outside their scope of possibility. They are allowed to experiment with what is wrong as a learning experience in a game-like environment. This (so called) "magic circle" [Huizinga55] – where the consequences are negotiable, played in a protected environment – works not as reality abstraction, but as reality protection. Once the participants gain a deeper understanding of the human element in the dynamics of forest fire through this playful experience, they are confronted with the results of their actions. The joy of interaction is followed by a deeper understanding – that a reckless action can take years to recover from and have expensive costs in terms of ecosystem resources and biodiversity.

Additionally, there is an assumption that "fire = bad". Fires are not always negative. In many cases, a controlled fire is even good for a forest [Silva10], and the causality direction between forest fires and global warming is not a simple issue.

The visitors should also leave the exhibit with knowledge. Thus, the mobile application is key for reinforcing the process of cognitive dissonance needed to inspire change in personal attitude towards forest fire. A constant reminder of the experience to be treasured and shared by the participant for a long time.

4.5.5 Implementation and Technical Challenges

The current version of the installation software for the *Play with Fire* gesture interaction uses *openFrameworks*. The news mashup combines text and video information from search engines using *Javascript* to extract news from search APIs. The mobile application functional prototype was created using *Sencha Touch*[215].

The following figure presents the *Play with Fire* interactive installation system architecture.
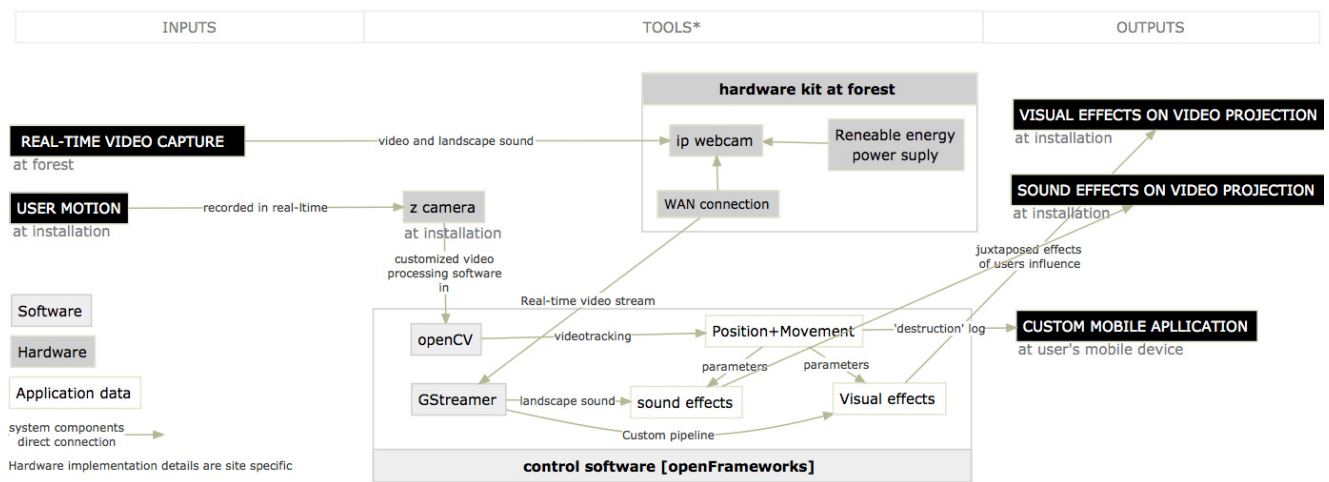
Figure 4.35. *Play with Fire* system architecture.

The *Play with Fire* technical details are described in the installation technical rider (Appendix H.3) that was presented when submitting the interactive installation to exhibitions and demonstrations.

The implementation of this experience, as described above, brings some important technical challenges, namely the capture of user gestures, the real-time rendering of fire effects, the illusion of destroying a forest over a real-time video stream, and the mobile component of the experience.

Capturing complex user gestures with fidelity and low latency is a challenging task. During the project's pre-production we developed a library of gestures to be discovered by the participants that would trigger specific behaviors of the fire simulation. Although these gestures involve full body movement they can be fully described by arm motion. Taking this into account we are using a *Kinect* 3D depth sensor and mapping user arm movement to input.

---

215   *Sencha Touch* – Build Mobile Web Apps with HTML5, high-performance HTML5 mobile application framework »
       http: / / www.sencha.com / products / touch

An impressive and responsive real-time fire simulation is crucial for user immersion into the experience. We are currently using Horvath's high quality "artist-directable" fire simulation model developed for film special effects [Horvath09] and implementing it in real-time.

Virtually destroying a remote forest presented as a real-time video stream involves some technical challenges. First there's the need to extract approximate tree structures from the video to define the regions where the fire simulation will take place. This is complex to do in a fully automatic way, so we are using a semi-automatic process where the rough tree structures are drawn over the feed in a calibration step and then the optical flow of image features is used to deform these structures over time.

The next challenge is how to composite the effects of fire destruction over the streaming video. After looking into Melek's work on rendering fire damage [Melek07], we will start by blending a black matte over the area to burn to simulate the charring of the wood, and then add smoke, ember and spark effects where appropriate to enhance the visual impact to the result.

One last challenge that presented itself during development was the uploading of a native mobile app to the user's phone. This approach presented problems related to mobile phone security and having to develop and support a different app version for each phone. The solution we found was to develop a web application, that would only require that the participant's phone have a web browser in order to check the "score" and the regeneration state of his/her forest.

4.5.6 Process and Outcomes | Presentations

After the conception, design and initial prototyping of *Play with Fire* [Mendes10], the main implementation took place with the collaboration of the members of the multidisciplinary team developing the interactive installation. Development started with building on the outputs of the previous interactive installations, especially *B-Wind!*, with the components developed so far. The similarities of the architecture system diagrams (cf. 4.3.4 and 4.5.5) are an evidence of that same structure.

Play with Fire was accepted for development at the *AZ Labs Colab* projects residency, and a week of focused work in October 2011 at *O Espaço do Tempo*, followed by a week of public exhibition to configure and improve the installation. User experience and usability tests were done throughout all the phases of the process.

Regarding research work in progress and dissemination, the proposal's conceptual framework and developments were presented at *ISEA 2011*, integrating the Sustainability panel [Mendes11c]. Our presentation fostered an engaging discussion on forest fire paradoxes [Silva10], the unstable balance of nature

without human intervention and some valuable references and figures to help consolidate the ongoing research.

A scaled down version was demonstrated at *ACE 2011 Creative Showcase and Interactive Art* [Mendes11d]. The installation was showcased at *AZ* hackmeet in Guimarães, where first tests were done. The full implementation of the interactive installation premiered at the *Creative Algorithms* exhibition at *Pavilhão do Conhecimento* (Knowledge Pavilion) in Lisbon, where the main set of tests and user observation were done. *Play with Fire* was also presented and tested at the *Pop Up* event in the scope of *Guimarães 2012 European Capital of Culture*.

These presentations in urban cultural contexts were followed by a demonstration at the small village in the North of Portugal Maçal do Chão, in order to present an artistic approach to a rural population affected by forest fires and to test the feedback of the different local cultures.

At the *DIS 2012 Demonstrations* we set up a presentation of the fully working scaled down demonstration that allowed participants to *Play With Fire* and to visualize the videos of previous exhibitions [Mendes12]. Finally, evaluation results were presented at *NordiCHI 2012* [Mendes12a].

4.5.7 Conclusions and Future Work

We have designed this interactive experience for persuasive purposes, inviting people to engage in forbidden and dangerous actions in a controlled environment, in order to confront them later with the long term consequences of their own choices. Although the idea of creating "forest fires" is turned into a game in which participants receive a score (typically translated into positive recognition) for how much of the forest the participants were able to destroy seems counter-productive to the projects aims and goals, the awareness on the consequences and the long lasting application after the experience have the power to relay the sustainability message.

The full scenarios initially proposed were not easy to implement; the complexities of automatically installing an application onto a user's phone using *Bluetooth* was not possible in today's multi-platform, security-riddled world of mobile devices. Instead, we developed a web application that solved both this limitation and the update issues, that are made on the server side each time the user opens the "application", i.e., accesses the web application. In future iterations of the installation, the user will be able to choose which landscape scenario to engage with (there is more than one location where *Laurissilva* still thrives in Madeira) and which point of view to adopt on the landscape (such as the close up on a tree, or a wide angle view on the Fanal valley). These and further future developments are included in the collaboration with the *SINAIS* project, after a first phase of residency in January 2012, followed by the second phase for implementation scheduled for the Winter of 2012.

The mobile phone application needs work in the customized *URL* the participants receive and in the regeneration of the forest itself. The community page will develop at the pace of the ARTiVIS online platform, due to its essential connection with the online platform (cf. 4.1).

Suggestions such as bringing in the "smell" of burning wood might be very evocative of fire, thus making this a more "unique" interactive work is a proposal to implement. Another suggestion was the temperature: heating the installation space would increase the real feel of being inside the fire. In both cases we deal with issues affecting interactivity related with senses other than sight and hearing. Smell and temperature could be easy to integrate, but difficult to remove or to stop the effect from one participant to the following. One option could be a cold breeze in between the experiences, but that would imply extra time and energy consumption, so neither is enough responsive nor sustainable.

Play with Fire user experience tests, observation, questionnaires, and the overall data analysis are described in detail in section 5.4.3, where discussion is centered on whether *Play with Fire* is meeting its claims of changing public awareness related with fire.

Future work to be done is also outlined by paper proposals reviewers, such as further exploration of the use of real-time video alongside choreographed performers. Also, more could be done with the mechanics of the 'take home' memento for the experience to make a lasting effect. We will further investigate how the persuasion outlined in the conclusion takes place, along with more work on the information presented about the damage and regeneration.

5. EVALUATION AND RESULTS ANALYSIS

In the ARTiVIS research, evaluation is part of development, from the definition and validation of the theme included in prototyping and development of the outputs, to the results analysis. Assessments have been made since the beginning, with a feedback loop between usability tests and the applications development.

The chapter starts with the concepts and discussion on the role and possibilities of HCI (Human-Computer Interaction) and digital arts practices. Then we present two sets of interviews – one on the theme of forest fire issues, and the other on social entrepreneurship. This is followed by the description of the user interaction tests, and the evaluation of the interactive installations in the different contexts where surveys were done. To conclude, we analyze the corresponding results.

Furthermore, we address the problem of evaluating whether environmental awareness can be achieved through such unconventional – and sometimes controversial – installations, and approach the challenges and benefits of using HCI techniques in digital arts.

5.1 Combining Art and HCI – Towards Hybrid Evaluation Methods

Throughout history, artists have continuously been appropriating any available technology that allows them to convey the meaning of their work. In this respect, artists have always been craftsmen, as even conceptual art requires one to understand the craft of philosophy and aesthetics. Digital art is not different. Ever since the dawn of computers artists have been following the evolution of the technology, simultaneously appropriating and questioning its possibilities, means of production and social codes.

As the craft evolves to encompass an ever complex array of technologies, artists will have not only to build new tools, but also to adapt and co-opt tools and techniques that have been in the past reserved for industrial uses. As such, the field of HCI provides tools of growing importance to digital artists. Digital artworks are built from both physical and digital systems and many require some sort of human interface to be experienced and convey their message. HCI techniques seek to understand the user experience of a system in order to optimize it for a given purpose. In the scope of digital art, good interaction design can reinforce the message of an artwork and bad interaction design can hurt or distort it. More importantly, though, is the notion that if an artist is fluent in HCI he can use its techniques as a tool to

shape the experience of the artwork, for example by designing a poor interaction to highlight a specific aspect of the work.

However, just blindly applying HCI techniques in artistic contexts will most likely not provide us with the full possible benefits it might otherwise bring. As Kristina Höök *et al.* state, "Artists may prefer a rich, narrative, and singular understanding to a simpler but rigorous and generalizable understanding" [Höök03, p.242] as in HCI. Hence, we need to develop more specific evaluation methods for digital arts. We need to draw from the existing practices of HCI, interaction and experience design in order to understand, merge and create our own evaluations methods and standards.

Care must be taken not to replace art criticism with HCI evaluation, for HCI evaluation will probably not be a good way to answer the question "is this good art?" [Höök03, Goldman04].

Whereas artistic validation is partly a consequence of public presentation in exhibitions and other artistic and research contexts [Goldman04], evaluation is important to assess the users' engagement with the interactive experiences. We are considering ways to evaluate and to assess the benefit coming from the aesthetic values and the long lasting impact of the interactive experience. Traditional HCI usability evaluation methods, such as observations, surveys and interviews [Nielsen93, Hackos98], asking typical questions like "is the system useful", "easy to learn and use", "satisfying" – are relevant, but not enough. What should be measured? Usability, aesthetic values, long lasting impact? How to evaluate the holistic experience? And what about the environmental awareness?

As suggested by Fuller: "First, the only way to find things out about what happens when complex objects such as media systems interact is to carry out such interactions – it has to be done live, with no control sample" [Fuller07], so while heuristics may help the initial design of a system, it has to be tested as early and as often as possible during development.

Another important aspect is the users' subjective understanding, i.e., their theories of what the artwork represents, their metaphors for describing it. For most interactive installation settings we do not want to disturb their experience by forcing them to speak aloud. On the other hand, group dynamics are important, and more user information helps to create a better image of the cultural context of the artwork; Höök's case study describes the application of this method [Höök03]. Techniques like Shadowing and Fly-on-the-Wall [Preece11, Hannington12] and other direct observation methods can help with this task.

Typical HCI concerns may allow us to ascertain usability issues [Nielsen93, Norman93, Shneiderman92] but to evaluate the holistic experience (e.g., in game-like environments) other proposals exist, such as GameFlow, a model that uses *flow theory* [Csikszentmihalyi91] to classify the users' experience within eight dimensions – concentration, challenge, skills, control, clear goals, feedback, immersion, and social interaction [Sweetser05]. The affective qualities of the experience are a key dimension to measure in an

interactive artwork. In this regard we are adapting some aspects of the Repertory Grid Technique (RGT) to source the users constructs and vocabulary and qualitatively assess their experiences in relation to the technological artifact [Fallman05].

Similarly, data recording is an important part of any HCI study. Recorded audio and video data can be used together with photographs, interviews and observation notes to help the researcher doing the analysis to create a more clear picture of the user experience. More valuable data can be gathered by the digital artwork itself if it is properly instrumented to record user experience information while functioning, like ambient audio recordings, sensor input time series and user interaction snapshots.

The evaluation methods and techniques adopted for the ARTiVIS interactive installations stem from these concerns.

5.2 Outline of the Evaluation Process and Methods

Covering the ARTiVIS motivations and outcomes, tests were done both in the development and the presentation phases mainly through (I) interviews, (II) observation and (III) questionnaires.

I.   Interviews consisted of two structured sets of questions: the first set of nine questions focused on forest fire issues motivations and demographic data (Appendix A), and the second set of five questions on entrepreneurship. The interviews of the first set were audio recorded while the ones of the second set were achieved through video recorded *VoIP* and composed into an interactive video. Both sets were transcribed for further analysis and integration in this thesis.

II.   Observation was done both through direct contact and through video recording. Notes were taken during the observation in place and from the videos, and later annotated in a structured form focused on user interaction and feedback (Appendix B). Observation in presence enabled adjustments that were done in place for a better interaction. This task was complemented with the general notes and the specific observation issues that were noticed in the observation form.

III. Questionnaires included direct and open questions to test the environmental awareness factor and the usability of the system. Quantitative and qualitative assessment of subjective issues such as awareness and emotional engagement was a challenging task to be undertaken. The majority of the questionnaires were done in presence right after the experience, with the rest having been performed online ten months later to assess the long term impact of the experience (the different forms used are available in Appendix C).

The evaluation sessions integrated participants observation, recording, and questionnaires. A combination of diverse methods was used: user experience tests that were video recorded for further analysis, followed by questionnaires. Complementarily, photos and videos focused on the interactive installations implementation and on user interaction observation.

The questionnaires were done in public events – exhibitions, showcases and public demonstrations, both in urban and rural environments. Applied in the case of *Hug@ree* and *Play with Fire*, these were done in different stages of the process. First, evaluation with questionnaires took place during public presentations of the installations – showcases and exhibitions – in an initial phase of the interactive installations, and involved usability issues that were used for the subsequent development. Additionally, the final tests focused on the aim of environmental awareness where the interactive installations were presented and tested in later exhibitions and demonstrations.

The following table summarizes the objectives of the methods and techniques used for evaluating each of the interactive installations.

ARTiVIS components Methods | Techniques	Concept	Future Plans	B-Wind!	Hug@ree	Play with Fire
Structured Interviews (voice + video recorded)	Validate research theme – forest fires awareness	Evaluate implications of future work on social entrepreneurship			
Role Play (stakeholder participation and observation)			Participants interaction to test the interface reaction to user interaction and to map wind movements (breeze, hurricane, …)	During the development: People's interaction with the trees: scale, time, … to define the sensors distribution and capacitance / robustness	Tests to infer the scope and time of the installation experience
Wizard of Oz testing (of development prototypes)				Keyboard used to trigger hug events in the absence of direct communication, allowing for full testing of the installation while still in development	Testing early fire simulation prototypes with users in the absence of gestural input.
User Observation (direct and from video surveillance)			User interaction tests with the installation during the development for visual interface adjustments. User observation from the surveillance camera records.	Before public presentation: place dynamics – people passing by, light cycle. User observation and control on the installation indoor interface from the surveillance camera stream.	User observation in presence in the installation presentations. User further observation from video recording of exhibition participants interacting in tests days.
Qualitative and Quantitative Questionnaires (in place and online)				Qualitative and usability tests in 3 venues and in 3 moments: when experienced, 3 to 6, and 10 months later	Qualitative and quantitative pilot test in 1 venue and final 6 dimensions test in 3 contexts: public exhibition in specific domain, general art exhibition, and rural environment.

Table 2. Objectives of the methods and techniques used for evaluating the ARTiVIS concept and interactive installations.

5.3 Interviews for Concept Testing and Future Plans

"It is hard to see forests burning – do you know what it's like to look at a forest burning? There is no explanation..."

First structured interviews were done to the population who live in areas affected by forest fires or own forests that have been burnt, in order to assess their position in relation to the ground motivations of this study. Qualitative analysis was done to confirm and to adjust the research on existing data with the testimony of the people involved.

Additionally, regarding the future developments planned for the ARTiVIS research project, structured interviews were done to four entrepreneurs, who generously shared their experience and gave advice to new entrepreneurs.

5.3.1 Interviews on Forest Fires

Interviews were conducted to assess people's awareness on forest fire issues to inform the specification and development. A total of 17 structured interviews – with a duration between 5 and 15 minutes each – were performed in person and were recorded in the Summer of 2011 at Maçal do Chão. This small village in the interior North of Portugal has been very much affected by forest fires and is near the protected area of Serra da Estrela, the highest mountain in Portuguese continental territory.

The 17 interviews were undertaken by people between 12 and 83 years old, 9 women and 8 men, of which 2% had no schooling, 6% attended primary schooling, 6% were high school graduate, and 3% university graduate. Most of the respondents (9) were inhabitants of the small village Maçal do Chão, the others (8) were from the city of Lisbon (6) and emigrants from the United States (2) and Italy (1) spending part of their Summer vacations with their family.

5.3.1.1 Facts, Feelings, and Possible Causes

From the interviews done only less than one fourth (4) of the participants had never witnessed a forest fire, while the majority (14) had that experience. The descriptions on how it happened and on the feelings during and after the forest fire are expressions of the danger and beauty of fire.

Among the ones who had the experience of helping, most of them confessed not having felt anything, for they were focused on "just trying to help firefighting", whether with water hoses, or observing firefighters releasing counter-fire. Others were "worried" and "feeling bad" because "the whole mountain was burning", or even reported that "High flames were seen. Everyone came to see where it was. All the village population joined extinguishing the fire. We felt the horror, and we are worried because we heard of many people that have died when helping". Through our investigation, we also noted the paradox in people's responses: "While in the middle of fighting a fire, I even got admired with the flames; anyway, it's annoying to see nature burning". The feelings described included "fear" mixed with the will of "immediately helping to fight the fire" – "A feeling of destruction, loss, powerlessness A sensation of disaster".

Some of the testimonies recalled stories from the past, like the one of a farmer burning brushwood near the neighbor's property, in which the fire spread in a huge area around, or another where a farmer ignited a fire because he dropped the candle that was used to light the corral, "provoking the death of the sheep that were trapped". Other reports brought uncanny episodes: "when I was in military service we used to light a small fire to make a mask using burnt cork; it was windy, we were not careful, and the fire spread burning more than a hundred olive trees", and "The most dangerous forest fire I witnessed was man made – by the firemen. It was lunch time and they lit up a fire for a barbecue, and then the fire propagated".

Nearly one third of the respondents (5) had experienced a forest fire in their own lands: "A fire that struck me a lot was on my cousin's property, when my brother drove the tractor over the flames to plow for the purpose of extinguishing the fire, risking his life with the threat of igniting the fuel tank"; "Once I was participating in a barbecue and a forest fire started from there. It was an affliction. It lasted one day long and at night we couldn't sleep worried about the aftermath"; "Pinecone flames were flying from one tree to another. We only felt relief when the fire was extinguished".

When asked about the causes of forest fires, most said that the majority was arson related; and some respondents were evasive, referring to "other people's" opinion. However, "Because it is hard to believe that there are so many arsons", negligence causes were frequently pointed, ranging from cigarette butts (the most mentioned) to naive distractions in barbecues and agricultural cleaning: "People started fires accidentally, because they were not careful burning the brambles", realizing then that they couldn't control the situation". Behaviors like these not only cause atrophy and death of the trees, but also put at risk belongings, animals and people's lives.

Respondent's answers on possible criminal hand included not only arsonists, but also shepherds, the timber men, "enemies", and even firemen. Criminal causes in their specific region were focused on "new pasture for the cattle". Unusual causes pointed the combination of the sun heat with glass, or "sparks

from the train wheels". Some also blamed the carelessness of the owners and of the authorities for not cleaning the forests.

In general, respondents were more emotionally engaged when they referred to forest fires in their own lands. Their reports showed more awareness of the consequences and dramatic memories of the firefighting.

5.3.1.2 Prevention Measures and Suggestions

When asked about what kinds of fire prevention they knew, some respondents confused prevention with causes. The main measures mentioned were forest surveillance by locals, keeping the forests clean and accesses unobstructed, and not throwing cigarette butts away. Respondents mentioned that beyond the forest guards there are young people doing surveillance, recalling the case when two of those young people doing forest surveillance caught an arsonist of whom they were suspicious – the arsonist motivation, they said, was that "he liked to see the firemen fighting the fire".

Additionally, preparing the barbecue places "by cleaning everything around" or lighting the fire indoors instead of outdoors "because if there is wind the fire becomes ungovernable" were other measures pointed by the ones who had already witnessed forest fires ignited in these circumstances.

Awareness as a prevention measure was approached in several ways, from education as currently is being done towards recycling, to campaigns by the firemen and civil protection alerting people to be careful in the countryside and on the road, for "if forest fires don't get visibility, they'll be dismissed to the background". Overall, it was noticed that "If prevention is efficient, 70% of the cases will stop occurring. In any situation, prevention is more efficient than corrective measures".

The prevention methods mentioned as being applied in the region brought further information and detail. However, some people mentioned that no prevention methods were being applied in the region.

Inhabitants from the rural village were aware of prevention methods according to their own experience and interest, recalling the measures that provided them or their family a paid occupancy. Hiring younger people for walking or riding (a bike, a horse or a car) in the forest for surveillance, women for cleaning the forests, or creating paths for forest breaks and accessibility were the measures mentioned as having been applied in recent years and having helped prevent forest fires. Some still blame the municipalities for not investing on a forest cleaning system or plowing the lands.

While some villagers put themselves in the role of the people involved, the others commented from a distant point of view: "prevention through patrol cars do visual control, but I'm not sure if it is worth it", "paths that create discontinuity of the forest", and "human surveillance through the use of technology".

They also commented that "Institutions like civil protection bring awareness to people, but people don't put it into practice. Even in schools there are simulation workshops by firemen that cost human and material resources". The causes pointed (here confused with consequences) "are usually material losses. Recently, even human lives were lost", adding that "People who have a good heart don't set fires".

Opinions on if the existing methods had been effective regarding forest fire prevention were divided between yes, "since people are working on forest surveillance there are less forest fires – the smoke is seen, communication means are fast, and intervention is fast too", and no because "people are not responsible – maybe if they were fined", "there is too much gorse in the forests" or in short "there are still many forest fires". Additionally, the steps or initiatives that were most suggested to prevent fires with effectiveness were surveillance by people and cleaning the forest. Additional ideas included firebreaks for access, funds for forest cleaning and for shepherds, preparing specific areas to feed the animals, and more posters with information.

A respondent, affected with all the damage that she had seen, expressed her anger proposing punishment to arsonists, so that they could never do it again. Another one commented on the pattern around political inefficiency: "It gets to be ridiculous – the government speaks, they create the framework, the funds are over – but if only 80% of those means were implemented, efficiency would be close to 100%", stressing the lack of knowledge and even disrespect from the authorities regarding those prevention measures. Funds are not enough and there are also political issues. There shouldn't be so much hypocrisy in this – there are economic and political interests in the organizations that manage and apply those means", concluding with "a good application of the existing funds and means would be enough".

The results of these interviews were also analyzed and final considerations are presented as follows.

5.3.1.3 Interviews Final Considerations

While the previous questions were assessing what people knew from their experience, one last question was posed because of its relevance to the subject of this thesis.

So finally, when asked about what they thought of the participation in artistic approaches in this scope of forest fires, some people simply answered they had no idea. Others had suggestions like: "TV to alert people", but most were doing vague comments, such as "I think it is good"; "we're always learning"; "I don't know how to explain very well"; "I'm not sure if there has been this kind of approach here. It is very relevant". This strangeness reaction was one more motivation to go forward with unconventional approaches for that although they were "not very much into that" in terms of experience with the subject, they were open to this kind of approach.

In the end a few opinions made it worthwhile, for reflection and directions for future work regarding artistic approaches to bring awareness (cf. quotes in 1.1.4).

In general, older people had experienced forest fires and told their sad memories. The youngest ones had not had that experience in recent times; instead, three young adults had already been forest guards whose mission was to walk around in the forests doing surveillance. On the whole, the answers suggest a correlation between the population involvement in prevention and the absence of forest fires in the area. In fact, there has been a long time that there are no forest fires in the Maçal do Chão small village area, specifically.

When asked about the main causes of forest fires, one sixth of the respondents confused the issue, thus answering about the consequences. Initial thoughts on this misconception lead to the supposition that this may be due to the fact that in the anxiety of answering to an interview respondents may be more aware and worried about the long term damages they suffered than about the causes that were external and not controlled by them. A key answer was that "People are not aware of the consequences" – which explains and legitimates why the causes were being confused with consequences. This major issue of environmental awareness towards prevention of forest protection was approached throughout the ARTiVIS concept and applications such as the interactive installation Play with Fire.

In the ARTiVIS perspective, there are two main conclusions that can be drawn from this set of interviews: one is that community engagement can be an effective tool to prevent forest fires, and the other one is that knowing about the consequences of forest fire is important for awareness and prevention.

5.3.2 Interviews to Entrepreneurs

The ARTiVIS overarching idea was to create a community of people using real-time video of selected forests for contemplation and for participation in artistic experiments involving surveillance and experienced through interactive installations, thus enhancing a bond with nature, especially forests. Because social entrepreneurship seemed a natural follow up of the ARTiVIS project after the thesis, we invested on making the requirements and implications clear from the beginning. To this effect, a set of structured interviews was undertaken to study related work to realize the potential of the ARTiVIS research as a future entrepreneurship project.

To benefit from the advice and experience of others, four international entrepreneurs were selected regarding the social responsibility projects they co-founded (cf. 2.6): TMS Ruge of *Project Diaspora* in

Uganda, Juliana Rotich of *iHub* and *Ushahidi* in Kenya, John Brennan of *OpenAction* in the USA, and Pedro Ângelo of *LCD* in Portugal.

The first part of the process started in the scope of the *UL Entrepreneur* workshop[216]. Individual interviews were conducted remotely using a *VoIP* application. Each of the entrepreneurs was asked seven questions, including the motivations and influences, the story of their ventures, the added value of their projects, challenges and limitations, and advice for beginners. This interactive video piece intended to be a useful resource both for choices to do then and also to be reviewed in the future. The Personal Strategic Plan (PSP) presented as an outcome in the scope of the workshop, displayed the questions in context in the form of a concept map, as follows.
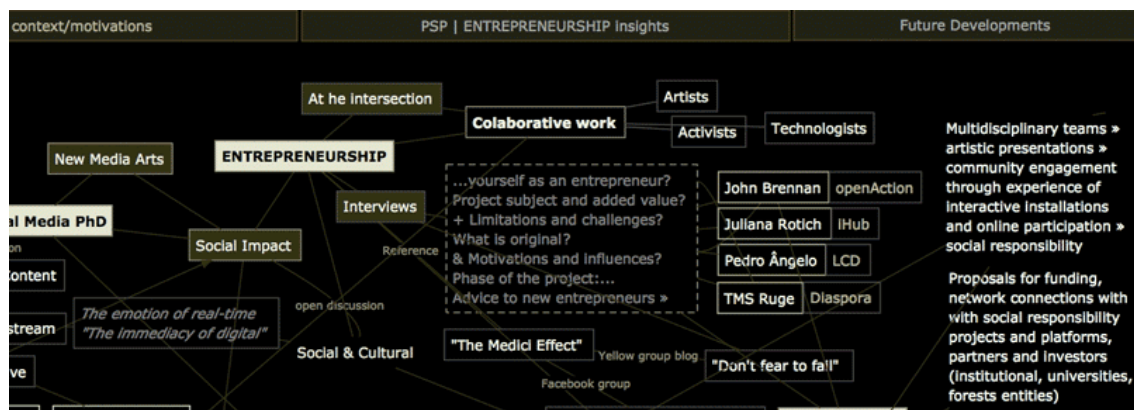
Figure 5.1. Detail of the concept map of the interviews to entrepreneurs as part of the „Personal Strategic Plan" presented in the scope of the Entrepreneurship workshop.

The second part was setup in the *Korsakow* workshop at *Media Ground*. The video recorded data were then reorganized in the form of an interactive video that is showcased online[217]. One can access the interconnected info by following each of the respondents answers to the different questions or through the same question answered by the four respondents. In order to organize the information, seven categories were created corresponding to the themes of the questions: "Entrepreneur", "Project", "Value", "Original", "Motivations", "Phase", and "Advice". Furthermore, "Surprise" and "Extra" sections were included as the respondents interjections which contributed to create context and enhance expressiveness and rhythm.

With the goal to gather insights regarding social entrepreneurship plans, the answers to these questions were transcribed and analyzed, and the lessons learnt regarding the ARTiVIS project future entrepreneurship plans are described in this section.

---

216 *PSP* done in July 2010 for the *UL Entrepreneur* course available online » http: / / monicamendes.info / entrepreneurship /

217 *Entrepreneurship Insights* – VoIP Interviews interactive video, July 2010 online » http: / / monicamendes.info / entrepreneurship / interviews /
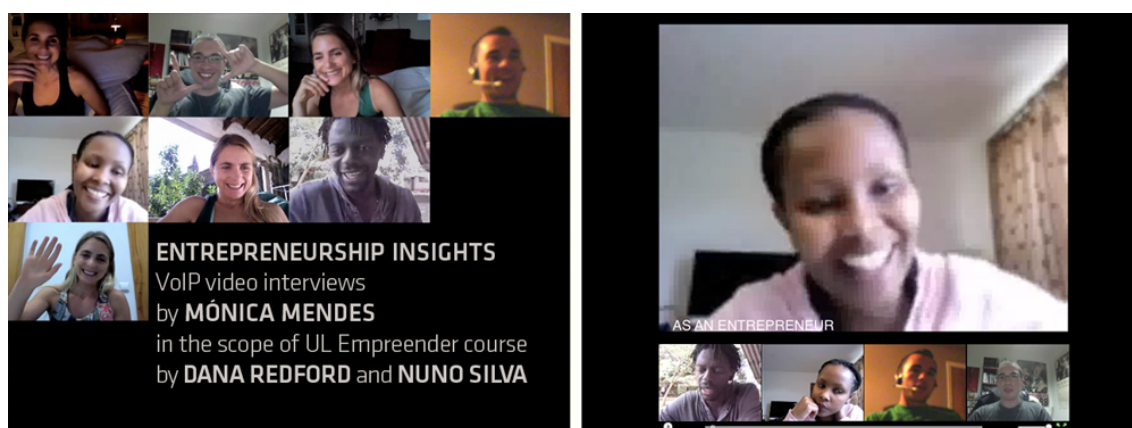
Figure 5.2. Screenshot of the interviews interactive movie title sequence and of the main interface displaying video options.

5.3.2.1 Entrepreneurship Projects

The first part was approached as an introduction for a practical definition of what an entrepreneur is and does. To get the most from the experience of the entrepreneurs being interviewed, the questions were posed in regard to their subjective experience, starting with: *In what sense do you consider yourself an entrepreneur?*

The feedback was diverse: while for TMS Ruge (TR) it was "I consider myself an entrepreneur in every sense possible. Because I think of how to run a business, how to do things my way", Juliana Rotich (JR) describes how she became "an 'accidental' entrepreneur – because *Ushahidi* was funded by philanthropy, but we view that infusion of cash as seed funding", for John Brennan (JB) "more often than anything else probably you're just challenging the current state of things", and for Pedro Ângelo (PA) "entrepreneur is a title that other people give you" – what is important is to cultivate an "entrepreneurial mentality". The characteristics of this mentality involve being creative, facing challenges and taking risks without the fear of failure "to solve problems and make things happen despite all the constraints" (PA). Creativity is also associated with freedom and consequently with responsibility: "Earning a paycheck to me is boring, it doesn't create anything. I like to be my own boss, more of a trailblazer than just settle in from 9 to 5" (TR). Work is often done within intensive schedules, too: "Your workday starts at 4am sometimes, and then at other times it ends at 4am" (JB). The facts that led to their projects creation were also mentioned. Some come from a non profit framework like *Ushahidi* and *LCD*, project Diaspora's initiatives are for profit business, while OpenAction is dealing with both not for profit and for profit.

Covered **projects subjects and targets** were mostly focused on social entrepreneurship and in philan-thropy. These included *Project Diaspora* doing social entrepreneurship projects regarding self sustain-ability for communities in the African Diaspora through direct commercialization by *UMPGL*[218] farmers

---

218 *Uganda Medicinal Plant Growers, Ltd. (UMPG)* is a project started and incubated under *Project Diaspora* » http:/ / umpgl.com

and jewelry by *The Women of Kireka*[219] (TR), *Digital Creation Lab LCD* working with creative technology as part of the *AZ Labs* hackerspaces network (PA), philanthropy towards developers working with open data technology by programmers by *Ushahidi* and Nairobi's innovation hub *iHub* (JR), and discoverability and interconnectivity of both non profit and for profit through the *OpenAction* online platform (JB).

Some of the descriptions brought further information that can be useful regarding the design of the ARTiVIS online platform and future developments. The *OpenAction* framework was a reference for its concept and also regarding the functionalities to consider in the ARTiVIS online platform – "We build widgets that can be maps, and timelines, to really showcase the impact that the project is having, so that they keep tapping into those live streams of content of the projects they're supporting to create. Not only does it increase the reach and awareness of the projects, but it also creates more engagement and more emotional connection, because you're showing what you're doing (JB). The implementation of the interactive installations was already, in fact, a result of the participation in the *AZ Labs* activities and its members collaboration – "a project which I would call social in nature, which is a network of laboratories that give creative people a space where they can experiment with technology and share knowledge among themselves" (PA). *Project Diaspora* is an option for future connections with ARTiVIS regarding the work plans in the African Diaspora. This project is also pertinent for its effective empowerment of communities as a result of their social entrepreneurship initiatives – "We work with enterprising women who previously were working in a quarry. We're teaching them business, finance, English, and computer literacy skills that will make their enterprise more sustainable" (TR).

The most mentioned **added value** was on sharing their contents and resources with the community and the **limitations** were optimistically faced as "challenges": "Added value we bring to the space: for universities and for foundations – they really have no way of tapping into live streams of content that the project they support create. Filling that need there, we're also opening that data so that others can mash that up as well (...) so that you or me or anybody else can say who's doing the projects and where. You add the information once and you disseminate it to multiple places" (JB). In the *Ushahidi* case the challenge is the same both as added value and the limitation, and it is important for ARTiVIS to realize a priori how difficult it is to find the talent and to be updated: "It takes time to train and get developers to be proficient in technology, because technology is changing fast" (JR). In this regard, hackerspaces are a good source of highly motivated talent: "This project brings forth the community, so the best of this project is how it unites and takes people from all over the country, connects and puts them sharing ideas and knowledge and building projects together" (PA). Another original added value was aligned with the goals set for *Play with Fire*: "working on computer graphics, trying to solve real world problems using

---

219   *Women of Kireka*, a local community-owned business that with the support and guidance of *Project Diaspora (PD)*, the focus of the project switched from charity to a for-profit business initiative » http:// womenofkireka.com

videogame technologies. Our added value was precisely that: transforming technology into a medium that wasn't being used to solve problems and taking it into the real world" (PA).

Funding was an expected limitation, here approached through different perspectives that are considered further in the ARTiVIS future work section (cf. 6.2). One is that low funding brings the need of bootstrapping. Another thing is that for profit projects are less prone to be supported: "It is pretty hard to actually get funding for this kind of model. The minute you say that this project can be self sustained with profits, funders tend to shy away. I think funders in a sense have gotten tied up into the aid model, that that's the only way development can happen, but that's probably the biggest problem we've run into, the fact that no one will believe us, even though we're doing good business. The *Women of Kireka* are all the way from moving from poverty to economic independence, so I don't see what's so wrong with this model for not getting funded" (TR). *Ushahidi*'s example was related with the challenges of linking promising companies with venture capitalists that can provide seed funding.

The question **What is original?** was intended to capture the essence of what the entrepreneurs so much familiarized with their own projects would at the time consider "original": combining existing technologies into new contexts is one of the approaches – "Original ideas are actually very difficult, it is more on iterating on what's already there and combining these in new ways, and then you're usually just in the next phase. I think the ideas separately have already been very talked about, blogged about, but combine them all is where we see our value" (JB). International collaboration was another – "We are investing in the knowledge economy of Africa. We also have African developers in the diaspora around the world and it is open source. I think it's also part of the Internet economy, because we collaborate with others – so I think that's unique" (JR).

And again, community empowerment, both through skills and knowledge transfer of new subjects – "Of all the skills that we're teaching them now, they can apply to whatever business in the future that they would like to pursue independently, so we're not just providing one avenue of creating income, we're providing skills and knowledge to be able to survive both internationally as well as locally" and debureaucratization – "We're able to pay the farmers twice as much as middlemen would be able to pay them, so that keeps them motivated and wanting to stay with the organization" (TR).

Overall, the seed of social change is the working mentality: "Our main goal is not to make money. We feel that our main goal is to make that change in society. As small as it may seem, just having people accept the value of learning by themselves, sharing knowledge, being together and working together in a community has a tremendous potential for social change" (PA).
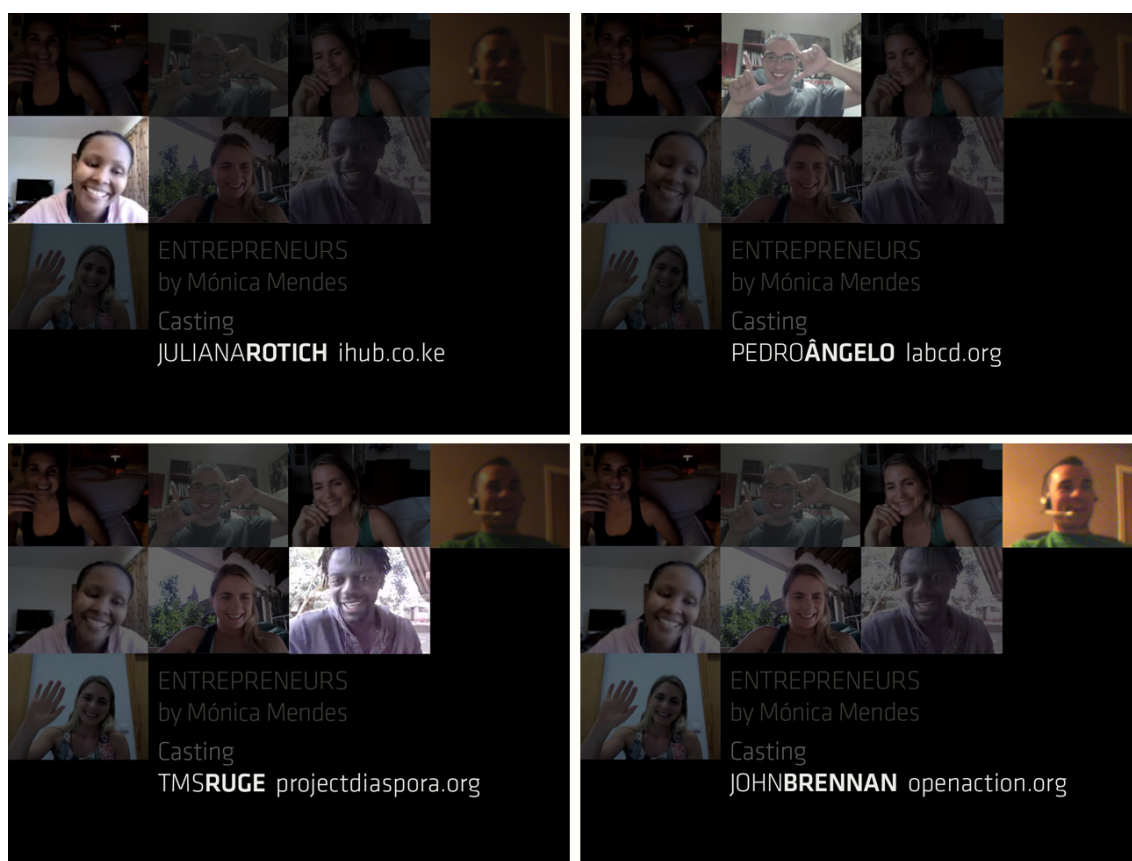
Figure 5.3. Interactive video opening titles presenting the entrepreneurs interviewed and their entrepreneurial projects' URLs.

The entrepreneur's spirit, proving that social entrepreneurship projects are viable without creating NGOs, and opening and optimizing the management of institutional data were the **motivations** that were very relevant in the scope of the ARTiVIS approach. The **influences** that were also significant examples for the ARTiVIS project included the Web 2.0 concepts and the organization structures of open source projects.

The projects were in different **stages**, which helped to realize what distinguished its incubation phase "nowhere near being able to stand on its own" (TR) and growth "I'll keep doing what I'm doing, this work really keeps me excited with its future" possibilities (PA), from its maturity "when you have people that used your software in unexpected ways, so it's become important for other uses that we didn't foresee (JR), or "if they are fully independent and can run the business on their own" (TR).

5.3.2.2 Entrepreneurs' Suggestions

Advice from the entrepreneurs own experience was generously shared to help the ones just starting. The most common words were for not being afraid to fail because "it's OK to put yourself out there and not

to be afraid to even launch", reinforcing that "everything don't have to be perfect, just do it with what you have and learn as you go" (JR). What an entrepreneur needs to have was summarized into "patience" and "passion": "You can have passion and when things don't happen now you're going to be very disappointed, but you have to have the patience to let things develop" (TR). One should also have in mind that "obviously you can be very passionate about it – but before you lay your emotions and jump in, take a step back and survey the scene. Identify your target audience, ask them questions" (JB).

Other important things entrepreneurs starting up should do are getting a co-founder "to have other perspective of someone that has thought on the same idea as you" (JB) and "Invest a lot in your team. You must make sure that you absolutely trust their skills and their work ethic to do something worthwhile" (PA). Moreover, "Never spend a dime you don't need to spend. Because every cent you save is more time you have until you reach that point where you decide to go forward or just give up" (PA). Further suggestions include building a prototype: "It's a lot easier to prove early success if you could show something workable rather than just having powerpoints" (JB).

Then, in between, "always commemorate your victories because those are the little things that keep you motivated. Because having a startup is not all about being energetic and powerful and successful, you are going to spend a lot of time working hard" (PA). And "It's early right now, but I think we'll get there. But we have to keep working, obviously, we just can't sit around and wait for it to happen" (TR).

5.3.2.3 Final Considerations

From these interviews, lessons were given by the entrepreneurs sharing both the diversity of their subjects and work. This section has revealed their common denominators in terms of characteristics, processes, and attitudes. What was then so inspiring from these interviews?

Each project was highlighted through their unique selling points. The input from the entrepreneurs' interviews was really enlightening on several aspects that were already useful for informing the ARTiVIS project development regarding entrepreneurship in the future. The aspects discussed included the entrepreneurial attitude, the impact on communities and their empowerment, the relevant role of open data for that to happen, connections with institutions and with people that can become symbiotic relationships, the philanthropic, for profit and not for profit ways of funding and bootstrapping.

Regarding the interview results and the advice for new entrepreneurs that was gathered, ARTiVIS seems to be in a good path to design for community building. Another conclusion was that for ARTiVIS it was still too early to start an entrepreneurial venture. The time will come to implement the plans for funding and establishment of connections described in the future perspectives section (cf. 6.2).

5.4 Interactive Installations Evaluation and Results Analysis

The interactive installations *B-Wind!*, *Hug@ree*, and *Play with Fire* were designed to bring different perspectives to the ARTiVIS concept. In *B-Wind!* the idea was to trigger the interest to start doing something meaningful, for whatever we would do will have an extended impact and real effect. *Hug@ree* enhanced the physical contact with natural elements to symbolize the closeness to nature. The experience provided with *Play with Fire* would lead participants to reflect on the paradoxes of nature and ultimately become more aware of the consequences.

In the process, different tests were done to evaluate the usability of the interactive installations and to develop further iterations that took into account the feedback collected. The order was maintained according to the installations deployment, and in this way the sequence of the developments is kept in context. As previously summarized in Table 2 (cf. 5.2), the evaluation of the installations included:

» Role play[220] in user experience tests and usability questions in questionnaires while in the process of creation – of which results were used for the following prototype development iterations;

» Wizard of Oz[221] simulations and user tests, allowing for early testing of incomplete prototypes and integration of user feedback into the development process;

» Surveys with participants feedback, with interaction observation directly in place and through recorded videos done during the presentations;

» and the realization of surveys several months later – three to six and ten months after the experience – to help figure out the mid to long term impact of the experience.

This section includes the description of each of the installations evaluation, the presentation of the results obtained through the data collected, and the subsequent analysis that was done in the scope of this research, including an outline for further iterations in the future.

---

220   See section 4.5.3 "Installation Setup and Experience Design" on the implementation chapter.

221   Technique that enables unimplemented or partially implemented technology to be evaluated by using a human to simulate the response of a system » http: / / www.usabilitynet.org / tools / wizard.htm

5.4.1 *B-Wind!* User Experience Tests and Participants Observation

B-Wind! was the first interactive installation experience to be implemented in the scope of ARTiVIS. As such, evaluation focused on usability issues during the development phase, user interaction, and system feedback. This initial approach was very open to experimenting the best options, so observation was the method most used in order to get insights and take notes for future developments.

This section describes the *B-Wind!* test iterations of user interaction and observations done and presents the reflections underlying the proposals for future development.

5.4.1.1 Test Design Realized for the B-Wind! Installation

During the design and prototyping of *B-Wind!* and throughout two iterations of artistic residency, user experience was tested with the collaboration of the *AZ Labs* residency participants, and observation was carried out throughout the development phases to access the system usability.

Then the final implementation of the interactive installation premiered at the *AZ Labs @ O Espaço do Tempo* exhibition[222] where user experience tests were accomplished using a real-time video feed from a surveillance camera, that was also recorded for further observation and analysis.

Figure 5.4. *B-Wind!* role play tests for full body interaction gesture mapping and computer vision software calibration.

---

222   *Audiencia Zero* – Exhibition » http: / / www.oespacodotempo.pt / en / prog.php?idpan=pro_det&recid=578

In *B-Wind!* diverse techniques were applied according to the phase of development and the installation public exhibition. User experience tests and observation were used to gather data in the development and first presentation stages.

1. Role play tests were done during the installation development (a) to help the full body movements mapping, (b) to enable several users simultaneously, and (c) to assess the average time of the experience.
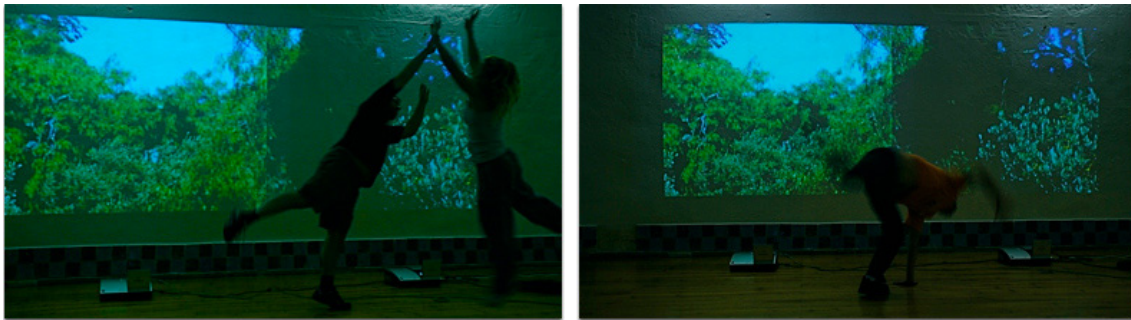
Figure 5.5. *B-Wind!* role play for testing the scale, the display hardware, and the software gesture recognition in the first version prototype.

2. Observation was done (a) with camera and during the software calibration tests at the *AZ Labs* residency in Montemor-o-Novo, and (b) with camera surveillance setup broadcasting and archiving video records of visitors interaction during the *AZ Labs @ O Espaço do Tempo* exhibition in Montemor-o-Novo. The exhibition was recorded during most of the time (except some moments when the server was down), resulting in 80 hours recorded from the live feed before and during the exhibition that were archived for analysis. The exhibition was open for 6 to 7 hours a day and we had contact with the exhibition assistant, so video recording the whole exhibition was made possible. Video segments were then selected as highlights and the links were placed online as outputs of the first exhibition presentation.

Figure 5.6. User experience tests done to assess the visual effects as reaction to user movements.

During the *B-Wind!* development process, the test iterations carried out required setup consisting of (a) computer vision for the software calibration and (b) video surveillance for user observation. In the development of the interactive installation, user experience tests were done with computer vision integrated in the application.

Regarding the video surveillance streaming and archiving, the considered hypothesis were *Darwin Stream Server, GISS* (previously described in 2.4, 2.6 and 4.2.1), and *UStream*. The option selected was *UStream*, considering its live video streaming and recording features, ease of use and the fact that it is for free. The ARTiVIS user was then created, hosting the *B-Wind!* streaming channel that broadcasted the exhibition setup during opening times, while simultaneously recording the video streaming that was later analyzed and presented in the installation website[223].

This setup was inspired by user experience observation methods [Preece11] and in this first implementation in the scope of the ARTiVIS installations the goal was to inform future developments for a more effective interactive experience regarding user motivation to participate and their interaction procedures.

5.4.1.2 B-Wind! to Affect Real Trees in Remote Places? Observation Results

In this section, we present a selection of data obtained from the observation tests and the analysis resulting from the *B-Wind!* preliminary stages. Heuristic evaluation helped the initial design of the system and has already been presented (cf. 4.3).

A total of three iterations of tests were done by *AZ Labs* participants and visitors of the exhibition that experienced the *B-Wind!* interactive installation. The first iteration was performed by the *B-Wind!* team members through movement role play during the first part of the *AZ* residency (cf. figure 5.4). The second was done during the setup of the visual sensor for the movements and the area covered, with the collaboration of members of the *AZ Labs* network (cf. figure 5.5). The third iteration were the tests done by people between 3 and 70 years old, equally distributed in gender, constituted by the visitors in the opening reception (cf. figures 5.7 onwards in this section), at *O Espaço do Tempo*.

---

223   *B-Wind!* interactive installation website » http: / / bwind.artivis.net

Figure 5.7. Images captured by the camera that monitored the *B-Wind!* experience showing screen calibration setup with projectors placed on the ceiling.

This *Audiência Zero* exhibition was composed of projects from the *AZ Labs LCD*, *altLab* and *xDA*. The exhibition was open to the public for ten days from July 12 to 31, 2010, for 6 to 7 hours a day (week days from 6 to 12pm, weekends from 4 to 11pm). The exhibition took place at the *Saudação* convent in Montemor-o-Novo where the two preparatory residencies took place.

Seventy surveillance videos were recorded with a length between ten seconds and three hours each, with a total of around eighty hours of archived video. The *UStream* user stats report a total of 182 total views, which in total viewer hours is equivalent to twelve days. A week after the exhibition, the videos were closed from public observation. The exhibition videos covered the final development and movement tests to the installation setup, followed by the exhibition opening and the next ten days.

During the exhibition period, minor adjustments were done to improve visualization indoors during daytime by adding an extra black curtain beside the projection wall. The outdoor component also needed improvement for visualization of the trees showcased at night, so spotlights were added for out-door lighting.

The following observations report to the videos review and the notes taken regarding the *B-Wind!* exhibition visitors' interaction.
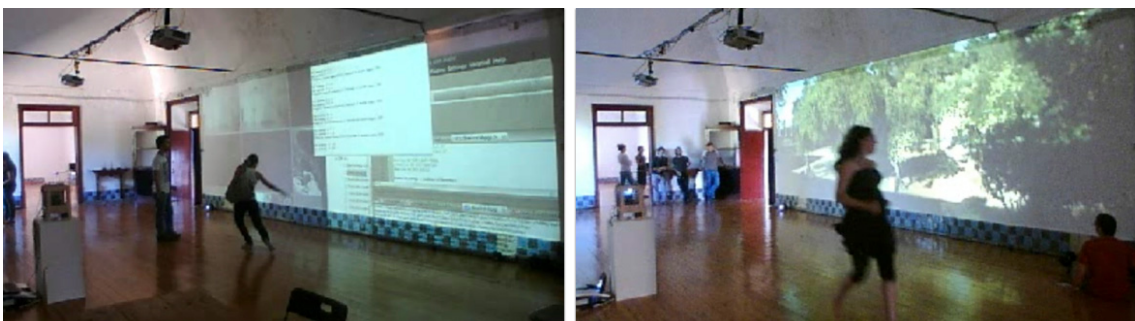
Figure 5.8. Setup of the camera used as motion sensor and user experience tests that preceded the exhibition opening.

A noteworthy attitude to observe was that when a visitor noticed what to do, then called the others and showed the interaction effects, and then observed them interacting.

Figure 5.9. Participant listening to the exhibition guide describing the installation, then interacting, and sharing with other friends.

Several people were passing by and, when they noticed that the projection displayed something moving, they went back and forth to realize what was going on, then they read the caption, interacted more, and went towards the window to see where the camera was. Then they went outside to the courtyard to see the fans on the trees working.

Figure 5.10. Participant observing the *B-Wind!* visual effects, then looking at the caption on the left side, walking towards the camera capturing the courtyard trees, and again interacting in front of the projection.

Sometimes visitors did not notice that the projection on the wall was interactive, so the exhibition guide explained the concept, and then they interacted. The first three images in the following sequence show people passing by without noticing in the first frame, the guide calling their attention, and then their interaction. Situations like this were frequently observed from a distance and discussed with the exhibition guide for better efficiency.

Some visitors showed more interest than others and stayed longer with the guide asking about technical details, getting an extra view of the camera placed on the window facing the castle courtyard, and then paying much more attention to the projection. Then the visitors themselves were pointing to the trees projection having realized that the real-time video was being captured from the courtyard.

Figure 5.11. Sequence showing visitors not noticing the projection, then the guide intervening to explain, followed by participants' interaction while other elements of the group wait to continue the visit.

Typical user interaction sequences observed showed that visitors started by looking at the interactive piece in front of *B-Wind!* when entering to the room, turning to the other room while aided by the exhibition guide to experience *B-Wind!*, walking to visualize the effect, reading the caption and looking at the camera – then back to the projection, now aware of the real-time video and the effects. When passing again, they walked faster and feeling the wind effect of the speed, looked at the projection to see the visual result, finally starting to engage with the installation during a short while.

The entire experience lasted one to five minutes. In general, participants were not interacting as playfully as planned – they did not appear to be immersed enough in the experience to interact with the intended freedom and curiosity.

Children were more engaged, they liked to run and observe the results of their actions on the projection– not to mention the fact that motivation was enhanced by the possibility of running in an indoor space of a gallery!

Figure 5.12. Child interacting and then taking others to run from side to side to generate more impressive effects.

It was a rewarding outcome to find parents taking their children to experience *B-Wind!* and encourage them to run fast to achieve the feel of wind.

Figure 5.13. Adult and child visitors interacting by exploring the space and speed.

Only some of the recordings included sound – the audio component is informative but the unstable weak signal connection made it necessary to turn it off.

Another part that was tried and even recorded, was the exhibition guide presentation – the digital invitation by the guide that was waiting for the visitors in the exhibition. This approach was tested near the end of this exhibition, but in future iterations it should be implemented from the start as a welcome message and an invitation for a guided tour.

Figure 5.14. Presentation of the exhibition guide to be seen on the exhibition video streaming channel as the first contact with the installation: "Hello, my name is Francisco and I will be your guide in this exhibition, so come and enjoy *B-Wind!*"

As the aim of this research evaluation was to test the interactive installation regarding visitors interaction, the data collected and analyzed was used to develop a more usable system for the following stages. The factors considered regarding the process and design of the application were the user experience and the gameplay and how engaging and immersive the experience was. The analysis of the participants feedback and of the observation results done in this phase suggest that, generally:

> the information provided to the participants was not enough, so participants were not interacting with full body movements – the help of the exhibition guide was decisive;
> there were physical constraints in the installation space – the projector luminance was reasonably good, but too much light in the room was affecting the required realistic approach of the look of a forest on the wall, influencing the participants engagement;
> the visual effects on the projection were not as much noticeable as desired, so the application software still needs some adjustments;
> captions should be placed outdoors at the courtyard trees of the exhibition site, close to the fans explaining why and how they were activated and inviting people to participate by visiting the exhibition inside the building.

More specifically, the reasons why people have not noticed or paid attention to the projection were:

» the light in the room that weakened the projection colors;

» the installation location in a place where people were usually passing by to the other rooms on their way to their regular yoga or dance classes;

» the distance constraints so that the sensors detect and send signals affected the visual interface reaction and corresponding sound effects;

» the other two pieces in the same room, that were immediately more visible and audible than the *B-Wind!* projection on the rear wall.

The low profile location of the installation also had to do with the place of the caption beside the entry door away from visual sight (people had to turn back to see it). Too much light in the room was also showing people's shadows beyond the projection itself. This was caused by the camera window in front of the projection, and the window in the first plan beside the projection.

Figure 5.15. Participant interacting by exploring different movements and observing the corresponding effects on the projection. The interference of the sunlight in the room can clearly be noticed through the light coming from the window on the right side.

The scale of the installation was now appropriate. The possibility of using two projectors and the whole extension of the largest room was perfectly adequate regarding the installation projection scale. Moreover, using high luminance projectors hanging at a distance from the ceiling, that allowed a projection from the ground to the top, was better than the short throw projectors that were experimented before. These required a distance from the ground which gave the feeling of interacting in front of a window.

Figure 5.16. Interface changes as a result of the participants interaction. Although noticeable at a distance through light changes in the interface, visual effects were still subtle in this public exhibition space.

5.4.1.3 B-Wind! Evaluation Conclusions and Future Work

Lessons learned from the *B-Wind!* evaluation observation process are herein reported into three main topics regarding the presentation of the installation in exhibitions:

1. Observation setup and methodology » Organizing the recorded videos, name and catalog them, and take notes on a daily basis is much more efficient than leaving it for later work.

2. Installation layout » Requirements must be clearly stated and applied. The scale is important, while ensuring appropriate light conditions are mandatory, as well as the distance from other pieces, and clear boundaries where the interaction area is. The caption information and its placement – indoors and outdoors – as well as the sound isolation, should also be optimized.

3. Interaction behavior » The user's attention was not immediate, and the reaction of the visual effect on the interface to the gestures was too slow. The installation needs to be improved in terms of responsiveness. Further work must be done on improving the wind visual effects on the projection, and the sound expressiveness – especially the association with the diverse types of movements. The fans power and responsiveness also have to be enhanced in order to increase the visuals impact.

Additionally, in the next iteration of the *B-Wind!* evaluation, the questionnaires that were later done in the scope of *Play with Fire* (cf. 5.4.3) evaluation will be adapted for the *B-Wind!* installation in order to correlate the experience dimensions with the overall goal of environmental awareness.

5.4.2 *Hug@ree* User Experience, Observation and Questionnaires

The *Hug@ree* installation has been designed to be an artistic experience to create a bond between human beings and the natural environment (cf. 4.4). The evaluation applied throughout the development and presentation stages focused on whether this physical interaction with the natural environment had been effective regarding sustainability awareness.

The realization of surveys applied to the ARTiVIS installations was very demanding in terms of its application in a subjective artistic context instead of a conventional controlled test in the lab. Its application, in the scope of the exhibitions, brought evidence on characteristics related with the context that were improved through diverse iterations. This section describes the evaluation process and outcomes of the Hug@ree experience in different contexts and presents the analysis of the results.

5.4.2.1 Design of the Hug@ree Evaluation

After the conception, design and prototyping of *Hug@ree* – throughout the iterations of the *AZ Sprint*, in the laboratory, and in the setup for the *Pop Up City* exhibition – first tests were carried out through a survey done by the exhibition visitors, where the interactive installation premiered. The questionnaire was further adjusted and then applied at the Summer demonstration in the rural village Maçal do Chão – right after the experience and also three to six months later. Additionally, ten months after the presentation in the scope of the *Sci|Art* Summer School at UCLA, participants were asked to answer the survey online for assessment of mid to long term effects.

The *Hug@ree* interactive experience required the implementation of techniques that were progressively applied and adapted according to the stage of development and presentation of the installation:

Figure 5.17. Testing the capacitive sensors for the first time during *AZ Sprint* in Maçal do Chão.

1. Role-play tests performed by the development team posing as users to assess different functional aspects of the installation. These user experience tests were applied during the installation development at *AZ Sprint* and *Pop Up* setup for: (a) assessment and calibration of the capacitor sensors, (b) the IP camera network creation and coverage, (c) the wireless radio communication between the tree and the projection at the installation, (d) definition of the scale and interaction with the projection, and (e) calibration of the projection and hugs videoclip colors, sizes and proportions.

Figure 5.18. *Hug@ree* at *Pop Up*: testing the capacitive sensors on the tree outdoors, the IP camera at the window inside the installation room, the XBee communication, and the video loop trigger on the screen.

2. Task analysis was performed to acknowledge how users embraced the tree with their different heights and weights, the individual attitude and collective initiatives, and the type of body contact (e.g., full body vs. touch with the hands). Motivated also by this need, we established an international connection with *101010 350.org* in a phase when the installation was not finished yet, so user and task analysis was done then. A Call for Participation in *Hug@ree* was launched at *10/10/10 Global Work Party*[224]. People were asked

---

[224] *Hug@ree* at *350.org* » http: / / www.350.org / en / hugree | ARTiVIS call and report page » http: / / hugatree.artivis.net / hugatree_101010.html

to participate in this call by hugging a real tree and sending a 5 to 10 seconds video or a photo to the *Hug@ree* email. This action on 10/10/10 resulted in their registration in the ARTiVIS virtual world and included them at the *Hug@ree* installation exhibition at *Pop Up Lisbon*. *Hug@ree* symbolized the bond between urban beings and the forest to express cities' new values regarding sustainability.
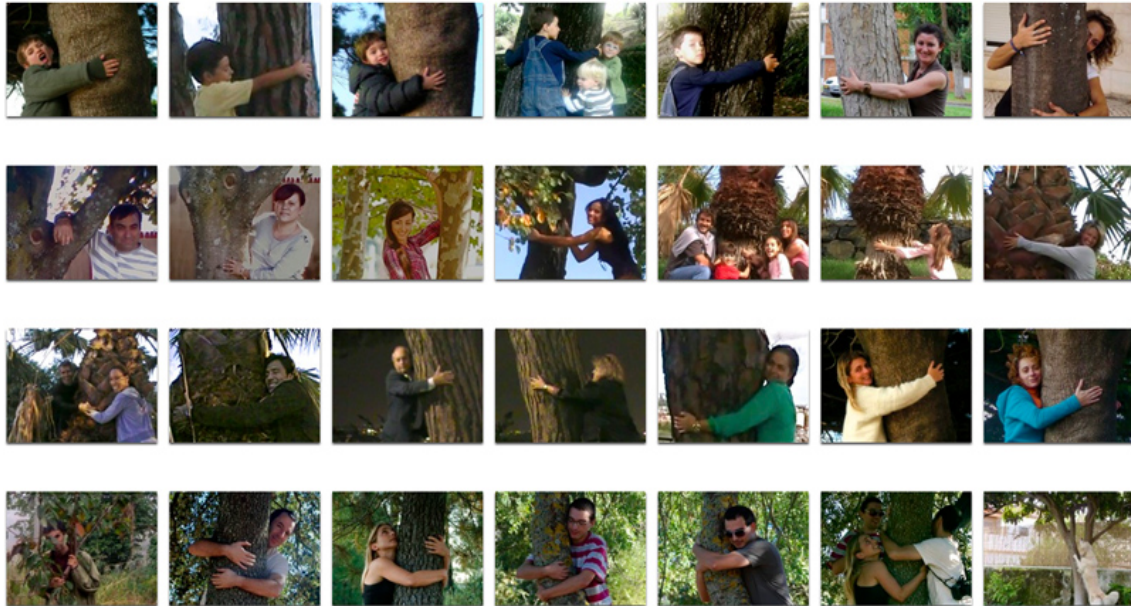
Figure 5.19. Gallery of the 26 participants that hugged a tree for task analysis in the scope of the *10 / 10 / 10 Global Work Party* on 2012.10.10 and sent to the *Hug@ree* call at *350.org* (the figure includes 5 previous user test photos from the *AZ Sprint* in the middle of bottom row).

The initiative succeeded, thanks to the online participants who joined the cause and sent their photos, and to the ones who kindly complied to the request of hugging a tree. The resources were used for testing and the contributors were the first to populate the world of *Hug@ree* at the *Pop Hug City Lisbon 2010* exhibition, where the *Hug@ree* interactive installation premiered.

3. The Wizard of Oz technique [Preece11, Hannington12] was applied in the presentation of *Hug@ree* premiere at *Pop Up* exhibition. As the interference of surrounding equipment affected the wireless communication, to send the signal from the sensors outdoors to the system indoors in a different way than the tests previously done, the Wizard of Oz technique was applied to enable the visitors user experience as predicted without breaking the interaction flow.

4. Current archive includes the timelapses of each of the *Hug@ree* presentations that were possible due to the feature included in the code to create a screenshot every 60 seconds. This sort of feature was already described in more detail in the "Combining Art and HCI" introduction (cf. 5.1). This proved to be very rich data to analyze the experience, which is also a useful feature for the other ARTiVIS installa-

tions. Observation was done during the exhibitions through the timelapses of recorded screenshots as surveillance data:

(a) in the first days of exhibition, the information provided to the participants was not enough for full awareness on the experience interaction, so outdoor participants were not aware of the video capture and recording of the interactive experience;

(b) participants needed feedback when they hugged the tree to confirm whether the hug had been "effective" (recorded);

(c) the registration setup was not yet ready in the first public presentations, so users could not get a reference for future visualization online. Data input was implemented from the presentation at Maçal do Chão in Summer.

5. Evaluations were done using questionnaires applied in four different iterations:

(a) First tests during *Pop Up* public exhibition in Lisbon (version 1 – longer) in 2010, December 1 and 10 ;

(b) Second tests at Maçal do Chão, Guarda in 2011, August 23 to 25, with the registration process feature added in the installation and the questionnaire revised (version 2);

(c) Third iteration of tests for the second time at Maçal do Chão three to six months after the *Hug@ree* experience *Summer* (from December to April) to test middle to long term effectiveness on environmental awareness;

(d) Fourth iteration of tests done online to *Sci|Art* participants at UCLA, Los Angeles, in June 2011, ten months after presenting the interactive installation (April 2012), in order to test long term memory effectiveness.

In the case of (b) and (c), there were group dynamics that were motivating for the participants to answer the questionnaires.

The intersection of methods applied throughout the development and presentation of the *Hug@ree* installation contributed to a better user experience, and to make the concept and the aims of the installation more clear and effective. In the case of (b) and (c), there were group dynamics that were motivating the participants to answer the questionnaires.

QUESTIONNAIRE STRUCTURE

The first version of the questionnaires was applied during the *Pop Up* exhibition (a) in December 1 and 10, 2010. Although an effort was made to create a questionnaire of only two pages in one sheet, partici-

pants took around 15 to 30 minutes to answer so many questions in a short type size in 2 pages, so this version proved to be too big for a collective exhibition.
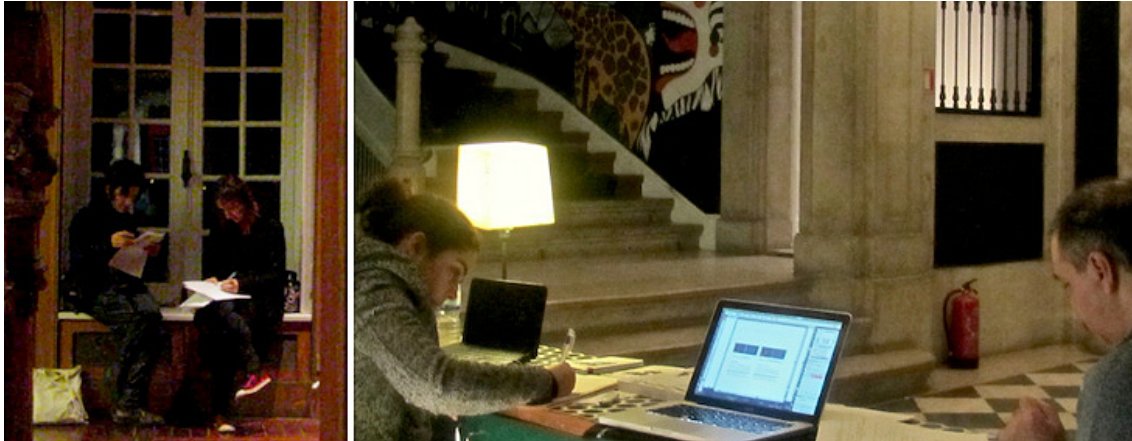
Figure 5.20. Participants answering the *Hug@ree* questionnaires at *Pop Up Lisboa*, inside the exhibition venue at Santa Catarina palace.

Since this was the first time that *Hug@ree* was being publicly presented, the questionnaire included a usability group of questions focusing on the functionality and understandability of the system.

Then a second version of tests (b) was adapted from the first one, removing usability questions that had already been made clear in the development and first iteration questions. The questionnaire was shortened in quantitative questions and time to answer, and in the number of multiple choice and answers using a Lickert scale. Two new initial questions were inspired by the Repertory Grid Technique (RGT) [Fallman05] where participants create their own constructs; to keep it simple, the other components of creating the antonyms and discussing the values of each pair of words were not included. Due to the clarification requests by the participants while answering he first test version, the language was simplified. This revised shorter version was applied with adults and, given the high number of children expected, with children too (in this case, with specific adaptations in order to be fully understood by children between 6 and 12 years old).

In the third iteration of tests (c) using version 2 of the questionnaire three to six months after the *Hug@ree* experience *Summer*, the questions were updated in order to test middle term memory impact of what participants recalled, and long term effectiveness on environmental awareness through what they remembered from the experience.

The fourth iteration of tests was done ten months after presenting the interactive installation during *Sci|Art* at UCLA (d) and it was the first *Hug@ree* questionnaire version that was totally done online by the students and faculty.

This online version was created from the second version of tests that was then revised and, preceded by authorization by the *Sci|Art Summer School* organizers, emails were sent to all the *Sci|Art* participants and tutors. The request was also published in the *Sci|Art* social network online[225].

The *Hug@ree* questionnaire forms of the three versions are available in Appendix C.1.

5.4.2.2 Hugging Trees for Real? Evaluation Results

In this section, we present the data resulting from this hybrid evaluation combining diverse methods. A total of 83 surveys were filled by participants that answered the questionnaire after experiencing the Hug@ree interactive installation. The following table summarizes the demographic data collected during the four iterations of the *Hug@ree* questionnaires.

HUG@REE DEMOGRAPHICS Tests Iteration	Installation Place	Number of Participants	Age Range	Gender F M	Familiarity Technology	Literacy [‰] N S H U P
POP UP CITY (a)	Lisbon	19	22-58	12F 7M	84 %	– – 21 47 26
SUMMER (b)	Maçal do Chão	33	6-83	18F 15M	79 %	3 36 42 12 3
SUMMER 3 to 6 months later (c)	Maçal do Chão	20	6-68	8F 12M	75 %	– 45 45 10 –
*SCI	ART* UCLA 10 months later (d)	Los Angeles	11	16-52	7F 4M	91 %	– – – 73 2
TOTAL		**83**	**6-83**	**45F 38M**	**80%**	**1 25 42 19 10**

Table 3. Demographic data of the participants of the four *Hug@ree* evaluation iterations. [F=Female, M=Male | N=No Schooling, S=Primary School, H=High School, U=University, P=Post-Graduate].

WORD CLOUDS FOR CONTENT ANALYSIS

Visualizing data in the form of word clouds is based on the number of occurrences of each word, that determines the size of the word. Word clouds can help us understand the quality of the experience, by

Figure 5.21. *Hug@ree* questionnaires at Maçal do Chão, outdoors under the "interactive" tree, helping older people to read / write the answers.

replacing quantitative content analysis with visual pattern analysis. These word clouds result from a construct elicitation inspired by RGT (Repertory Grid Technique). The following word cloud displays the results visualization of the introductory questions in the *Hug@ree* questionnaire "What are the first 3 words that come to your mind to describe Hug@ree in terms of: the experience? and the installation?"

1. Immediately after the experience at (b) Maçal do Chão, these are the constructs elicited:

Figure 5.22. The first three words with which participants in the rural environment described *Hug@ree* right after the experience.

An overview of the first impressions of the participants through their answers shows us that "Affection" and "Good" were the most frequent terms, followed by "Love", and then "Beautiful", "Happy", "Pride", and "Interesting".

2. With these samples comparing mid-long term constructs elicited at rural (c) Maçal do Chão three to six months later and urban (d) *Sci|Art* UCLA ten months later, we intend to infer long term effects:

Figure 5.24. Words used to describe *Hug@ree* in rural environment, mid-long term – Maçal do Chão, three to six months after the experience.

Figure 5.23. Words used to describe *Hug@ree* in urban environment, mid-long term – *Sci | Art* at UCLA, ten months after the experience.

We noticed that there is retention of the values of the experience along the time. From the analysis of the results, there are common concepts and procedures that were effectively internalized.

In the rural environment though, we notice that the feelings mentioned reveal a deeper connection with nature – through "Happiness", "Love", "Warmth" and "Joy". A more superficial although positive relationship with nature is reported from the urban environment results, that highlight "Fun", "Cool" and "Cute", along with the recognition of the approach as "Innovative" and "Different".

Over time, the memories that last seem to be less detailed in what relates to actions. The results here reflect the way we tend to remember feelings better than facts and we reconstruct old memories the way we think they happened rather than like they actually happened[226].

3. Additionally, comparing the test (a) when the installation was experienced (b) and three to six months later in the same rural environment (c), we verify that the immediate evaluation and feelings of "Good" and "Affection" turned into a broader feeling of "Happiness". The interpretation of such indications as a satisfactory result of the goal of creating a bond between human beings and nature is reinforced by the second most frequent expression that months later confirms the action that led to that feeling, "Hugged the tree".

4. Overall, the combination of all the reports highlights emotions and affections:

---

226   Pettinelli, Mark (2012) "The Psychology Of Emotions, Feelings and Thoughts", in *Connections* » http: / / cnx.org / content / m14358 / latest /

Figure 5.25. Word cloud aggregating the first impressions about the experience and the installation obtained from the *Hug@ree* questionnaire done at (b) Maçal do Chão in *Summer*, (c) Maçal do Chão three to six months later, and (d) *Sci | Art* at UCLA ten months later.

These confirm both the hypothesis and goals of the experience provided through the *Hug@ree* installation: sensuality by the physical contact with nature that creates a bond with the hugged tree. Expressions such as "No longer remember" are present however, although with a smaller representation size.

Analysis of Further Dimensions from Participants Results

In this section, we propose to analyze further dimensions with the same data gathered in different contexts and times, mainly from the questionnaire results from *Pop Up* in Lisbon (a), *Summer* in Maçal do Chão (b), Maçal do Chão three to six months later (c), and *Sci/Art* at UCLA ten months later (d). In this scope, we also compare the immediate experience results between an urban population (a) with the people who live in rural areas closer to nature (b), and explore the evolution of participants feelings over time after the interactive experience by comparing test iterations (b) and (c).

Although questionnaire (a) had a different layout and some different questions than the other tests, there is enough overlap that allows us to compare it to other tests. In this analysis we refer to the structure of the other questionnaires (b, c, d) and make the connection to (a) where appropriate.

The first question group aimed to assess participants' emotional engagement, overall satisfaction with the installation and their motivation for a closer contact with nature. Responses regarding engagement and satisfaction were mostly positive with little difference between urban and rural contexts or between

immediate or delayed recall of the experience. Worthy of note is the fact that participants from a rural area, regarding their motivation for a closer contact with nature six months after the experience, presented a more markedly neutral position.

Question group II was concerned with how the participants had interacted with one of the system's main features, the direct manipulation of the videoclip on the touchscreen inside the installation space. Most participants in all the test contexts mentioned that they had interacted with their own videoclip, (except for the *Sci|Art* participants due to constraints in the way the system was assembled at that location). However, very few participants mentioned that they had also interacted with the rest of the available videoclips.

The single question in group III was kept from the initial usability assessment and was aimed at assessing if the goal of the installation was explicit, with mostly positive results.

Finally, questions in group IV were posed in order to measure the cognitive and affective effects of the interactive experience and whether it had an impact leading to a change in personal attitude towards trees and the forest. The first question in this group asked how did participants look at trees after the experience. Most the results in all contexts showed an almost even split between the respondents, with around half saying that they would view trees in a different way. A result to consider came from the delayed memory test done in (c) where most participants said that they would not view trees in a different way. When answering the questionnaire some participants mentioned that this was due to the fact that they already had a very close relationship with nature while others mentioned that their hug did not change anything. However, when asked if the experience had brought them closer to nature, most participants in all contexts answered yes, both validating the effect of the experience and indicating that perhaps the first question was a bit ambiguous in not taking into account participants prior relationship with trees.

Regarding further engagement with the *Hug@ree* experience, most participants in all contexts said they would return to the installation at a later time and also that they would like to further interact with the online community.

When asked whether they would like to see this experience applied in different contexts, the majority of respondents said yes, providing suggestions like in schools, urban and natural parks, public landmarks, urban centers and even more distant locations like other countries or the desert.

The last set of questions in this group was concerned with the tree hugging behavior. When asked whether they had hugged a tree before this experience, roughly half of the participants in all contexts said yes. When asked if after the experience they planned on hugging other trees (or had hugged in the

case of the retrospective studies) most participants said yes in all test contexts except for the *Sci|Art* exhibition, where only about half the participants had hugged trees after the experience.

The current analysis resulting from the quantitative data in the *Hug@ree* questionnaires is complemented with the following sub-section, where the answers to the specifications, comments and suggestions are analyzed.

PARTICIPANTS COMMENTS AND SUGGESTIONS

In this sub-section we propose to bring qualitative clarification through participants' voice on the tests open questions regarding their comments and suggestions.

The themes that the *Hug@ree* experience suggested to the participants were generally emotional and connected to nature and its relevance. Additionally, their comments encompassed environmental activism, human influence on the natural environment, and feelings of proximity and appreciation for nature. Comments like these confirm the achievement of the installation aims: "Art, especially when it has an interactive nature, is a great vehicle to draw attention and raise awareness", "It's a beautiful experience to show people how to treat the environment", "Nonverbal communication with nature", "The tree as source of energy", "to love and preserve nature, to fight against destruction!", "The combination between art and science, the exploration of nature", "Living with Nature, not as competition but in symbiosis".

What participants considered "the best" and "the worst" of the *Hug@ree* installation was only part of the second version of the tests, so the answers report to (c) and (d).

Opinions on "the best" focused on the experience of contact with the tree, together with the use of technology in environmental causes and the simplicity of the setup. Using some of their own words, the best was "the technology's potential to mediate between humans and living nature", "the camera capturing everything", "the fun to do it with friends and see the reactions of people passing by", "trying something new that I had never heard about before", "closer relationship with nature", and also "the feeling you get after hugging the tree".

On "the worst" side, comments were related with usability factors that were not stable at the time of the experience: "video was glitchy", "the installation not fully working", "the tree was too large to hug". Two of the participants mentioned the worst as "not enough advertisement for pedestrians to know that they should hug the tree", and "the explanation on the tree is so small to be noticed", which in fact in that research context was considered non essential, but in future public exhibitions will be safeguarded. Any-

way, not all the users pointed out the worst factors, but this one was disappointed: "it seemed insignificant and not very impactful", and typical answers from the children were "I was a little shy".

Participants agreed and left further opinions in what way(s) *Hug@ree* could promote attitude change, including stimulating creativity and environmental awareness through reflection: "Greater sensitivity and respect for nature", "It arouses curiosity", "reflection on the importance of trees in the context of quality of life on Earth", "People need to start taking better care of the trees and forests and stop cutting them down", "More attention, more care, better protection and incentive for replanting – I would give them pet trees", "This could lead to a reduction of accidents with nature", "The fun of hugging a tree makes the experience happier and so people will want to do it again", "If people realize their emotional attachment to nature, they could use that to help protect the natural resources of the planet".

Some participants saw *Hug@ree* as "a reminder" to raise awareness on the need to preserve nature, others said they would repeat the experiment of the tree that was "taught" to them. Frequent enthusiastic comments were "very good", "very interesting experience", and even "I loved hugging the tree".

Further comments reported to environmental awareness: "It's good to draw attention to remind us to respect and to give dignity to the environment", "The notion of perennial tree, in a scale of many years", "The theme is conducive to attitude change towards nature conservation", and "Hurray to new technologies towards the environment!". We also collected suggestions to add more sensory experiences and further initiatives in nature. Specifically, performing the experiment in rural areas and with different age groups have been already done, while "More feedback from the experience"– for instance, through audio, and "I wish there were more actions of this kind on the Internet to reach more people" – are on the roadmap (cf. 4.4.7) through the implementation of audio feedback and the virtual hug experience.

5.4.2.3 Hug@ree Evaluation Conclusions and Future Work

Both presentations were completed in different stages of development, so were the questionnaires regarding the new features and diverse contexts. Although this evolution does not allow to do a direct comparison on the different stages of the tests, it was extremely useful for the evolution of the *Hug@ree* installation and of the methods to gather and analyze the participants feedback.

On the usability point of view, the different tests in the diverse phases were especially useful to develop further iterations of the installation.

On the social impact perspective, the awareness answers were in general consistent in its formulation and also on the perspectives. In a more detailed analysis, the diverse iterations allowed to create better

methods and terms for questioning in a more neutral way, and we can also observe that the questions became more clear with less ambiguities; we can also correlate the participants increase of confidence in the answers on the environmental awareness issues and also higher levels of success.

From the observation of participants, we realized their will to participate, and what in other contexts would seem more awkward, in artistic context people were willing to participate to become part. Moreover, a sustainability context also fosters participation. In the questionnaires, when asked about if they ever hugged a tree, 42 % participants answered never and 58% had done it before. Then, when asked if they would do it again, 76% checked yes. The reasons were diverse, ranging from "willing to help", to "I have always done it", and even a case of "I am going to continue to go up on the trees, so I am surely going to continue hugging the trees". This was clearly an answer from when tests were done in the rural environment. In the next day, another participant with the same age and sex after confirming that she had never hugged a tree before, expressed the following when asked about whether she would hug a tree again: "Yes, I would - because it will help the research. "Now if it weren't for work", she says "If I just came here and suddenly hugged the tree, people would say 'Look at that crazy woman!'". On the whole, in fact, while in the hug question most of the people had never done it before, when asked about whether they would do it again, the huge majority of 90% answered yes.

After the current results analysis, we will review the long-term test not mentioning the names of the diverse components of the installation, so that the participants themselves recall what they memorized from the experience.

Future work suggestions regarding the *Hug@ree* installation developments and new features are described in section 4.4.7.

5.4.3 *Play with Fire* User Experience Tests, Observation and Questionnaires

Play with Fire has been designed to be an artistic experience that explores ambiguity and cognitive dissonance effects as procedural rhetoric to effect attitude change (as previously described in section 4.5). Regarding the evaluation, the main focus was on whether this ambiguity was perceived by the users, and in what ways it is effective. This subjective goal was very challenging to measure from an interactive art perspective.

Complementarily, other dimensions were evaluated to ascertain their importance on the measured effects. Factors like the knowledge of the dynamics of fires, the emotional engagement, the aesthetic enjoyment through artistic exploration, the experience of play, system usability – all concurred to evaluate

the environmental awareness goal. Moreover, opportunity was given for participants' comments and suggestions for further iterations of the *Play with Fire* experience. This section describes the evaluation of *Play with Fire* in four different contexts and presents the corresponding results and analysis.

5.4.3.1 Design of the Play with Fire Evaluation

In the scope of the larger ARTiVIS project, the initial concept was informed by interviews with local the population from a small village in the North of Portugal to validate the research topic of forest fire awareness (cf. 5.3.1).

After the conception, design and prototyping of Play with Fire in the lab and throughout two iterations of the *AZ Labs* artistic residency, pilot tests were carried out through a survey done with the *AZ Labs* showcase participants. Then, the final implementation of the interactive installation premiered at the *Creative Algorithms* exhibition where redesigned tests were done in the form of a questionnaire exploring the six dimensions that are described later in this chapter. This questionnaire was also applied later at the *Pop Up* exhibition in the scope of *Guimarães 2012 European Capital of Culture* and at a demonstration in the rural context of the small village Maçal do Chão.

The Process and the methods Applied in the Diverse Stages and Venues

The *Play with Fire* evaluation process implemented and adapted several techniques, applied according to the installation development stage and presentation. Through a refinement of the methods developed for the previous installations, a more complete and broader image of the phenomena was sought.

1. Role play tests were done during the installation development process (a) to help the full body movements mapping, (b) to enable several users simultaneously, and (c) to assess the average time of the experience.

Figure 5.26. *Play with Fire* role play tests performed during the development at AZ Labs residency: starting the fire, growing, concentrating, moving, and extinguishing it.

Figure 5.27. *Play with Fire* exhibition at *Pop Up*: the action and excitement of playing with fire, and the mashup, the score and the user scanning the QR code to access the web mobile application.

2. Observation was done (a) with camera and while guiding students groups during the exhibition in Montemor-o-Novo, (b) with camera and during the tests at *AZ Labs* showcase in Guimarães, and (c) with camera and visitors interaction at the *Creative Algorithms* exhibition, Knowledge Pavilion, in Lisbon.

3. Questionnaires were done in two versions, that were applied in four venues.

(a) First pilot tests during *AZ Labs* showcase, in Guimarães, in December 2011. The questionnaires were done, together with the mentioned video recording and users observation. Here we gathered feedback from experienced participants with backgrounds in user interaction and in marketing. The introductory and final questions of these pilot tests were based on the construct elaboration phase of the Repertory Grid Technique (RGT) and were kept in further test iterations.

(b) The second set of tests was done during the installation premiere at *Creative Algorithms* exhibition, Knowledge Pavilion in Lisbon, in February 2012. The questionnaires were answered by the exhibition visitors consisting of families with small children, students in school visits, and scientists, and submitted online by the Multimedia Arts degree students that visited the exhibition as a group. A set of 30 questions assessed the various experience dimensions. The introductory and final questions based in the RGT remain from the previous version.

(c) The same version of the questionnaire was applied during the *Pop Up* exhibition in the scope of *Guimarães 2012 European Capital of Culture* that took place at Guimarães market stores, in March 2012. Regular exhibition visitors and also a broad range of people that were passing by experienced the installation.

(d) To test the participants reactions in a rural environment, *Play with Fire* was also presented at the community hall of Maçal do Chão, a small village of Guarda district, in April 2012. The questionnaires were done in this different environment that was set up to test *Play with Fire* with a rural population.

Along the *Play with Fire* tests iterations two questionnaires were designed. These *Play with Fire* questionnaire forms are available in Appendix C.2.

The first version was used as a pilot test, consisting of a set of open questions at the beginning, a body of short questions about the experience and an optional section for further comments or suggestions. This model followed the structure and the focus of the first set of ARTiVIS questionnaires done with the interactive installation *Hug@ree* which are described in the previous section (cf. 5.4.2). As both installations were based in real-time video and the overall aim in both was environmental awareness, the questionnaire was initially adapted without many modifications to be applied in the *Play with Fire* case too. This pilot test was done at *AZ Labs* showcase while *Play with Fire* was in the prototyping phase. In this version, more open questions and usability related issues were addressed. The questions were distributed under the following themes: general appreciation, environment, usability, interaction and subjective experience, results, comments and suggestions. This set was more focused on usability issues and comments in order to contribute for future developments. Some of the feedback was really sharp and adequate and was effectively used for future development.

In the next version of the tests the first two questions were inspired by the Repertory Grid Technique (RGT) to discover the users' vocabulary and help describe the subjective installation experience (these dimensions were not graded as in RGT, so this data is qualitative). The core of the test consisted of a set of 30 assertions to be classified by the users through a Lickert scale. These assertions represent the participants attitude toward six dimensions of the experience, with five questions for each dimension, that were randomly ordered before being presented.

This setup was inspired by factor analysis [Darlington04] and the idea was to find out which dimensions of the experience contribute more towards an environmental awareness outcome.

5.4.3.2 Playing with Fire for Sustainability? Evaluation Results from Data Collected and Analyzed

In this section, we present the data obtained from the tests done through this hybrid evaluation combining diverse methods. Complementarily, we analyze and draw reflections from the results.

A total of 69 tests were done by participants that answered to the questionnaire after experiencing the *Play with Fire* interactive installation. The following table summarizes the demographic data collected during the four iterations of the *Play with Fire* questionnaires.

PLAY WITH FIRE DEMOGRAPHICS Tests iteration	Installation Place	Number of Participants	Age Range	Gender F	M	Familiarity Technology	Literacy [%] N	S	H	U	P
AZ LABS SHOWCASE (a)	Guimarães	13	32-44	4F	9M	85 %	–	–	15	38	38
CREATIVE ALGORITHMS (b)	Lisbon	34	10-61	20F	14M	88 %	–	6	41	32	18
POP UP (c)	Guimarães	7	29-42	2F	5M	86 %	–	–	–	71	29
DEMONSTRATION (d)	Maçal do Chão	15	9-53	5F	10M	60 %	–	47	47	7	–
TOTAL		**69**	**9-61**	**31F**	**38M**	**80%**					

Table 4. Demographic data of the participants of the four *Play with Fire* evaluation iterations. [F=Female, M=Male | N=No Schooling, S=Primary School, H=High School, U=University, P=Post-Graduate].

WORD CLOUDS FOR CONTENT ANALYSIS

Word clouds have already been introduced in the previous interactive installation evaluation (cf. 5.4.2). The following word cloud displays the results visualization of the introductory questions inspired by the RGT method: "What are the first 3 words that come to your mind to describe: (1) the experience? And (2) the installation?".

An overview of the first impressions of the participants through their answers shows us that "Awareness" and "Educational" were the 5th and 6th more frequent words, respectively, after "Interesting", "Interactive", "Fun" and "Fire".

Figure 5.28. Word cloud aggregating the first impressions of the *Play with Fire* questionnaire done at (a) *AZ Labs*, (b) *Creative Algorithms*, (c) *Pop Up*, and (d) Maçal do Chão.

The word clouds representing the first set of tests when the prototype was in development (a) and when presented after finished (b, c, d) display considerable differences. While in the first iteration (a), the main words are "Nature", "Interesting" and "Fun", in (b, c, d) "Interesting", "Interactive" and "Fire" are the highlighted ones.

Furthermore, by confronting the four different contexts first impressions, we notice that all of them have in common the word "Interesting" as the most frequent word. More expressive, though, is the fact that the following three main words are distinct in each of the cases: in (a) "Nature", "Fun" and "Educa-tional", in (b) "Interactive", "Awareness" and "Fire", in (c) "Playful", and in (d) "Cool", "New" and "Fun".

Comparatively, the different contexts where the tests were done reflect common interests and regularity that unify the social differences of these diverse local cultures.

Figure 5.29. Word clouds of the first impressions of the *Play with Fire experience* comparing the tests iterations: (a) *AZ Labs* pilot test up left, (b) *Creative Algorithms* exhibition in Lisbon up right, (c) *Pop Up* exhibition in Guimarães bottom left, and (d) rural village demonstration in Maçal do Chão bottom right. The relative proportion of the characters in each of the word clouds also gives us a comparative notion of the quantity of participants in each of the venues.

Both urban and rural contexts get to the same results in terms of environmental awareness, through different processes and interpretations of the *Play with Fire* experience. On the whole, the overall results of the word clouds convey the conclusion that *Play with Fire* meets the goals of the research. However, when we compare the word clouds we still get a surprising range of rich commonalities and discrepancies that make it engaging.

Analysis of the Experience Dimensions

With the goal of this research being the subjective and broad issue of environmental awareness, the most part of the factors analyzed concurrently reported to that concern. Complementarily, other factors were considered, whether related to the process and design of the application, or to the user experience and the gameplay and immersiveness of the experience. When combined, some of the questions gained an ambiguity that was left untouched. The broad range of answers in some cases are an evidence of that ambiguity and of the multiplicity of possible experiences in itself.

Preliminary Results

In this preliminary study, the result of the tests of the statements in the nuclear part were processed as follows. The graphics present the results of the participants (numbers on the y axis) classification of the statements in a Lickert scale from 1 (completely disagree) to 7 (completely agree) (shown on the x axis). The following graphics present a selection of the results.
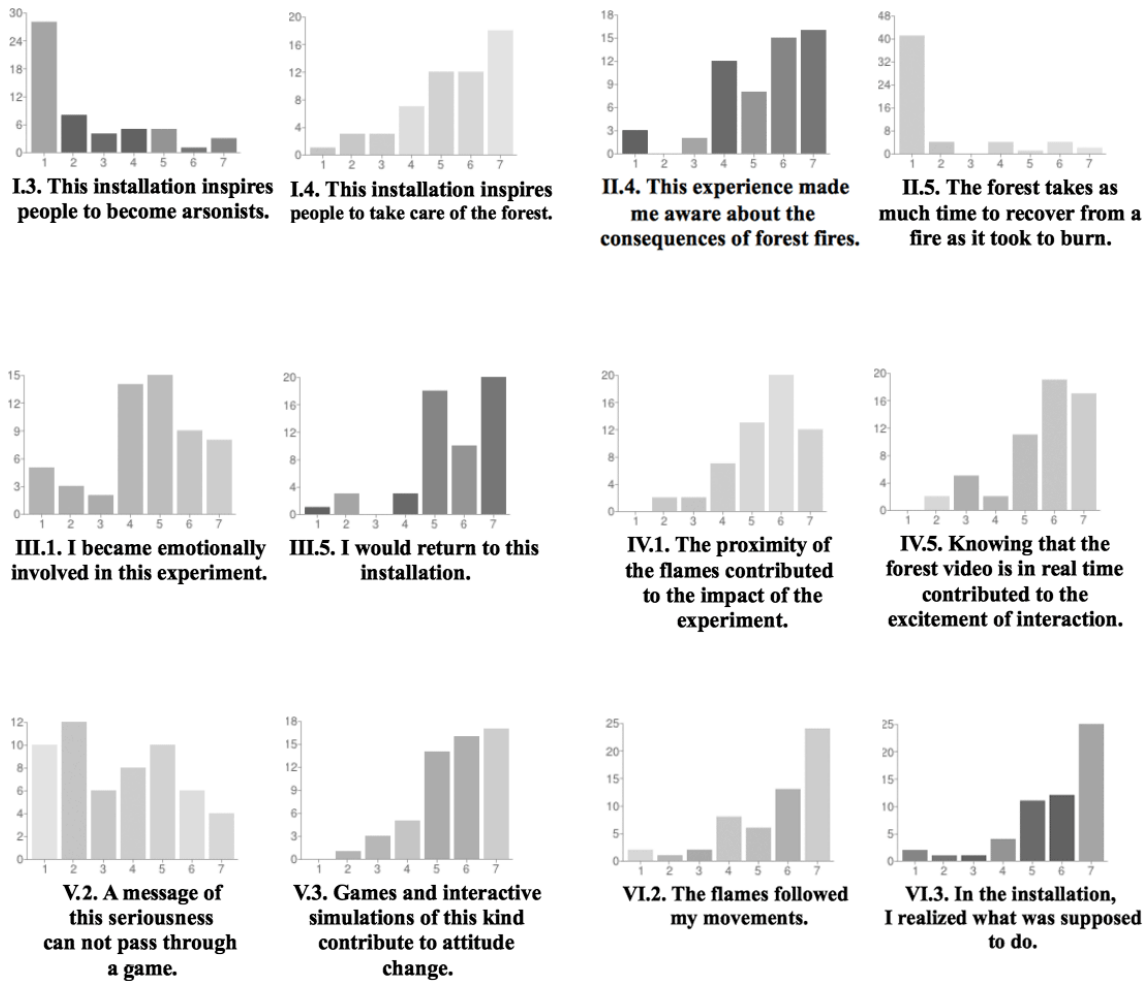

Figure 5.30. Selection of two questionnaire results of each *Play with Fire* experience dimension: (I) Environmental Awareness | Sustainability, (II) Knowledge | Learning about the dynamics of Fires, (III) Emotional Engagement, (IV) Aesthetic Enjoyment | Artistic Exploration, (V) Playful Experience, and (VI) System Functionality | Interaction | Usability.

These results suggest that there is a significant response from the participants regarding the various ex-perience dimensions, thus indicating a high potential for developing positive attitudes towards forests and the environment. The set of charts above shows a selection of highlights from the tests, and in the following sections we delve into the correlation analysis.

User Test Data Analysis Process and Results

Before data processing began, a clean-up step was performed to transform the raw data exported from the online questionnaires. The rest of the data analysis process was automated through a series of scripts that implemented each individual analysis step allowing for repeatability and independent validation of the analysis process.

The analysis started by computing a set of summary statistics for each question: mode, median, sample mean and sample standard deviation. Next, an estimator value for the weight of each experience dimension group was computed and used as input for a Pearson sample correlation, between each experience dimension group sample and the one corresponding to the environmental awareness dimension.

Question	Mode	Median	Mean	Std_Deviation
I.1	6	5	5.125	1.652
I.2	6	6	5.803	1.034
I.3	1	2	2.429	1.838
I.4	7	6	5.392	1.580
I.5	6	5	5.107	1.330
II.1	5	5	5.089	1.632
II.2	7	7	6.518	1.191
II.3	7	7	6.214	1.057
II.4	7	6	5.339	1.599
II.5	1	1	1.929	1.808
III.1	5	5	4.607	1.713
III.2	4	4	3.804	1.920
III.3	1	1	2.035	1.726
III.4	5	5	4.268	1.949
III.5	7	6	5.589	1.462
IV.1	6	6	5.482	1.265
IV.2	5	5	4.679	1.642
IV.3	7	6	5.929	1.093
IV.4	6	5	4.911	1.792
IV.5	6	6	5.625	1.383
V.1	5	5	4.500	1.888
V.2	2	4	3.535	1.916
V.3	7	6	5.643	1.257
V.4	5	5	5.446	1.320
V.5	2	3	3.339	1.938
VI.1	7	5	4.536	2.224
VI.2	7	6	5.679	1.597
VI.3	7	6	5.804	1.507
VI.4	5	5	4.839	1.787
VI.5	6	5	4.804	1.689

Table 5. *Play with Fire* results: summary statistics.. Questions are coded using group name corresponding to the experience dimension (I to VI).
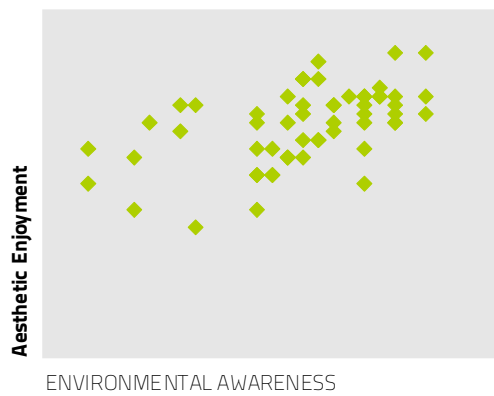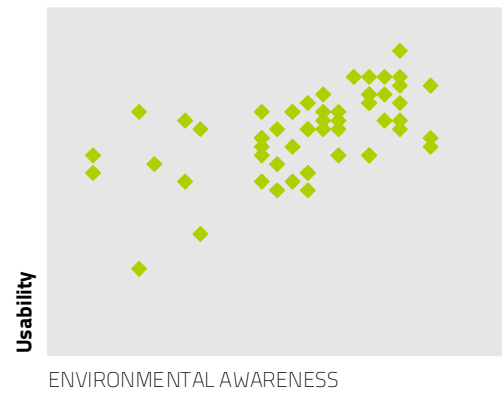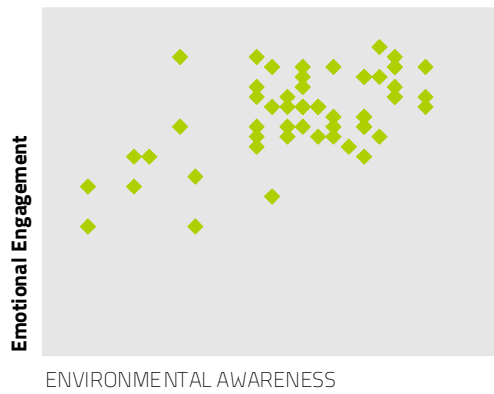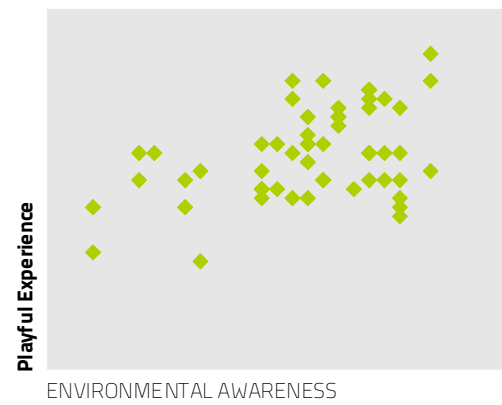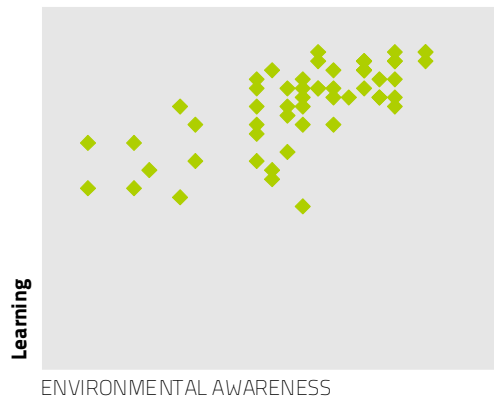
Figure 5.31. Scatter plots displaying the relationship between individual experience dimensions (II to VI) and the Environmental Awareness dimension (I) in *Play with Fire*.
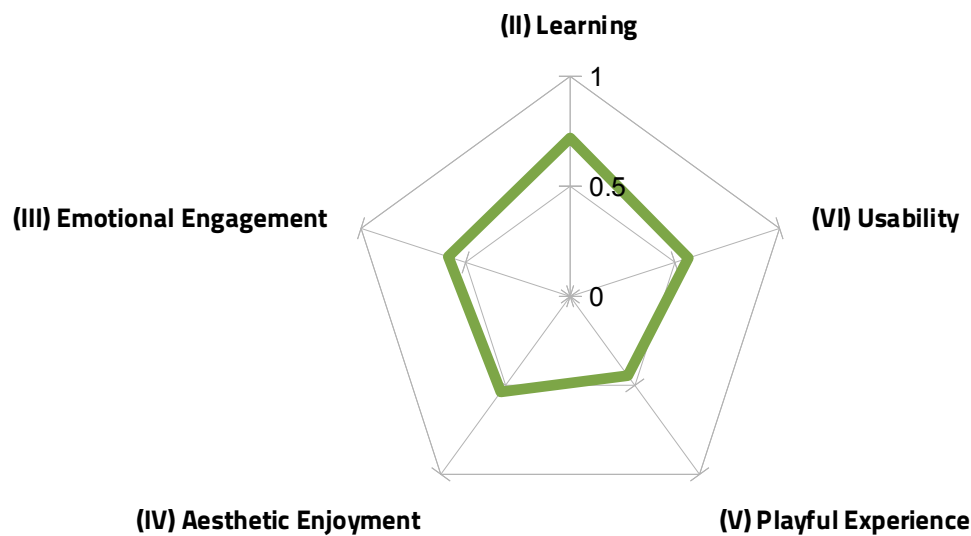
Figure 5.32 Correlation between *Play with Fire* experience dimensions (II to VI) and Environmental Awareness (I).

Results Analysis

From the summary statistics we can see that most questions got a very positive reaction from users with a relatively low spread value. Notable exceptions were questions III.1 ("I became emotionally involved in this experiment") and III.2 ("I was pleased to play with fire"), which turned out mostly neutral with a relatively high spread, perhaps echoing the controversial nature of the experience; and question V.1 ("Playing took precedence over environmental awareness") with a mild negative reaction and a relatively high spread, showing that although the combination of play and a serious subject can provoke mixed feelings in participants, they seem to be aware of the "magic circle" and the separation between fun and reality.

As for the relationship between the experience dimensions we can see that all of them seem to have some correlation with the environmental awareness dimension (around 0.5), with the knowledge about the dynamics and consequences of forest fire presenting a stronger correlation than the others (around 0.7) and the playfulness of the experience having a slightly weaker correlation (around 0.4).

The results suggest that the environmental awareness outcome is the combination of many experience components like knowledge about fire dynamics, emotional engagement, aesthetic enjoyment, usability and playfulness.

The knowledge dimension seems to be more connected with environmental awareness, probably because both of these dimensions reflect different aspects of an individual's information about the environment and the dangers that might affect it. However, this knowledge dimension is also key in promoting cognitive dissonance towards a change in personal attitude relative to forest protection. As such,

further studies are needed to ascertain if this dimension can in fact be conducing to attitude change with possible impacts in the design of persuasive experiences for forest protection.

Quoting Participants Comments and Suggestions

The first set of tests was done in an early development phase, whilst the following final version was carried out under poor light conditions. The light influenced the recognition and scan of the *QR code*, and extra time was spent with a technical issue that was not supposed to interfere, so some limitations influenced the results and raised opinions such as: "not yet fully functional", and "difficulty when reading the code provided on the screen". These and comments like "It's a good idea, but the practical application needs more development to be fully working", "Add a sound system", "I want to know what will follow", and "Thumbs up to continue exploring!" were clearly pointing for further development to be done and especially useful for preventing future limitations.

Moreover, many suggestions gathered from all the tests – "To see the recovery of flora and fauna", and "Add climatic factors such as wind and rain", "Maybe by watching the fire rapidly propagating through a larger area, the participant would better notice the impact of his act and become emotionally engaged", "Fire should be more realistic, more immersive projection environment", "Complement with audio message", "Heat the space", "Instead of retrieving the burnt forest, we could create it" – are ideas to consider for future iterations of the Play with Fire installation.

Highlights from Observations

The results obtained from direct observation in place and from the videos recorded helped make sense of the very rich contextual data.

Some limitations in the presentations were understood as challenges to overcome, such as when the installation was presented in its prototype phase not yet fully working in terms of movement interaction. Participants were not experiencing the engagement through the full body movements – simulated by interacting with the mouse as if it were the body. Physical constraints in the installation, especially scale were affecting the realistic approach and participants engagement. As in some of the venues most participants did not have smart phones, they could not have access to the second part of the experience – to enable access to this part of the experience, we demonstrated with our own devices, as represented in the following figure.

From user observation in Maçal do Chão, people had generally a reaction of "anxiety" for water. The role of contributing to extinguish the fire was more evident than in other cases.

Figure 5.33. *Play with Fire* user interaction at Maçal do Chão: participants playing with fire to burn the forest, and display of the performance score while enabling access to the application in the mobile phone.

Based on their background, while doing the tests their thinking aloud was mostly focused on the role of helping to extinguish the fire, not on relaxing and having fun with playing with the virtual fire. This is presumably related with the fact that they had their own personal experience (as verified in the theme interviews done to people that lived in the same location) for living closer to that reality. The test comments are a confirmation of this different perspective. On the other hand, in urban and artistic exhibition contexts, participants were in a more playful mode.

In the presentation of the first tests version, some of the technical problems were related with the projection light conditions during the tests, which was not as vivid as desired for immersiveness, and did not have enough contrast for the *QR code* reader to scan immediately. This was assessed from the participation and help needed during the tests, confirmed by participants observation through the recorded videos and their answers to the tests. Nevertheless, the comments were very positive and motivating regarding the aim of the *Play with Fire* experience on environmental awareness.

In some cases, participants were not as much engaged in the experience as desired. For total engagement, the whole experience had to be fully functional. Attention must be given to optimal scale and light conditions, the sound must be audible and properly synchronized, and further work must be done on enhancing the fire visual effects.

5.4.3.3 Play with Fire Evaluation Future Work

Future developments regarding the *Play with Fire* installation evaluation include a new test iteration that is planned to a different setting in Madeira. This will allow to obtain the feedback of a very specific and demanding audience constituted by graduate students and researchers on user experience and entertainment technologies.

This iteration is also part of the collaboration of *Play with Fire* with the ongoing research project *SINAIS* in the sequence of the first phase of an artistic residency (January 2012). So far, the setup has already been defined and scale tests were done to have this installation in human or even larger scale.

5.5 Overall Research Results Analysis

From the start of this research work, our goal has been that interactions with the ARTiVIS installations would be leading to communities awareness and empowerment towards a more sustainable environment. Evaluating this awareness effect, especially given the interactive installation's emotional and paradoxical nature, has been an ever present concern. Hence we have researched how to bridge Art practices and HCI evaluation in order to develop a set of hybrid methods that could be effective.

In this chapter we have presented our work in designing and applying Art practices and HCI evaluation methods and the first results of this evaluation that show good promise for further investigation.

The development of the project progressed in terms of complexity (as described in chapter 4), the evaluation process has also evolved – from concept interviews, to user experience and usability testing, and surveys acknowledging the effectiveness of the experience dimensions – in terms of approaching the research objective of environmental awareness. In the overall process, this represents one more step in what relates to evaluation methodologies throughout the diverse stages.

Besides the main question about the effect of these interactive experiences on environmental awareness, other aspects can still be further explored by looking at the demographic data that was collected. This would allow us to measure how the context might affect the outcomes and what are the differences in response between an urban environment and a rural setting or between an art gallery context and a community hall.

As to the question "How will this project raise awareness...?", the proposals were embodied as experiences of interactive installations in exhibitions, in order to approach the natural environment in unexpected contexts.

With the purpose to measure the long term impact, surveys were done to the participants of the *Hug@ree* iterations – three to six months later again in Maçal do Chão, and ten months later for the first time to the Sci|Art students participants – and the results shown are very close to the ones that were obtained immediately after the experience.

One significant result is comparing the main word clouds of *Hug@ree* and *Play with Fire* – whereas *Hug@ree* generated an affective response – through words like the "Happiness" feeling, the *Play with Fire* most frequent word was "Interesting", a result that reflects the paradoxical aspect of the interactive installations, that take people to think in a more reflexive mode.

Comments from the participants in the experience report that they started caring more, and from their feedback and availability they showed that they are open to collaborate in the scope of art and research.

Regarding future work with the installations, we foresee the need to evaluate the cognitive results of the interactive experiences. To fully accomplish our purposes, further approaches might include bio-signal analysis.

In the scope of the ARTiVIS project, motivated by the interviews done to entrepreneurs, we also envision exploring entrepreneurship opportunities for future implementation, now informed by expert advice obtained from the interviews to entrepreneurs that were conducted in the scope of this research.

6. CONCLUSIONS AND FUTURE PERSPECTIVES

ARTiVIS embodies an innovative approach – with a challenging technological component – that combines digital arts, HCI and environmental sustainability. Presented in a diversified range of contexts and places, ARTiVIS was extensively shared as a research project that has been maturing from the conceptualization of an online platform and the prototype of a forest surveillance DIY kit to the implementation, presentation and evaluation of the interactive installations *B-Wind!*, *Hug@ree* and *Play with Fire*.

In this research we have proposed to create a structure of collaborative surveillance enabled by networked media with the overarching goal of forest protection. Through this platform concept, named ARTiVIS, we seek to bring people closer to forests, while at the same time promote care and respect for nature and empower communities to better protect their natural resources.

We have prototyped the platform interface and infrastructure as well as having ascertained the resources needed for a full scale implementation. We have designed an open-source hardware and software kit to simplify the deployment of video streaming nodes, as well as a series of interactive installations – *B-Wind!*, *Hug@ree* and *Play with Fire* – as artistic experiences that make use of the streaming video provided by the platform and explore the role of art and design in environmental awareness. These installations have been developed, deployed, and evaluated. The evaluation process has questioned the core arguments of the research, and the results have strengthened our original proposal.

Conclusions regarding details are described in the evaluation analysis. In contributions and findings, the main concepts of the research are highlighted: environmental awareness, real-time video, surveillance role in the contemporary world, connection with research centers and governmental institutions.

Art and Surveillance are by nature different issues. Nevertheless, the use of surveillance in arts context not only has brought very insightful approaches as the ones described in the case studies mentioned (cf. chapter 2), but also allowed the ARTiVIS research project to go further through the hybrid experiments done in the scope of artistic explorations. An obvious advantage of the ARTiVIS artistic framework was that it provided access to institutional infrastructures and allowed to overcome legal limitations that in a conventional process would still be on a waiting list of bureaucratic requests.

In this scope, open access to forest surveillance towers was allowed, enabling for tests with the real-time video streaming for the ARTiVIS online platform as well as the recording of the video footage used in

the interactive installation Play with Fire. The use of trees in public spaces such as a garden in the heart of the city of Lisbon or the outdoors in the UCLA campus was another example of a streamlined process facilitated by the context of this project.

6.1 Findings and Contributions

The entire set of interactive installations have a common denominator – they are working towards a closer relationship with nature. What we discovered with the iterations when shaping these experiences is that a closer relationship was established, a bond especially fed by the physical contact with nature and awareness. The motivations were not only to contribute to a better world, they were also the good feelings triggered by a healthier contact with nature. The outputs are environmental awareness with and through a closer relationship with nature.

These experiences stimulate other senses than sight and hearing. Touch and smell also intervened through the physical interface of nature – leading to the emotional engagement that, together with environmental awareness, reinforced the relationship with nature.

The description of future work for each of the outcomes is here briefly summarized. For more details, the readers should refer to the future work section of the relevant project component (chapter 4).

With the **ARTiVIS installations,** we developed poetic visual approaches to articulate the concept and to develop learning tools to raise empathy and understanding. However, with more time, human resources, and further institutional support, these installations can advance into a more sophisticated state, both technically and aesthetically.

The ambivalence of the use of **surveillance** is one of the issues discussed in the state of the art (cf. 2.4). We propose to create a structure of surveillance playing the role of the system designer – and in this context we are "the good guys" making *Big Brother* go green by enabling surveillance for the noble cause of forest protection.

Moreover, it was noted from the tests done in some of the interactive installations and observations that people were **engaged** and definitely open to these new approaches of both research and artistic experi-

ments by their voluntary participation. People's engagement was motivated by a willingness to help in a research project, or to be involved and become visible in an artistic project.

The goals with ARTiVIS were achieved: raising environmental awareness by putting in practice the use of **real-time video of forests** in artistic explorations and by presenting it in an artistic framework; to create connections with ongoing research projects – like *SINAIS*; we also started the use of surveillance infrastructures with *Play with Fire* in Montemor-o-Novo. ARTiVIS has been introduced in the rural environment population and aroused curiosity, interest, and further support for future events.

The ARTiVIS mediated interactions provide contact with nature through technology. From our interviews of local populations, observation of participants and tests during the installations experiences, and their feedback, we infer that the interactions are leading to **communities awareness and empowerment** – ultimately, for the design of a more sustainable environment.

6.2 Future Work

ARTiVIS as it stands constitutes the base for further developments departing from the proposals and explorations done in the scope of this research. Future plans include creating an ARTiVIS research community based on three main axis of development – Arts, Technology, and the Environment:

> » Arts in a broad scope including research, digital media, experimental design, traditional crafts, and entertainment
> » Technology used in creative and unconventional ways with a sustainable approach
> » Environmental protection through the engagement with local culture and community empowerment.

Regarding additional contextual information on the theme, **forest studies** is an area for further research – requiring interdisciplinary work with experts working on analysis of actual methodologies and infrastructures, planning for forest fire prevention, monitoring, early detection and warning mechanisms, and communication systems among participant entities.

We are now implementing the prototype of the *DIY forest surveillance kit* based on the previous experiences and research. When the entire system is production-ready, it will also be applied in remote places in the wild, starting with the *Laurissilva* forest.

The idea behind the **interactive installations** is to create a consistent, robust and high quality set of ARTiVIS nodes and installations that can be re-created and presented together as a standalone exhibition. This showcase should preferably be technically and financially self sustained and itinerant to reach both urban and rural populations in the most remote places. Each installation has the quality and reliability to be presented independently of the others, whether showcased in a conference venue as ambient media, in a broader public festival as a performative presentation, or as a research demonstration. Each of the components has the potential to be further developed from the work accomplished so far.

Specific developments regarding each of the installations have already been described in the corresponding sections (cf. chapters 4 and 5). Although this research project is in its final stage, relevant work still remains to be done: further tests and data analysis, DIY kit development and online platform development and deployment, plus future collaborations and connections with existing art and research projects. The connection between the interactive installations websites with the online platform, as the prototype becomes a final fully functional system, will bring more evidence to the project overall goals and will help to consolidate it.

The fact that all the interactive installations were publicly presented helped with the development before, during and in between the different presentations. Presented as research work in the artistic scope, every version had an upgrade each time it was exhibited. Some features and updates still require additional development effort.

Further specific work with each of the **interactive installations** is described in the corresponding design and implementation sections (cf. 4.3, 4.4 and 4.5). In general, *B-Wind!* requires more work with the features, visual effects and real-time video, now informed by the Play with Fire experience developed afterwards. *Hug@ree* needs the online component in terms of presentation with interactivity and the implementation of the virtual hug. *Play with Fire* requires work dedicated to the flame visuals and the regeneration visualization in the mobile application.

Future ARTiVIS experiences developments have started and approach sustainability in a broader sense. E.g.: *MAicro* developing into a tree/water network extension, as described in the section of complementary work with *MAicro, The Enchanted Forest,* and *Treeellucinations.*

As far as a sustained growth of the project is concerned, or getting the structure for further financing, the plan is to bootstrap the project starting from workshops and other related activities. Additionally, in the future, by achieving the goal of becoming a reference in forests real-time video streaming, distribution and archiving, ARTiVIS will be prone to gather institutional support from governmental, educational and cultural agents, and its wide range of audience can be very attractive to support worldwide.

In the scope of building communities, ARTiVIS will apply for funding from *The Knight Foundation*, that has been developing efforts to foster informed and engaged communities by supporting "transformational ideas that promote quality journalism, advance media innovation, engage communities and foster the arts"[227].

Another component to be explored is the **institutional connection** with existing sources of information that can be much more complete and contribute towards community building, such as integrating the results of field research done by students. One of the hypotheses is already pointing to considering a database of the characterization of Portuguese forests is the perspective of future work regarding the *Play with Fire* interactive installation mobile application content. The idea is to create a connection and feed the system with community based contents such as the outcomes of the project "Um bosque perto de si!", an initiative that has challenged students of primary and secondary education to study forest ecosystems in their region [Garcia11]. This project had the collaboration of the scientific community, local associations and the network of *Ciência Viva* centers, and was presented at the Knowledge Pavilion, the framework where the exhibition *Creative Algorithms* took place with the *Play with Fire* installation. In this case, the perspective is to start a connection with the use of the data collected by the students as part of the database of the mobile application regarding the information on Portuguese forests.

In this network scope, ARTiVIS has also been invited to create connections with the nonprofit organization funded by the designer Hugo Domingues – *Descobrindo*[228]. Enhancing the identities of the different places, products and people in a sustainable framework, this association proposes discovering and promoting local resources: natural, historical, cultural, agricultural, social and human. As aimed for the future ARTiVIS activities, *Descobrindo* is also are inspired by the cycles of nature, raising the ancestral knowledge of Gardunha, a territory near the small village Maçal do Chão where the ARTiVIS project has been presented. They are open to supporting conferences, exhibitions and residencies, as well as to the participation in their publication "Solstício", a magazine reporting the local culture and natural environment.

---

227   *Knight Foundation* » http: / / knightfoundation.org / about /

228   *DESCOBRINDO* (Discovering) –Territorial Development Association – aims to motivate and train people boosting the creation of innovative projects, connecting with institutions, organizations and local associations of the south territory of Gardunha » http: / / www.descobrindo.pt

Additional work will also be needed to look for funding opportunities from diverse areas such as art (e.g.: *IA – Instituto das Artes*), technology (*FCT*), environment (*PRODER, Fundação Vodafone for telecommunications*), education areas, governmental support (*ERDF – European Regional Development Fund*[229]), and awards (such as *Prémio Zon Multimédia*[230] and the *Knight News Challenge*[231]).

Aside from institutional funding, the plan is to create **community** as in *FLOSS* and to be able to accept challenges for further developments such as workshops in media arts festivals and hackmeets, and invitations for presentations with the purpose of bringing the environmental awareness issues to a broader audience. This can also contribute for self-funding the project from workshops and residencies fees and applying for additional funding in environmental arts in multidisciplinary settings. In this scope, we propose to develop further research resulting in upgrades to the installations and to enhance local culture development and people empowerment with focused benefits to the natural environment.

Crowdsourced development structures are certainly a way to consider in the ARTiVIS plans for the future. *Goteo*, already noted in the *DIY forest surveillance kit* design, is an excellent platform where the ARTiVIS concept and goals fit perfectly. This is due to their crowdfunding and distributed collaboration, encouraging the independent development of creative and innovative initiatives that contribute to the common good, supporting "projects with social, cultural, scientific, educational, technological, or ecological objectives that generate new opportunities for the improvement of society and the enrichment of community goods and resources"[232]. They themselves have a very important support network, comprising among others the *Ministry of Culture, ColaBoraBora* (*Eutokia Social Innovation Center*), *Medialab Prado*, and further entities related to contemporary culture in Spain.

Multidisciplinary forums and open platforms such as the *GISS* project mentioned in connection with the DIY kit software components section (cf. 4.2.2) are also promising. In this case, ARTiVIS proposes to be a Portuguese case study regarding the use of the open platform for real-time multimedia contents.

The ARTiVIS **guiding principles** can also be inspired by the structuring aspects of related ongoing projects around us. We looked at examples like the cultural association *Cultivamos Cultura*, "a platform for experimentation and development of shared knowledge in the theory and practice of science, technology and contemporary art"[233] that also contributes to the cultural identity by fostering bonds with the

229 *ERDF* 2007-2013, to be continued in 2014-2020 » http: / / pagina.jccm.es / fondosestructurales / new-boletin / boletines-2010 / boletin-monografico-noviembre-2011-ingles / 2014-2020-the-european-regional-development-fund /

230 *Zon Multimédia Creativity Awards* » http: / / www.zonold.com / Premio / premiozon.aspx

231 *Knight News Challenge* – Informed & engaged communities » http: / / www.newschallenge.org

232 *Goteo.org* – Crowdfunding the commons » http: / / www.goteo.org / about

233 *Cultivamos Cultura* – cultural association » http: / / cultivamoscultura.blogspot.pt

local community and environment, and the experimental art laboratory *Ectopia*, exploring the intersection of art and science and "fostering the development of collaborative projects involving artists and researchers"[234], both directed by bio artists Marta de Menezes and Maria Manuela Lopes. *Binaural Nodar*[235] is a cultural organization with a similar approach, in this case focusing on "context-specific-art" by promoting the exploration and research in sound and new media arts, on the articulation between the artistic production and the surrounding rural areas – where multi-media artists like Maile Colbert[236] developed part of her video and sound work. The laboratory *alg-a*[237] is also a very inspiring example regarding the context and the process of building their own infrastructures through knowledge sharing, such as the creation of the research building plan done in the scope of the sustainable buildings workshop they organized.

Driven by the motivations and goals and informed by examples like these, we realize that ARTiVIS has the potential to be able to create its own research infrastructure in the near future. In this sense, we foresee the possibilities of ARTiVIS as a non profit, an independent research center, an AIR (Artist in Residence) program centre, a crafts center, and a local culture promoter . ARTiVIS will work towards becoming a major reference as a place and processes regarding the combination of arts, real-time video and interactivity for sustainability.

At last, not only we feel the responsibility of sharing the research outcomes of the PhD research done so far, but also to go forward with the ARTiVIS aims. Most importantly, we hope that the idea pursued through this approach generates feedback and inspires further participation in the three main axes of this research – Arts, Real-Time Video, and Interactivity – for Sustainability.

May ARTiVIS be the roots of the tree from which interlaced branches' new seeds will blossom and then grow in fertile soil.

---

234 *Ectopia* is an experimental art laboratory in a biological research institute, hosting "artists exploring the intersection of art and science", and fostering "collaborative projects involving artists and researchers" » http: / / ectopia-lab.blogspot.pt / p / home-news.html

235 *Binaural Nodar* is a non-profit Cultural Organization founded in 2004 "with the aim of promoting the exploration and research in sound and new media arts (…) in the rural areas of Nodar and the Gralheira Mountain Range » http: / / www.binauralmedia.org / news / en / about

236 Maile Colbert presented her work in a seminar in the scope of the UT Austin | Portugal Program, on 15 April 2010, at FCT / UNL » http: / / utaustinportugal.org / news / seminar_with_multimedia_artist_maile_colbert

237 *Laboratorio alg-a* – "Art and action community" cultural association » http: / / www.alg-a.org / lab-alg-a # pagination_artigos_alga

SOURCES | BIBLIOGRAPHY

AASBAKKEN, Mia, JACCHERI, Letizia, WANG, Alf Inge (2011) *Evaluating User Experiences from Interactive Art Installations*, TDT4570 Game Technology Specialization Project, NTNU – Trondheim, Norwegian University of Science and Technology, Norway.

ABRAHAM, Sunil (2012) "Sunil Abraham", *The Centre for Internet and Society*, Karnataka and New Delhi, India | http: / / cis-india.org / publications / cis / sunil [Retrieved 2012 / 10 / 10].

ABRAMOVIC, Marina (2010) "The Artist is Present", *MoMA: New Concepts for Performance*, New York, Mar-May 2010 | http: / / www.moma.org / interactives / exhibitions / 2010 / marinaabramovic / marina_exhibition.html [Retrieved 2010 / 03 / 11].

AFN (2012) *Autoridade Florestal Nacional (National Forest Authority)*, Sistema Nacional de Defesa da Floresta Contra Incêndios – SNDFCI (National Forest Fire Protection System) | http: / / www.icnf.pt / florestas / dudf / Resource / ficheiros / sndfci / apresentacao-sndfci [Retrieved 2012 / 10 / 09].

ALBERGARIA, Gabriela (2010) *Thermic*, Solo exhibition curated by Delfim Sardo, Pavilhão Branco do Museu da Cidade, Lisbon, Portugal, April 15 – June 13, 2010. | http: / / www.gabrielaalbergaria.com / pdf / 33__20100730165613.pdf [Retrieved 2012 / 04 / 27].

ASHTON, Kevin (2009) "That 'Internet of Things' Thing", *RFID Journal*, July 22, 2009 | http: / / www.rfidjournal.com / article / view / 4986 [Retrieved 2011 / 05 / 16].

ASSCHE, Christine Van, *ed.* (2008) *David Claerbout, the Shape of Time*, catalog, Zürich, JRP / Ringier.

BARRETO, Mary, KARAPANOS, Evangelos, NUNES, Nuno (2011) "Social Translucence as a Theoretical Framework for Sustainable HCI", SINAIS, position paper, *CHI 2011 Workshop: Sustainable Interaction Design in Professional Domains – Visible – Actionable – Sustainable*, Vancouver, Canada, May 7, 2011.

BIEN-U, Bae (2007) "Nature Series – Pine Tree", *Gana Art Gallery* Exhibition, Corea, ARCO 2007 | http: / / bbuart.com / nature.htm [Retrieved 2011 / 06 / 28].

BIGGS, Michael (2000) "Editorial: the Foundations of Practice-Based Research", *Working Papers in Art and Design,* Volume 1 | http: / / sitem.herts.ac.uk / artdes_research / papers / wpades / vol1 / vol1intro.html [Retrieved 2012 / 04 / 03].

BILAL, Wafaa (2011) *The 3rd I* | Project website http: / / www.3rdi.me [Retrieved 2011 / 03 / 11].

BOARDMAN, David, GERBAUDO, Paolo (2010) *In Fondo al Mar – Bringing Poisons Afloat* | Project website http: / / www.infondoalmar.info [Retrieved 2012 / 05 / 23].

BOGOST, Ian (2007) *Persuasive Games: the Expressive Power of Videogames*, MIT Press.

BOLTER, David, GROMALA, Diane (2005) *Windows and Mirrors: Interaction Design, Digital Art, and the Myth of Transparency*, The MIT Press, Leonardo Books, MA, US.

BOWE, Rebecca (2012) "India's Gargantuan Biometric Database Raises Big Questions", *Electronic Frontier Foundation (EFF)*, September 27, 2012 | https: / / www.eff.org / deeplinks / 2012 / 09 / indias-gargantuan-biometric-database-raises-big-questions [Retrieved 2012 / 10 / 10].

BUNTING, Madeleine (2009) "The Rise of Climate-Change Art", in *Rethink – Contemporary Art & Climate Change* exhibition, The Guardian, 2009 / 12 / 02 | http: / / www.guardian.co.uk / artanddesign / 2009 / dec / 02 / climate-change-art-earth-rethink [Retrieved 2011 / 02 / 15].

BURTYNSKY, Edward (2008) *Photographic Works* | http: / / www.edwardburtynsky.com [Retrieved 2011 / 02 / 15].

BUXTON, Bill (2007) *Sketching User Experiences: Getting the Design Right and the Right Design*, Morgan Kaufmann.

BUZAN, Tony, BUZAN, Barry (2006) The Mind Map Book, BBC Active, Pearson Education, London, UK (1st ed. 1993).

CAPELO, Jorge, *ed.* (2004) *A Paisagem Vegetal da Ilha da Madeira (Madeira Island's Vegetation Landscape)*, Quercetea 6: 3-200, ALFA, Lisboa. Portugal.

CARNEIRO, Alberto (1991) "'Notas para Um Manifesto de Arte Ecológica' Dezembro, 1968 – Fevereiro, 1972", in *Alberto Carneiro*, CAM – Fundação Calouste Gulbenkian / Fundação de Serralves, Lisboa / Porto, Portugal.

CATRY, Filipe, DAMASCENO, Pedro, SILVA, Joaquim, GALANTE, Miguel, MOREIRA, Francisco (2007) "Spatial Distribution Patterns of Wildfire Ignitions in Portugal", Proceedings of *4th International Wildland Fire Conference*, May 13-18, 2007, Sevilla, Spain.

CHICK, Anne, MICKLETHWAITE, Paul (2011) *Design for Sustainable Change: How Design and Designers Can Drive the Sustainability Agenda*, AVA Publishing SA.

CHICÓ, Sílvia (2006) *Colóquio Internacional Arte e Paisagem (International Symposium of Art and Landscape)*, Instituto de História de Arte da Faculdade de Ciência Sociais e Humanas, Universidade Nova de Lisboa, , September 29-30, 2006, Lisbon, Portugal.

CIPOLLA, Carla, PERUCCIO, Pier Paollo, *ed.* (2008) *Changing the Change – Design, Visions, Proposals and Tools*, Conference Proceedings, Allemandi, Conference Press, 10-12 July, 2008, Turin, Italy.

COLERAN, Mark (2011) *Fantasy User Interfaces – FUI*, Visual Design | http: / / coleran.com / category / work / fui / [Retrieved 2011 / 09 / 25].

CONNERS, Leila, CONNERS, Nadia (2007) *11th Hour Action*, Produced and narrated by Leonardo DiCaprio, DVD, Lusomundo, Warner Home Video.

CORREIA, Nuno, ALVES, Luís, CORREIA, Helder, MORGADO, Carmen, SOARES, Luís., CUNHA, J.osé, ROMÃO, Teresa, DIAS, Eduardo, JORGE, Joaquim (2005) "InStory: a System for Mobile Information Access, Storytelling and Gaming Activities in Physical Spaces", Proceedings of the *ACM SIGCHI International Conference on Advances in Computer Entertainment Technology (ACE2005)*, June 15-20, 2005, Valencia, Spain, pp.102-109.

CORREIA, Nuno, MENDES, Mónica (2009), "Interface Design for Mobile Devices", Proceedings of *Future Places Festival 2008*, Porto, Portugal, pp.47-49.

COSTA, Bruno, FIGUEIREDO, Rita (2007) "Blow Me", *MAPA Academic "Art & Technology Award"*, Universidade Católica, Porto, Portugal | http: / / olhares-outono.ucp.pt / 2007 / cmapa.php [Retrieved 2012 / 07 / 24].

CSIKSZENTMIHALYI, Mihaly (1991) *Flow: The Psychology of Optimal Experience*, Harper Perennial.

DANIEL, Sharon (2011) "Collaborative Systems: Redefining Public Art", in LOVEJOY, Margot, PAUL, Christiane, VESNA, Victoria, *ed., Context Providers: Conditions of Meaning in Digital Arts*, Intellect, UK, pp.55-87.

DARLINGTON, Richard (2004) "Factor Analysis", Cornell University – Department of Psychology | http: / / comp9.psych.cornell.edu / Darlington / factor.htm [Retrieved 2012 / 04 / 03].

DAVENPORT, Glorianna, AGAMANOLIS, Stefan, BARRY, Barbara, BRADLEY, Brian, BROOKS, Kevin (2000) "Synergistic Storyscapes and Constructionist Cinematic Sharing", IBM Systems Journal, Vol. 39, Issues 3&4, pp.456-469.

DE VALK, Marloes (2009) "Tools to Fight Boredom", *Contemporary Music Review*, Volume 28, Issue 1.

DIZIKES, Peter (2008) "The Meaning of the Butterfly – Why Pop Culture Loves the 'Butterfly Effect,' and Gets The it Totally Wrong", *The Boston Globe*, June 8, 2008. | http: / / www.boston.com / bostonglobe / ideas / articles / 2008 / 06 / 08 / the_meaning_of_the_butterfly / [Retrieved 2011 / 02 / 15].

DORAN, Andra, *et al*. (2009) "A Demonstration of MobiTree: Progressive 3D Tree Models Streaming on Mobile Clients", Proceedings of the *17th ACM International Conference on Multimedia*, MM '09, ACM, NY, US, pp.955-956. DOI 10.1145 / 1631272.1631465

DURAND, Frédéric (2008) "Quando as Florestas Emitem Carbono, em Vez de o Captarem", *Atlas do Ambiente do Le Monde Diplomatique: Análises e Soluções*, Outro Modo Ed., Lisboa.

DURLING, David, FRIEDMAN, Ken, GUTHERSON, Paul (2002) "Editorial: Debating the Practice-Based PhD", *International Journal of Design Sciences and Technology*, Volume 10 Number 2, ISSN 1639-7267.

EOS (2010) *Talking Tree*, EOS Magazine, Happiness Brussels, Belgium | http: / / talking-tree.com [Retrieved 2010 / 09 / 11].

EPIC (2002) *Observing Surveillance Project*, Electronic Privacy Information Center – EPIC, Washington, DC | http: / / observingsurveillance.org [Retrieved 2012 / 05 / 27].

EVANS, Helen (2008) "Nuage Vert", *Cluster Magasine*, issue 07 Transmitting Architecture, Torino, May 2008 | http: / / hehe.org.free.fr / hehe / texte / nv / [Retrieved 2012 / 05 / 23].

FALLMAN, Daniel, WATERWORTH, John (2005) "Dealing with User Experience and Affective Evaluation in HCI Design: A Repertory Grid Approach", Workshop Paper, *Conference on Human Factors in Computing Systems – CHI 2005*, April 2-7, Portland, US.

FAO – Food and Agriculture Organization of the United Nations (2004) "Involving Local Communities to Prevent and Control Forest Fires", in *FAO Newsroom*, July 26, 2004, Rome, Italy. | http: / / www.fao.org / newsroom / en / news / 2004 / 48709 / index.html [Retrieved 2010 / 02 / 26].

FEDKIW, Ronald, STAM, Jos, JENSEN, Henrik Wann (2001) "Visual Simulation of Smoke", *Proceedings of the 28th Annual Conference on Computer Graphics and Interactive Techniques – SIGGRAPH '01*, ACM, NY, US, pp.15-22. DOI 10.1145 / 383259.383260

FERREIRA, Francisco, TENTE, Hugo, TORRES, Pedro, CARDOSO, Sérgio, PALMA-OLIVEIRA, José (2000) "Air Quality Monitoring and Management in Lisbon", *Environmental Monitoring and Assessment*, Kluwer Academic Publishers, Volume 65, Numbers 1-2, pp.443-450.

FESTINGER, Leon (1957) *A Theory of Cognitive Dissonance*, Stanford University Press.

FOREST (2009) *Forest Data and Information Systems*, Joint Research Centre, European Commission | http: / / forest.jrc.ec.europa.eu [Retrieved 2009 / 09 / 16].

FOUCAULT, Michel (1975) "Panopticism", *Discipline & Punish: The Birth of the Prison*, NY, Vintage Books, 1995, pp.195-228, transl. Alan Sheridan.

FRAYLING, Christopher (1993) *Research in Art and Design*, RCA Research Papers, vol. 1, no. 1. London: Royal College of Art | http: / / www.scribd.com / doc / 73904052 / Christopher-Frayling-Research-in-Art-and-Design [Retrieved 2012 / 05 / 08].

FUAD-LUKE, Alastair (2009) *Design Activism – Beautiful Strangeness for a Sustainable World*, Earthscan Ltd.

FULLER, Matthew (2007) *Media Ecologies – Materialist Energies in Art and Technoculture*, MIT Press.

GAMES FOR CHANGE (2011) *Games For Change – Catalyzing Social Impact Through Digital Games*, NY, US. | http: / / www.gamesforchange.org [Retrieved 2011 / 04 / 23].

GARCIA, César, c*oord.* (2011) "Um Bosque Perto de Si! Conhecer Ecossistemas Florestais" (A forest Near You! Meet Forest Ecosystems), Ciência Viva | http: / / www.cienciaviva.pt / projectos / bosque / [Retrieved 2012 / 02 / 16].

GMES (2010) *Forest Monitoring*, Global Monitoring for Environment and Security (GMES), co-sponsored by the European Space Agency (ESA) and the European Commission (EC) | http: / / www.gmes-forest.info [Retrieved 2010 / 08 / 22].

GOLDMAN, Alan (2004) "Evaluating Art", *The Blackwell Guide to Aesthetics* (Ed. P. Kivy), Blackwell Publishing Ltd, Oxford, UK, chapter 5, pp.93–108.

GÓMEZ, Diego (2001) *Hiperbarrio – Historias Locales, Audiencia Global*, Colombia | http: / / hiperbarrio.org

GONÇALVES, André (2007) "I Thought Some Daisies Might Cheer You Up", Installation at *Interactivos?*, Media Lab Madrid, Centro Cultural Del Conde Duque, Madrid, June 9-30, 2007 | http: / / www.undotw.org / ctrl / installations / daisies / [Retrieved 2012 / 07 / 24].

GORIUNOVA, Olga (2008) "Autocreativity: The Operation of Codes of Freedom in Art and Culture", in *FLOSS + ART*, Mute Publishing Ltd.

GOUVEIA, Cristina, FONSECA, Alexandra, CÂMARA, António, FERREIRA, Francisco (2004) "Promoting the Use of Environmental Data Collected by Concerned Citizens Through Information and Communication Technologies", *Journal of Environmental Management* , Elsevier, 71 (2004), pp.135–154.

GRADZIK, Agnieszka, SZOSTALO, Wiktor (2009) "The Treehugger Project"*, An Ongoing Project of Environmental Art* | http: / / www.treehuggerproject.com [Retrieved 2010 / 09 / 11].

GRAU, Oliver (2004) "Immersion and Interaction from Circular Frescoes to Interactive Image Spaces", Media Art Net, Zentrum für Kunst und Medientechnologie Karlsruhe | http: / / www.medienkunstnetz.de / themes / overview_of_media_art / immersion / 25 / [Retrieved 2012 / 09 / 17].

GUGGENHEIM, Davis (2006) *An Inconvenient Truth*, starring Al Gore, DVD, Paramount, Lusomundo Audiovisuais | Movie official site http: / / www.climatecrisis.net [Retrieved 2008 / 03 / 08].

GUNDERSEN, Eric (2010) *Development Seed* , Creative Data Visualization and Mapping | http: / / developmentseed.org / team / eric-gundersen / [Retrieved 2012 / 09 / 05].

GURSTEIN, Michael (2007) *What is Community Informatics (and Why Does It Matter)?*, Polimetrica, Canada.

HACKOS, JoAnn, REDISH, Janice (1998) *User and Task Analysis for Interface Design*, New York, Wiley Computer Publishing, John Wiley & Sons, Inc.

HALL, Justin (2010) *Play on the iPad: the Magic Circle and a Marketplace* | http: / / radar.oreilly.com / 2010 / 03 / play-on-the-ipad-the-magic-cir.html [Retrieved 2011 / 04 / 23].

HANNINGTON, Bruce, MARTIN, Bella (2012) *Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions*, Rockport Publishers.

HELFAND, Jessica (2001) "Dematerialization of Screen Space", *Screen: Essays on Graphic Design, New Media and Visual Culture*, New York, Chronicle Books, Princeton Architectural Press, pp.34-39.

HILL, Julia (2012) "You, Yes you, make the difference", *Julia Butterfly Hill* | http:/ / www.juliabutterfly.com [Retrieved 2012 / 09 / 23].

HOLMES, Tiffany (2007) "Eco-visualization: Combining art and Technology to Reduce Energy Consumption", Proceedings of *Creativity and Cognition – C&C '07*, June 13-15, 2007, Washington, DC, USA.

HÖÖK, Kristina, SENGERS, Phoebe, ANDERSSON, Gerd (2003) "Sense and Sensibility: Evaluation and Interactive Art", Proceedings of the SIGCHI *Conference on Human Factors in Computing Systems – CHI 2003*, ACM, NY, US, pp.241-248 . DOI 10.1145 / 642611.642654

HORVATH, Christopher, GEIGER, Willi, (2009) "Directable, High-Resolution Simulation of Fire on the GPU", *ACM Transactions on Graphics (TOG),* Proceedings of ACM SIGGRAPH 2009, Volume 28 Issue 3, August 2009, Article No. 26, ACM, NY, USA. DOI 10.1145 / 1531326.1531347

HUIZINGA, Johan (1955) *Homo Ludens: a Study of the Play-Element in Culture*, Boston, The Beacon Press (1st ed. 1944).

IKEDA, Sei, *et al.* (2010) "FireVolleyball: Multi-player Interactive Game – Providing a Sense of Touching Fire", Proceedings of the *International Conference on Multimedia – ACM MM '10*, October 25-29, 2010, Firenze, Italy, ACM, NY, USA, pp.923-926. DOI 10.1145 / 1873951.1874114

IRWIN, Terry (2005) "The Web of Life (a New Way to View Graphic Design)", *Era 05 World Design Congress – The Changing Role and Challenges of Design,* Danish Design Centre, Copenhagen, Denmark, September 26–28, 2005.

JACINTO, Ricardo (2006) "Les Voisins", installation at ARCO Contemporary Art Fair 2007, Vera Cortez Agência de Arte, Madrid, Spain, February 15-19, 2007.

JORDAN, Chris (2009) "Intolerable Beauty: Portraits of American Mass Consumption" and "Running the Numbers: An American Self-Portrait", in *Chris Jordan – Photographic arts* | http:/ / www.chrisjordan.com / gallery / intolerable / [Retrieved 2011 / 04 / 25].

KAC, Eduardo (1996) "Ornitorrinco and Rara Avis: Telepresence Art on the Internet", *Leonardo*, Vol. 29, N. 5, pp.389-400.

KALTENBRUNNER, Martin, BOVERMANN, Till, BENCINA, Ross, COSTANZA, Enrico (2005) "TUIO - A Protocol for Table-Top Tangible User Interfaces", Proceedings of the 6th International Workshop on Gesture in Human-Computer Interaction and Simulation – GW 2005, Vannes, France.

KAMMERER, Dietmar (2004) "Video Surveillance in Hollywood Movies", Surveillance & Society, CCTV Special (eds. Norris, McCahill and Wood), Volume 2(2 / 3), pp.464-473.

KAUFMAN, Anthony (1999) "Interview: Momentum and Emotion, Emir Kusturica's 'Black Cat, White Cat', in indieWIRE, September 9, 1999 |
http:/ / www.indiewire.com / article / interview_momentum_and_emotion_emir_kusturicas_black_cat_white_cat [Retrieved 2011 / 02 / 27].

KIRN, Peter (2009) "Save that Old PDA: Run Reware, Play Pd Musical Creations, Android (OFFF, NYC)", *Create Digital Music*, May 12, 2009. | http:/ / createdigitalmusic.com / 2009 / 05 / save-that-old-pda-run-reware-play-pd-musical-creations-android-offf-nyc / [Retrieved 2011 / 05 / 12].

KLEIN, Naomi (2000) *No Logo*, Relógio D'Água, Lisboa, Portugal, transl. Pedro Dias.

KOBLIN, Aaron (2011) *Digital Art and Design Works* | http: / / www.aaronkoblin.com / work.html [Retrieved 2011 / 09 / 25].

KORSTEN, Saskia (2010) "Surfacing Media in the Artwork of David Claerbout", *Reversed Remediation – How Art Can Make One critically Aware of the Workings of Media*, Master's Thesis New in Media and Culture, University of Amsterdam.

LAUREL, Brenda, *ed.* (2003) *Design Research: Methods and Perspectives,* The MIT Press.

LAUREL, Brenda (2011) "Gaian IxD", *Interactions*, Vol. 18, Issue 5, September + October 2011, ACM, NY, US, pp.38-46. DOI 10.1145 / 2008176.2008187

LAZAR, Jonathan, FENG, Jinjuan, HOCHHEISER, Harry (2010) "Research Methods in Human-Computer Interaction", John Wiley & Sons.

LOZANO-HEMMER, Rafael (2006) "Third Person", *Bitforms Gallery*, New York | http: / / www.lozano-hemmer.com / third_person.php [Retrieved 2011 / 03 / 07]

LPN (2003) "Contributo da LPN – Liga para a Protecção da Natureza – para a Elaboração do Livro Branco Sobre Incêndios Florestais", *Conference Incêndios Florestais - 2003: A Reflexão Inadiável*, Liga para a Protecção da Natureza, Coimbra, Portugal, September 26, 2003.

LUKSCH, Manu (2007) "Faceless", *Goodbye Privacy*, Ars Electronica 2007, Linz | http: / / www.ambienttv.net / content / ? q=manuluksch [Retrieved 2010 / 09 / 11].

LUNENFELD, Peter (2003) "The Design Cluster", in LAUREL, Brenda, ed., *Design Research: Methods and Perspectives*, The MIT Press, pp.10-15.

MADEIRA, Rui (2009) *Parque* (Park), Interactive installation, Parque da Paz, Almada, Portugal | http: / / vimeo.com / 4789754 [Retrieved 2011 / 02 / 15].

MAEDA, John (2004) *Creative Code: Aesthetics and Computation,* Thames and Hudson.

MAEDA, John (2006) *The Laws of Simplicity (Simplicity: Design, Technology, Business, Life)*, The MIT Press.

MANN, Steve, NOLAN, Jason, WELLMAN, Barry (2003) "Sousveillance: Inventing and Using Wearable Computing Devices for Data Collection in Surveillance Environments", *Surveillance & Society,* Vol 1, No3, Foucault and Panopticism Revisited, pp.331-355.

MANOVICH, Lev (2001) *From DV Realism to a Universal Recording Machine* | http: / / www.manovich.net / DOCS / reality_media_final.doc [Retrieved 2012 / 04 / 03].

MARKUN, Pedro (2012) "Why is Data Journalism Important?", Transparência Hacker, in GRAY, Jonathan, BOUNEGRU, Liliana, CHAMBERS, Lucy, *eds., The Data Journalism Handbook*, European Journalism Centre, Open Knowledge Foundation.

MARTINS, Guilherme (2010) Robots Family Members, Experimental Robotics | http: / / lab.guilhermemartins.net / 2009 / 11 / 19 / meet-the-new-family-members / [Retrieved 2012 / 03 / 17].

MARTINS, Tiago, NASCIMENTO, Ricardo, ZINGERLE, Andreas, SOMMERER, Christa, MIGNONNEAU, Laurent, CORREIA, Nuno (2009) "Headbang Hero", Proceedings of the *International Conference on Advances in Computer Entertainment Technology (ACE '09)*, ACM, New York, NY, USA, pp.454-454. DOI 10.1145 / 1690388.1690501

MAU, Bruce, LEONARD, Jennifer (2002) *Massive Change*, Institute Without Boundaries, Phaidon Press, New York..

MELEK, Zeki (2007) *Interactive Simulation of Fire, Burn and Decomposition*, PhD Dissertation in Computer Science, Texas A&M University.

MENDES, Mónica (2010) "RTiVISS Real-Time Video Interactive Systems for Sustainability", Proceedings of *5th International Conference Artech 2010* , Guimarães, Portugal, April 22-23, 2010, pp.29-38.

MENDES, Mónica, ÂNGELO, Pedro, CORREIA, Nuno (2011) "Hug@ree: A RTiVISS experience", Proceedings of the *5th International Conference on Tangible, Embedded, and Embodied Interaction, TEI'11,* Art Explorations, Funchal, Portugal, January 25-29, pp.257-260. DOI 10.1145 / 1935701.1935753

MENDES, Mónica, CORREIA, Nuno (2011a) "Big Brother Goes Green: Surveillance for Sustainable Forests", *South by Southwest Interactive Festival*, Austin, USA, March 11-15, 2011 | http: / / schedule.sxsw.com / events / event_IAP6736 [Retrieved 2011 / 09 / 15].

MENDES, Mónica (2011b) "RTiVISS as a Sustainable Design Proposal", position paper, *CHI 2011 Workshop: Sustainable Interaction Design in Professional Domains – Visible – Actionable – Sustainable*, Vancouver, Canada, May7, 2011 | http: / / sustainablehci.wordpress.com [Retrieved 2011 / 09 / 17].

MENDES, Mónica, CORREIA, Nuno, NISI, Valentina, ÂNGELO, Pedro (2011c) "Play with Fire | A Real-Time Video Experience for Sustainability", Proceedings of the *17th International Festival of New Media, Electronic and Digital Arts, ISEA 2011,* Istanbul, Turquey, September 14-21, 2011 | http: / / isea2011.sabanciuniv.edu / paper / play-fire-real-time-video-experience-sustainability [Retrieved 2011 / 12 / 04].

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2011d) "Play with Fire", Proceedings of the *8th International Conference on Advances in Computer Entertainment Technology, ACE '11*, Creative Showcase and Interactive Art, Lisbon, Portugal, November 08-11, 2011. DOI 10.1145 / 2071423.2071530

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2012) "Play with Fire*"*, Proceedings of the ACM conference on Designing Interactive Systems, *DIS2012*, Newcastle, UK, June 13, 2012.

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2012a) "Digital Art, HCI and Environmental Awareness: Evaluating Play with Fire", Proceedings of the *7th Nordic Conference on Human-Computer Interaction*, NordiCHI 2012, Copenhagen, Denmark, October 14–17, 2012, pp.408-417. DOI 10.1145 / 2399016.2399079

MOLLEINDUSTRIA (2011) *Molleindustria - Radical Games Against the Tyranny of Entertainment* | http: / / www.molleindustria.org / en / home [Retrieved 2011 / 04 / 23].

MONDET, Sebastien, *et al.* [2009] "*Compact and Progressive pPant Models for Streaming in Networked Virtual Environments"*, Journal of *Transactions on Multimedia Computing, Communications, and Applications (TOMCCAP)*, Volume 5 Issue 3, August 2009, Article No. 21, ACM New York, NY, USA. DOI 10.1145 / 1556134.1556138

MOORE, Allison (2009) "Paper Cut", Video game, Digital Ludology workshop series – Artistic Projects Exploring Game Creation with Open Source tools, Studio XX 2008-2009, Montréal, Canada | http: / / www.looper.ca / timberjack.html [Retrieved 2012 / 05 / 23].

MOREIRA, Fernando, coord. (2005) Vigilância florestal, detecção e alerta de incêndios florestais e apoio a sistemas de combate, INOV – INESC Inovação, Iniciativa sobre Incêndios Florestais, COTEC | http: / / www.cotecportugal.pt / index.php?option=com_content&task=view&id=1359&Itemid=271 [Retrieved 2010 / 08 / 22].

MOTA, Catarina, MENDES, Mónica, ÂNGELO, Pedro, LOBO, Ricardo (2011) "Audiência Zero", MCD - Musique & Cultures Digitales #62 - Media Labs in Europe, Mapping Places and Networks, pp.40-41.

MUNARI, Bruno (1997) Design & Comunicação Visual: Contribuição para uma Metodologia Didática, São Paulo, Martins Fontes, Transl. Daniel Santana.

NASA (2012) "Fire", Global Maps, NASA Earth Observations – NEO, EOS Project Science Office | http: / / earthobservatory.nasa.gov / GlobalMaps / view.php?d1=MOD14A1_M_FIRE [Retrieved 2012 / 10 / 03].

NIELSEN, Jakob [1993] Usability Engineering, Morgan Kaufmann, San Francisco, US.

NISI, Valentina, OAKLEY, Ian, BOER, Martine (2010) "Locative Narratives as Experience: a new perspective on Location Aware Multimedia Stories", Proceedings of 5th International Conference Artech 2010, Guimarães, Portugal, April 22-23, 2010, pp.59-64.

NORMAN, Donald (1993) Things That Make Us Smart: Defending Human Attributes in the Age of the Machine, Massachusetts, Reading, Perseus Books.

O'SHEA, Chris (2009) Hand from Above, Interactive installation | http: / / www.chrisoshea.org / hand-from-above [Retrieved 2011 / 04 / 23].

O'SULLIVAN, Dan, IGOE, Tom (2004) Physical Computing – Sensing and Controlling the Physical World with Computers, Boston, Thomson Course Technology.

PARKER, Marlon, WILLS, Julia, WIILS, Gary (2012) "RLabs: A South African Perspective on a Community-Driven Approach to Community Informatics", Journal of Community Informatics.

PAUL, Christiane (2003) Digital Art, Thames & Hudson – World of Art, London.

PEDROSA, Fantina, HERRMANN, Maria Lúcia (2007) "Forest Fires in Protected Areas in Portugal and in the State of Santa Catarina (Brazil): Comparative Analysis of Policies of Prevention and Recovery of Burned Areas", Proceedings of 4th International Wildland Fire Conference, Sevilla, Spain, May 13-18, 2007.

PINE, Joseph, GILMORE, James (1998) Welcome to the Experience Economy, Harvard Business Press.

PLEIX (2004) Netlag, World Webcam Map | http: / / www.pleix.net / Netlag [Retrieved 2010 / 07 / 13].

PRASCHAK, Dennis (2010) oneHug, Hochschule Darmstadt, Germany | http: / / www.oneHug.de [Retrieved 2010 / 11 / 25]

PREECE, Jennifer, ROGERS, Yvonne, SHARP, Helen (2011) Interaction Design: Beyond Human - Computer Interaction, 3rd Edition, John Wiley & Sons Ltd.

REAS, Casey, FRY, Ben (2007) Processing: A Programming Handbook for Visual Designers and Artists, MIT Press.

REAS, Casey (2008) "TI, a.k.a. Process 10 (Installation 1)", Digital art installation, in Expanded Box at ARCO Contemporary Art Fair 2008, Madrid, Spain | http: / / reas.com / iperimage.php?section=works&view=2&work=ti_s [Retrieved 2011 / 05 / 16].

REAS, Casey, MCWILLIAMS, Chandler, LUST (2010) Form+Code in Design, Art, and Architecture, Princeton Architectural Press, New York.

REFARM THE CITY (2011) "Tools for Urban Farmers", Refarm the City Project | http: / / www.refarmthecity.org [Retrieved 2011 / 05 / 23].

RHEA, Darrel (2003) "Bringing Clarity to the 'Fuzzy Front End' – A Predictable Process for Innovation", in LAUREL, Brenda, ed., Design Research: Methods and Perspectives, The MIT Press, pp.145-154.

RIBEIRO, Luís Botelho (2004) "Vigilância Electrónica da Floresta", *III Jornadas Ambientais da Beira Interior*, Castelo Branco, February 27, 2004 | http:/ / lusoptel.no.sapo.pt / [Retrieved 2012 / 04 / 27]..

ROY, Niklas (2010) *My Little Piece of Privacy*, Interactive installation | http:/ / www.niklasroy.com / project / 88 / my-little-piece-of-privacy [Retrieved 2011 / 03 / 09].

SCENOCOSME (2011) "Akousmaflore", in *Uncontainable* Exhibition, Curator Lanfranco Aceti, ISEA 2011 – 17th International Symposium Electronic Art, Istanbul, TURKEY, September 12-21, 2011 | http:/ / www.scenocosme.com / akousmaflore_en.htm [Retrieved 2012 / 04 / 27].

SCRIVENER, Steven (2000) "Reflection In and On Action and Practice in Creative-Production Doctoral Projects in Art and Design", *Working Papers in Art and Design 1* | http:/ / sitem.herts.ac.uk / artdes_research / papers / wpades / vol1 / scrivener2.html [Retrieved 2012 / 05 / 02].

SHADE, Leslie (1999) "Roughing It in the Electronic Bush: Community Networking in Canada", *Canadian Journal of Communication*, Vol. 24, No2.

SHEDROFF, Nathan (2001) *Experience Design 1*, New Riders Press.

SHIRKY, Clay (2008) *Here Comes Everybody: The Power of Organizing Without Organizations*, Penguin Press.

SHNEIDERMAN, Ben (1992) *Designing the User Interface: Strategies for Effective Human-Computer Interaction: 2nd Edition*, Addison-Wesley, Reading, MA.

SIER, André (2012) "0 255 0 & k.~ @algoritmos criativos @pavilhão conhecimento, 6 – 26 fev 2012", *s373's blog bits* | http:/ / s373.net / continuum / 2012 / 02 / 06 / 0-255-0-k-algoritmos-criativos-pavilhao-conhecimento / [Retrieved 2012 / 03 / 17].

SILVA, Joaquim, REGO, Francisco, FERNANDES, Paulo, RIGOLOT, Eric, *eds.* (2010) *Towards Integrated Fire Management – Outcomes of the European Project Fire Paradox*, European Forest Institute Research Report 23, Joensuu, Finland.

SMITHSON, Robert (1970) "Robert Smithson", Website by Elyse Goldberg, *James Cohan Gallery*, New York | http:/ / www.robertsmithson.com [Retrieved 2012 / 10 / 12].

SOMMERER, Christa, MIGNONNEAU, Laurent (1996) "MIC Exploration Space", *ATR Media Integration and Communications Research Lab*, Kyoto Japan | http:/ / www.interface.ufg.ac.at / christa-laurent / WORKS / CONCEPTS / MicConcept.html [Retrieved 2012 / 05 / 17].

SOMMERER, Christa, MIGNONNEAU, Laurent (1997) "Interactive Plant Growing", *Media Art History – Media Museum of the ZKM – Center for Art and Media Karlsruhe*, Ed. H-P. Schwarz, Munich / New York, Prestel Verlag,, pp.154-155.

SOMMERER, Christa, MIGNONNEAU, Laurent (2000) "Designing Interfaces for Interactive Artworks", Proceedings of *IEEE KES 2000 Knowledge Based Engineering Systems Conference*, University of Brighton, UK, 2000, pp.80-84.

SØNDERGAARD, Morten, *ed.* (2005) *Get Real: Real Time + Art + Theory + Practice + History*, George Braziller, Inc., NY.

STAFFORD-FRASER, Quentin (2001) "The Life and Times of the First Web Cam," *Communications of the ACM,* July 2001, Vol. 44, No.7 pp.25-26 | http:/ / www.cl.cam.ac.uk / coffee / qsf / cacm200107.html [Retrieved 2011 / 02 / 15].

STANZA (2005) *Fabrica: a VJ System* | http:/ / www.stanza.co.uk / fabrica / [Retrieved 2011 / 02 / 15].

STEINHAUSER, Andreas (2007) "md4-200 drone", *Goodbye Privacy*, Ars Electronica 2007, Linz. | http:/ / 90.146.8.18 / en / archives / festival_archive / festival_catalogs / festival_artikel.asp?iProjectID=14320 [Retrieved 2010 / 05 / 11].

STEINKAMP, Jennifer (2011) *Inspired by Nature: Celebrating the Beauty and Complexity of Trees*, Exhibition at The Vero
Beach Museum of Art, August 26, 2011 – Jan 8, 2012, FL, US |
http:/ / www.mutualart.com / Events / Exhibitions / Inspired-by-Nature--Celebrating-the-
Beau / F355364FA23EEDA3?utm_source=alert_b&utm_medium=email&utm_campaign=al_by_venue#Info
[Retrieved 2011 / 06 / 15].

STULA, Maja, KRSTINIC, Damir, SERIC, Ljiljana (2012) "Intelligent Forest Fire Monitoring System", *Information Systems Front*,
vol. 14, pp.725–739, Springer Science+Business Media. DOI 10.1007 / s10796-011-9299-8

SWEETSER, Penelope, WYETH, Peta (2005) "GameFlow: A Model for Evaluating Player Enjoyment in Games", Magazine of
Computers in Entertainment (CIE) – Theoretical and Practical Computer Applications in Entertainment Archive, Vol. 3
Issue 3, July 2005, ACM New York, NY, USA. DOI 10.1145 / 1077246.1077253

THACKARA, John (2005) *In the Bubble: Designing in a Complex World*, MIT Press.

VARTAN, Starre (2009) "Art in Copenhagen: Helping Contextualize the Abstractions of Climate Change", *Huffington Post*,
December 16 | http:/ / www.huffingtonpost.com / starre-vartan / art-in-copenhagen-helping_b_393846.html
[Retrieved 2010 / 09 / 11].

VESNA, Victoria (1998) "'Another Day in Paradise' and 'Virtual Concrete:' Installation and Telepresence Works", *Leonardo
Journal of the International Society for the Arts*, Vol. 31, Issue 1, February 1998, pp.13-19.

VESNA, Victoria (2001) "Toward a Third Culture: Being in Between", *Leonardo*, Vol. 34, No.2, The MIT Press, pp.121-125.

VESNA, Victoria (2007) *Database Aesthetics: Art in the Age of Information Overflow*, University of Minnesota Press,
Minneapolis, London.

VESNA, Victoria (2011) "Media Artists in Scientific Contexts", Part Three, *Context Providers: Conditions of Meaning in Digital
Arts*, (Co-edited with LOVEJOY, Margot, and PAUL, Christiane), Intellect, UK.

VIEGAS, Domingos, *ed.* (2009) "Recent Forest Fire Related Accidents in Europe", *Centre for Studies on Forest Fires, European
Commission*, Joint Research Centre Institute for Environment and Sustainability, Italy. DOI: 10.2788 / 50781.

VIEIRA, Pedro, MATOS, João (2011) "Forest Fire Finder", *NGNS - Ingenious Solutions* | http:/ / www.ngns-
is.com / html / florestas / fff_descr_eng.html [Retrieved 2012 / 10 / 09].

VIRILIO, Paul (2000) *A Velocidade da Libertação,* Lisboa, Relógio D'Água, transl. Edmundo Cordeiro ("La Vitesse de Libération",
1st ed. 1995).

VIROLAINEN, Antti, *et al.* (2010) "Cool Interaction with Calm Technologies - Experimenting with Ice as a Multitouch Surface",
Proceedings of the *ACM International Conference on Interactive Tabletops and Surfaces 2010 – ITS'10*, ACM, NY, US,
Saarbrücken, Germany, November 07-10, 2010, pp.15-18. DOI 10.1145 / 1936652.1936656

WATSON, Theodore, GOBEILLE, Emily (2007) *Funky Forest*, Interactive Installation |
http:/ / www.theowatson.com / site_docs / work.php?id=41 [Retrieved 2011 / 04 / 23].

WOOLFORD, Kirk (2007) *Will.0.W1sp – Installation Overview*, Live Arts exhibition, Proceedings of the *15th International
Conference on Multimedia*, Germany, pp.379-380.

WOOLFORD, Kirk (2011) "Observing Nature Performing Ecology Gallery", in *Bhaptic* http:/ / www.bhaptic.net / observing-
nature-performing-ecology-gallery [Retrieved 2012 / 10 / 17].

ZOELINER, Michael (2010) *SurveillanceSaver* http:/ / i.document.m05.de / ?page_id=438 | *SurveillanceShaker*
http:/ / i.document.m05.de / ?page_id=668 [Retrieved 2010 / 06 / 23].

APPENDIX

A. Structured Interviews Script

RTiVISS Maçal do Chão, 2011.08.23-25

1. Já presenciou algum incêndio florestal? Se sim, como aconteceu? E o que sentiu durante e depois?

2. Já teve um incêndio florestal numa propriedade sua? Se sim, como aconteceu? E o que sentiu durante e depois?

3. Que causas de incêndios florestais conhece?

4. Na sua opinião, qual ou quais as principais causas de incêndios nesta região?

5. Que formas de prevenção de incêndios conhece?

6. Quais desses métodos estão a ser aplicados nesta região?

7. Na sua opinião, os métodos existentes têm sido eficazes na prevenção dos incêndios?

8. Que medidas e/ou iniciativas sugere para prevenir incêndios com a máxima eficácia?

9. O que lhe parece a participação em experiências/abordagens artísticas?

---

1. Idade _____ **2.** Género ☐ F ☐ M **3.a.** Naturalidade _____ **3.b.** Residência _____

4. Grau de instrução: ☐ Sem escolaridade ☐ 1º ciclo ☐ Ensino Secundário ☐ Licenciatura ☐ Pós-Graduação

5. Considera-se familiarizado com os novos media/tecnologia? ☐ Sim ☐ Não

6. Com que frequência utiliza estas tecnologias? (Seleccionar uma opção: 1=nunca, 2=de mês a mês, 3=semanalmente, 4=diariamente)
Computador 1 2 3 4   Telemóvel 1 2 3 4   Jogos de consola 1 2 3 4   Internet 1 2 3 4

OBRIGADA! :) Mónica Mendes │ RTiVISS [Sistemas Interactivos de Vídeo em Tempo-Real para a Sustentabilidade]

NOTE: Forms are presented in a reduced size (real size of tests on paper is A4).

B. Observation Form

OBSERVATION FORM
INTERACTIVE INSTALLATION

1. User's comments – speaking aloud
1.1 while experiencing the installation
1.2 when passing by or watching the others

2. Interaction | Body language
2.1 Full body (arms and legs)
2.2 Gestures only (arms and hands)
2.3 Walking only

3. Duration of the interaction

| < 30 sec | 30 sec-1 min | 1-2 min | 2-4 min |

4. Experience – In the installation, users
4.1 got closer to watch others interacting
4.2 "read" the captions / mashup news
4.3 entered the interaction space
4.4 activated and acknowledged their presence triggering the sound
4.5 realized they influenced the image in the screen
4.6 used their own mobile phone and added the URL / scanned the QR code
4.7 accessed the mobile application through other's device

General Observations

–--

Demographic Information

| Age group: | a. Up to 12 | b. 12-20 | c. 21-60 | d. 60+ |

Gender: F   M

Location of the exhibition, demo: Urban / Rural

Context: Research demonstration / Artistic exhibition / Experimental unofficial

General observation form used as a basis for observation of participants interacting in *B-Wind!* and *Play with Fire*.

C. Questionnaire Forms

C.1 Hug@ree Questionnaire Forms: Version 1 and 2

Hug@ree / Abraçaum@rvore

TESTE DE USABILIDADE E EXPERIÊNCIA DE UTILIZADOR | 2010.12.10-11

[O objectivo deste teste não é avaliar o participantes, mas sim a qualidade da experiência proporcionada pela instalação. Este questionário é anónimo, apenas solicitamos dados genéricos. Os dados recolhidos são confidenciais e serão utilizados exclusivamente no âmbito da investigação em curso]

CARACTERIZAÇÃO DO PARTICIPANTE

1. Idade _____   2. Género ⍰ F   ⍰ M   3.a. Naturalidade _____   3.b. Nacionalidade _____

4. Grau de instrução: ⍰ Pós-Graduação   ⍰ Licenciatura   ⍰ Ensino Secundário   ⍰ 1º ciclo   ⍰ Sem escolaridade

5. Considera-se familiarizado com os novos media?   ⍰ Sim   ⍰ Não

6. Que tecnologias utiliza? [Nunca=1   Raramente=2   Mensalmente=3   Semanalmente=4   Diariamente=5]
Computador 1 2 3 4 5   Telemóvel 1 2 3 4 5   Jogos de consola 1 2 3 4 5   Internet 1 2 3 4 5

I. APRECIAÇÃO GERAL

1. Qual o grau de envolvimento emocional na experiência?   ⍰ Muito   ⍰ Bastante   ⍰ Algum   ⍰ Pouco   ⍰ Nenhum

2. Qual o nível de satisfação por ter participado na experiência?   ⍰ Muito   ⍰ Bastante   ⍰ Algum   ⍰ Pouco   ⍰ Nenhum

3. Qual a motivação para uma maior aproximação da natureza?   ⍰ Muita   ⍰ Bastante   ⍰ Alguma   ⍰ Pouca   ⍰ Nenhuma

---
II. USABILIDADE

1. Qual o grau de dificuldade de utilização da instalação?   ⍰ Fácil   ⍰ Difícil   ⍰ Razoável

2. O abraço na árvore despoletou o vídeo?   ⍰ Sim   ⍰ Não

3. Interagiu com o vídeo no ecrã?   ⍰ Sim   ⍰ Não

4. A tarefa é explicita?   ⍰ Sim   ⍰ Não

5. As indicações eram claras?   ⍰ Sim   ⍰ Não

6. O objectivo está explícito?   ⍰ Sim   ⍰ Não

7. A velocidade da reacção da interface satisfaz?   ⍰ Sim   ⍰ Não

8. Prefere controlar a interface num ecrã ou preferia tocar numa projecção na parede?
⍰ Ecrã   ⍰ Projecção   ⍰ Outro/a _____

9. A escala da interface é adequada?   ⍰ Sim   ⍰ Não

10. Prefere esta escala reduzida à medida de uma janela ou preferia ter uma dimensão para interacção mais próximo da escala real?
⍰ Escala reduzida   ⍰ Escala real   ⍰ É Indiferente

11. Sentiu feedback do seu abraço?   ⍰ Sim   ⍰ Não

12. Gostaria de ter feedback da árvore?   ⍰ Sim   ⍰ Não   ⍰ É Indiferente

14. A interacção foi agradável?   ⍰ Sim   ⍰ Não   ⍰ Indiferente

Hug@ree test form version 1, *Pop Up* in Lisbon [applied in (a)].

III. INTERACÇÃO E EXPERIÊNCIA SUBJECTIVA

1. Numere sequencialmente as acções que correspondem à sua experiência (a partir de 1):
☐ Chegar à sala da instalação   ☐ Seguir as indicações no interior   ☐ Abraçar a árvore   ☐ Interagir com o ecrã para deslocar
o vídeo para a folhagem da árvore   ☐ Ler a legenda na árvore   ☐ Ver a restante exposição

2. Que interacção houve com o vídeo?
☐ Tocar no ecrã para deslocar o seu vídeo para a folhagem   ☐ Interagir com outros videos   ☐ Experimentar desenhos/configurações

3. Quanto tempo demorou o abraço (contacto com a árvore)?_____

4. Quanto tempo demorou o total da experiência da instalação (interior+exterior)?_____

5. Gostaria que tivesse demorado mais ou menos tempo? Porquê?_____

IV. RESULTADOS

1. Após esta experiência, como vai olhar para as árvores?☐ Exactamente da mesma maneira   ☐ Possivelmente, de outra maneira...
☐ Seguramente, de forma diferente; se desejar, especifique_____

2. Poderá a arte ser um meio para uma aproximação do ser humano com a natureza?   ☐ Sim   ☐ Não   ☐ Talvez

3. Poderá a tecnologia ser um meio para uma aproximação do ser humano com a natureza?   ☐ Sim   ☐ Não   ☐ Talvez

4. Poderá a conjugação arte & tecnologia ser um meio para aproximação do ser humano com a natureza? ☐ Sim   ☐ Não   ☐ Talvez

5. Poderá a conjugação arte & tecnologia ser um meio para consciencialização em relação às alterações climáticas? ☐ Sim   ☐ Não   ☐ Talvez

6. Gostaria de poder acompanhar online a evolução da instalação?   ☐ Sim   ☐ Não

7. Tenciona voltar a esta instalação?   ☐ Sim, para_____   ☐ Não   ☐ Talvez

8. Gostaria de ter esta mesma experiência em locais diferentes?   ☐ Sim. Por exemplo:_____   ☐ Não

9. Gostaria de vir a participar na implementação desta instalação noutro contexto?
☐ Sim. Por exemplo:_____   ☐ Não

10. Anteriormente a esta experiência, alguma vez tinha abraçado uma árvore?   ☐ Sim   ☐ Não

11. Após esta experiência, pensa vir a abraçar outras árvores?   ☐ Sim   ☐ Não   ☐ Talvez

---
V. COMENTÁRIOS / SUGESTÕES

1. A partir da sua experiência/interacção, será esta abordagem eficaz para trazer este tema à superfície?
_____

2. Esta experiência poderá contribuir para alguma mudança de atitude? Se sim, em que sentido?
_____

3. Se desejar, deixe aqui os seus comentários/sugesões:_____
_____
_____

---
*OBRIGADA*OBRIGADO*
 Hug@ree | Mónica Mendes, Pedro Ângelo e Nuno Correia

Abraçaum@rvore [*Hug@ree*] Maçal do Chão, 2011.08.24-25

» Quais as 3 primeiras palavras que lhe ocorrem para descrever:

... a experiência que teve? _____ _____ _____

... esta instalação? _____ _____ _____

I. Seleccione um valor de 1 (mínimo) a 5 (máximo) na sua resposta:

I.1. Qual o seu envolvimento emocional nesta experiência?	1	2	3	4	5
I.2. Qual o nível de satisfação por ter abraçado a árvore?	1	2	3	4	5
I.3. Qual a motivação para uma maior aproximação da natureza?	1	2	3	4	5

II.1. Interagiu com o seu video no ecrã? ☐ Sim   ☐ Sim, e com outros videos também   ☐ Não

II.2. Registou alguma informação no seu clip?
☐ Sim, o meu nome   ☐ Sim, uma mensagem   ☐ Sim, o email   ☐ Não, porque _____

—

III.1. O objectivo da instalação é explícito? ☐ Sim   ☐ Não

IV. 1. Após esta experiência, como olha para as árvores? ☐ Da mesma maneira   ☐ De forma diferente

IV. 1.1. Se desejar, especifique: _____

IV. 2. Após esta experiência, como sente a sua ligação à natureza? ☐ Na mesma   ☐ Mais próxima   ☐ Mais distante

IV.2.1. Se desejar, especifique: _____

IV.3. Gostava de interagir com uma versão desta instalação na Internet? ☐ Sim   ☐ Não

IV.4. Voltaria a esta instalação? ☐ Não   ☐ Sim, para _____

IV.5. Aplicaria esta experiência em locais diferentes? ☐ Não   ☐ Sim. Por exemplo: _____

IV.6.. Antes desta experiência, alguma vez tinha abraçado uma árvore? ☐ Sim   ☐ Não

IV.7. E após esta experiência, pensa vir a abraçar outras árvores? ☐ Sim   ☐ Não

Hug@ree test forms version 2, *Summer* at Maçal do Chão [adult version, applied in (b) and adapted to past tense for (c)].

ABRAÇAUM@RVORE » COMENTÁRIOS / SUGESTÕES

V.1. Que temas lhe sugere esta experiência?

_____

_____

_____

V.2. Como poderá esta experiência contribuir para alguma mudança de atitude?

_____

_____

_____

V.3. Se desejar, deixe aqui os seus comentários/sugestões:

_____

_____

_____

---

1. Idade _____   **2**. Género ☐ F ☐ M   **3.a**. Naturalidade _____   **3.b**. Residência _____

4. Grau de instrução: ☐ Sem escolaridade   ☐ 1º ciclo   ☐ Ensino Secundário   ☐ Licenciatura   ☐ Pós-Graduação

5. Considera-se familiarizado com os novos media/tecnologia? ☐ Sim   ☐ Não

6. Com que frequência utiliza estas tecnologias? (Seleccionar uma opção: 0=nunca, 1=de mês a mês, 2=semanalmente, 3=diariamente)
Computador 0 1 2 3   Telemóvel 0 1 2 3   Jogos de consola 0 1 2 3   Internet 0 1 2 3

OBRIGADA! Mónica Mendes, Pedro Ângelo e Nuno Correia | Abraçaum@rvore [*Hug@ree*] » Uma Experiência RTiVISS

Abraçaum@rvore [*Hug@ree*] Maçal do Chão, 2011.08.24-25

» Quais as 3 primeiras palavras que dizem o que sentiste?

1. _____   2. _____   3. _____

» E 3 palavras que expliquem o que aconteceu?

1. _____   2. _____   3. _____

I.1. O que achaste desta experiência?   ☐ Gostei   ☐ Não gostei

I.2. E o que achaste de ter abraçado a árvore?   ☐ Gostei   ☐ Não gostei

---
II.1. Mexeste no teu video no ecrã?   ☐ Sim   ☐ Sim, e nos outros videos também   ☐ Não

II.2. Escreveste alguma coisa no teu video?

☐ Sim: _____   ☐ Não, porque _____

—
IV. 1. Depois desta experiência, como olhas para as árvores?   ☐ Na mesma   ☐ De maneira diferente

IV. 1.1. Se quiseres, explica como: _____

IV.3. Gostavas de ver esta instalação na Internet?   ☐ Sim   ☐ Não

IV.4. Voltavas a esta instalação?   ☐ Não   ☐ Sim, para _____

IV.5. Achas que devia aplicar em locais diferentes?   ☐ Não   ☐ Sim. Por exemplo: _____

IV.6. Já alguma vez tinhas abraçado uma árvore?   ☐ Sim   ☐ Não

IV.7. E depois desta experiência, vais abraçar outras árvores?   ☐ Sim   ☐ Não

Hug@ree test forms version 2, *Summer* at Maçal do Chão [children version, applied in (b) and adapted to past tense for (c)].

ABRAÇAUM@RVORE » OPINIÂO / IDEIAS

V.1. O que te apetece dizer sobre esta experiência?

_____

_____

_____

V.2. Como farias tu se quisesses que as pessoas ficassem mais amigas das árvores?

_____

_____

_____

V.3. Queres deixar mais algumas ideias para esta instalação?

_____

_____

_____

---

1. Idade _____   2. Género ☐ F   ☐ M   3.a. Naturalidade _____   3.b. Residência _____

4. Grau de instrução: ☐ Pré-escolar   ☐ 1º ciclo   ☐ Ensino Secundário

5. Estás à vontade com os novos media/tecnologia?   ☐ Sim   ☐ Não

6. Quantas vezes usas estas tecnologias? (Seleccionar uma destas: 0=nunca, 1=de mês a mês, 2=semanalmente, 3=diariamente)
Computador 0   1   2   3   Telemóvel 0   1   2   3   Jogos de consola 0   1   2   3   Internet 0   1   2   3

OBRIGADA! Mónica Mendes, Pedro Ângelo e Nuno Correia | Abraçaum@rvore [*Hug@ree*] » Uma Experiência RTiVISS

Hug@ree at Sci|Art » 10 months later

Sci|Art NanoLab "Imagine the impossible – exploring Art and Science in Los Angeles" | UCLA, June 19 - July 1, 2011

[The aim of this test is to evaluate the installation experience, not the participants. The questionnaire is anonymous, and the data collected will be used exclusively in the scope of this research]

» What are the first 3 words that come to your mind to describe: ... the experience?

» What are the first 3 words that come to your mind to describe: ... the Hug@ree installation?

I. Rate the following aspects from 1 (minimum) to 5 (maximum):

I.1. What was your emotional engagement in this experiment?

1 2 3 4 5

[-] ◯ ◯ ◯ ◯ ◯ [+]

I.2. What was your level of satisfaction for having hugged the tree?

1 2 3 4 5

[-] ◯ ◯ ◯ ◯ ◯ [+]

I.3. After that, what was your motivation for a closer contact with nature?

1 2 3 4 5

[-] ◯ ◯ ◯ ◯ ◯ [+]

II.1. Have you interacted with your video on the screen?
☐ Yes
☐ No
☐ Yes, and I have interacted with the other videos, too

III.1. Was the purpose of the installation explicit?
☐ Yes
☐ No

IV. 1. After the experience, how do you look at trees?
☐ The same way
☐ Differently

IV. 1.1. If desired, specify:

Hug@ree test forms version 2 online, *Sci | Art* in LA, ten months later » http: / / goo.gl / XLDOs [applied in (d)].

IV. 2. After the experience, how do you feel your connection to nature?
- ☐ The same
- ☐ Closer
- ☐ Farther

IV. 2.1. If you wish, specify:

IV.3. Would you like to interact with the community of the Hug@ree installation in the Internet?
- ☐ Yes
- ☐ No

V.4. Would you return to the Hug@ree installation?
- ☐ No
- ☐ Yes

V.4.1. If yes, in order to...

IV.5. Would you apply this experience in different places?
- ☐ No
- ☐ Yes

V.5.1. If yes, can you give example(s)?

IV.6. Before this experience, had you ever hug a tree before?
- ☐ Yes
- ☐ No

IV.7. After the experience, have you hugged other trees?
- ☐ Yes
- ☐ No

Comments & Suggestions

V.1. What themes did the experience suggest to you?

V.2. In your opinion, what were "the best" and "the worst" of this installation?

V.3. In what way(s) could this experience promote attitude change?

V.4. If you wish, please leave your comments/suggestions here:

General Data

1. Age

2. Gender
○ F
○ M

3.a. Birth place

3.b. Home town

4. Level of education:
○ High School Graduate
○ University Graduate
○ Post-Graduate

5. Are you familiar with new media / technology?
○ Yes
○ No

6.a. How often do you use the computer?
(Select one option: 0 = never, 1 = every month, 2 = weekly, 3 = daily)
　　　0　1　2　3
never ○ ○ ○ ○ daily

6.b. How often do you use the mobile phone?
(Select one option: 0 = never, 1 = every month, 2 = weekly, 3 = daily)
　　　0　1　2　3
never ○ ○ ○ ○ daily

6.c. How often do you use console games?
(Select one option: 0 = never, 1 = every month, 2 = weekly, 3 = daily)
　　　0　1　2　3
never ○ ○ ○ ○ daily

6.d. How often do you use the Internet?
(Select one option: 0 = never, 1 = every month, 2 = weekly, 3 = daily)
　　　0　1　2　3
never ○ ○ ○ ○ daily

THANK YOU! Mónica Mendes, Pedro Ângelo, Nuno Correia | Hug@ree » An ARTiVIS experience

(Submit)

Powered by Google Docs

Play with Fire [*Brinca com o Fogo*] Mostra AZ | Guimarães, 2011.12.17-18

» Quais as 3 primeiras palavras que lhe ocorrem para descrever:

... a experiência que teve? _____ _____ _____

... esta instalação? _____ _____ _____

I. Seleccione um valor de 1 (mínimo) a 4 (máximo) na sua resposta: [–] [+]

I.1. Qual o seu envolvimento emocional nesta experiência? 1 2 3 4

I.2. Qual o nível de satisfação por ter brincado com o fogo? 1 2 3 4

I.3. Qual grau de consciência em relação às consequências? 1 2 3 4

I.4. Qual a motivação para uma maior aproximação da natureza? 1 2 3 4

II.1. Interagiu com o fogo? ☐ Sim ☐ Não

II.2. Acedeu à aplicação móvel na parte final do Play with Fire?
☐ Sim, através da marca visual [QR code] ☐ Sim, pelo endereço [URL] ☐ Não, porque _____

II.3. Que dispositivo utilizou ou tenciona utilizar para aceder à componente online?
☐ Telemóvel ☐ Computador ☐ Outro: _____ ☐ Nenhum

—

III.1. O objectivo da instalação é explícito? ☐ Sim ☐ Não

IV. 1. Após esta experiência, como olha para as florestas? ☐ Da mesma maneira ☐ De forma diferente
IV. 1.1. Se desejar, especifique: _____

IV. 2. Após esta experiência, como sente a sua ligação à natureza? ☐ Na mesma ☐ Mais próxima ☐ Mais distante
IV.2.1. Se desejar, especifique: _____

IV.3. Gostava de interagir com a comunidade desta instalação na Internet? ☐ Sim ☐ Não

V.4. Voltaria a esta instalação? ☐ Não ☐ Sim, para _____

IV.5. Aplicaria esta experiência em locais diferentes? ☐ Não ☐ Sim. Por exemplo: _____

IV.6. Antes desta experiência, alguma vez tinha lidado com incêndios florestais? ☐ Sim ☐ Não

IV.7. Após esta experiência, pensa vir a acompanhar a regeneração da floresta ardida através da aplicação móvel ?
☐ Não ☐ Sim, com a seguinte frequência _____

Play with Fire test form version 1, *AZ Labs* showcase in Guimarães [applied in (a)].

PLAY WITH FIRE [BRINCA COM O FOGO] » Uma Experiência ARTiVIS

V.1. Que temas lhe sugere esta experiência?

_____
_____
_____

V.2. Quais foram para si "o melhor" e "o pior" desta instalação?

_____
_____
_____

V.3. Como poderá esta experiência contribuir para alguma mudança de atitude?

_____
_____
_____

V.4. Se desejar, deixe aqui os seus comentários/sugestões:

_____
_____
_____

---

1. Idade _____   **2**. Género ☐ F   ☐ M   **3.a**. Naturalidade _____   **3.b**. Residência _____

4. Grau de instrução: ☐ Sem escolaridade   ☐ 1º ciclo   ☐ Ensino Secundário   ☐ Licenciatura   ☐ Pós-Graduação

5. Considera-se familiarizado com os novos media/tecnologia?   ☐ Sim   ☐ Não

6. Com que frequência utiliza estas tecnologias? (Seleccionar uma opção: 0=nunca, 1=de mês a mês, 2=semanalmente, 3=diariamente)
Computador 0   1   2   3   Telemóvel 0   1   2   3   Jogos de consola 0   1   2   3   Internet 0   1   2   3

OBRIGADA! Mónica Mendes, Pedro Ângelo, Valentina Nisi, Nuno Correia + Filipe Cruz, Ricardo Webbens

Play with Fire

[O objectivo deste teste é avaliar a experiência proporcionada pela instalação, e não os participantes. O questionário é anónimo, e os dados recolhidos serão utilizados exclusivamente no âmbito desta investigação]

» Quais as 3 primeiras palavras que ocorrem para descrever:

... a experiência que teve? _____ _____ _____

... esta instalação? _____ _____ _____

Classifique as seguintes afirmações, de 1 (Discordo completamente) a 7 (Concordo completamente):

		Discordo completamente					Concordo completamente	
V.4.	Ao interagir senti como se estivesse num jogo.	1	2	3	4	5	6	7
II.2.	Um incêndio florestal é muito fácil de começar e muito difícil de recuperar.	1	2	3	4	5	6	7
II.3.	Esta experiência traz o tema dos fogos florestais à superfície.	1	2	3	4	5	6	7
IV.5.	Fiquei com mais conhecimentos acerca da floresta apresentada.	1	2	3	4	5	6	7
V.2.	Uma mensagem desta seriedade não consegue passar através de um jogo.	1	2	3	4	5	6	7
III.1.	Envolvi-me emocionalmente nesta experiência.	1	2	3	4	5	6	7
III.4.	As consequências de interagir com o fogo deixaram-me triste.	1	2	3	4	5	6	7
II.3.	O som contribuiu para a sensação de imersão no incêndio.	1	2	3	4	5	6	7
I.3.	Esta instalação inspira as pessoas a serem incendiários.	1	2	3	4	5	6	7
II.1.	Com esta experiência tornei-me mais consciente dos danos causados pelo fogo.	1	2	3	4	5	6	7
IV.1.	A proximidade das chamas contribuiu para o impacto da experiência.	1	2	3	4	5	6	7
I.4.	Esta instalação inspira as pessoas a cuidar da floresta.	1	2	3	4	5	6	7
IV.2.	As chamas eram fascinantes.	1	2	3	4	5	6	7
IV.5.	Saber que o vídeo da floresta é em tempo real contribuiu para a emoção da interacção.	1	2	3	4	5	6	7
I.5.	Após esta experiência, olho para as florestas de uma forma mais consciente.	1	2	3	4	5	6	7
VI.2.	As chamas seguiam os meus movimentos.	1	2	3	4	5	6	7
V.1.	A brincadeira sobrepõe-se à consciencialização ambiental.	1	2	3	4	5	6	7

*Play with Fire t*est form version 2, *Pop Up Guimarães 2012* exhibition in Guimarães [applied in (b), (c) and (d)] Al left, key code of the questions that were randomly ordered .

		Discordo completamente						Concordo completamente	

VI.4.   Após esta experiência, gostaria de seguir a recuperação da floresta no meu telemóvel.   1   2   3   4   5   6   7

I.2.   Esta instalação promove a consciencialização para a sustentabilidade ambiental.   1   2   3   4   5   6   7

V.3.   Os jogos e simulações interactivas deste género contribuem para mudança de atitude.   1   2   3   4   5   6   7

III.5.   Voltaria a esta instalação.   1   2   3   4   5   6   7

I.1.   Após esta experiência, sinto-me motivado para um contacto mais próximo com a natureza.   1   2   3   4   5   6   7

V.5.   Esta experiência é apenas um jogo.   1   2   3   4   5   6   7

III.2.   Senti-me satisfeito ao brincar com o fogo.   1   2   3   4   5   6   7

VI.1.   Fui capaz de pegar fogo à floresta.   1   2   3   4   5   6   7

II.4.   Esta experiência tornou-me consciente em relação às consequências dos incêndios.   1   2   3   4   5   6   7

II.5.   A floresta demora tanto tempo a recuperar de um incêndio quanto tempo demorou a arder.   1   2   3   4   5   6   7

III.3.   Brincar com o fogo é só diversão.   1   2   3   4   5   6   7

IV.4.   A floresta parecia mesmo queimada.   1   2   3   4   5   6   7

VI.3.   Na instalação, percebi o que era suposto fazer.   1   2   3   4   5   6   7

Quais foram para si "o melhor" e "o pior" desta instalação?

_____

_____

Se desejar, deixe aqui os seus comentários/sugestões:

_____

_____

---

1. Idade _____   **2**. Género ☐ F ☐ M   **3.a**. Naturalidade _____   **3.b**. Local de residência _____

4. Grau de instrução: ☐ Sem escolaridade   ☐ 1º ciclo   ☐ Ensino Secundário   ☐ Licenciatura   ☐ Pós-Graduação

5. Considera-se familiarizado com os novos media/tecnologia?   ☐ Sim   ☐ Não

6. Com que frequência utiliza estas tecnologias? (Seleccionar uma opção: 0=nunca, 1=mensalmente, 2=semanalmente, 3=diariamente)
Computador 0   1   2   3   Telemóvel 0   1   2   3   Jogos de consola 0   1   2   3   Internet 0   1   2   3

OBRIGADA! Mónica Mendes, Pedro Ângelo, Valentina Nisi, Nuno Correia

Play with Fire » M-ITI

An ARTiVIS interactive installation presented in the scope of the connection with the SINAIS project | Madeira, 2012

[The aim of this test is to evaluate the installation experience, not the participants. The questionnaire is anonymous, and the data collected will be used exclusively in the scope of this research]

» What are the first 3 words that come to your mind to describe: ... the experience?

» What are the first 3 words that come to your mind to describe: ... the installation?

Rate the following statements from 1 (completely disagree) to 7 (completely agree):

When I was interacting I felt like I was in a game.

1 2 3 4 5 6 7
completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

A forest fire is very easy to start and very difficult to recover.

1 2 3 4 5 6 7
completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

This experience brings the issue of forest fires to the surface.

1 2 3 4 5 6 7
completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

I became more knowledgeable about the forest presented.

1 2 3 4 5 6 7
completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

A message of this seriousness can not pass through a game.

1 2 3 4 5 6 7
completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

I became emotionally involved in this experiment.

1 2 3 4 5 6 7
completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

The consequences of interacting with the fire made me sad.

1 2 3 4 5 6 7
completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

The sound contributed to the sense of immersion in fire.

1 2 3 4 5 6 7
completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

Play with Fire test form version 2 online in English, to be applied in future tests in Madeira » http: / / goo.gl / WcOGf

This installation inspires people to become arsonists.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

With this experience I became more aware of the damages caused by fire.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

The proximity of the flames contributed to the impact of the experiment.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

This installation inspires people to take care of the forest.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

The flames were fascinating.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

Knowing that the forest video is in real time contributed to the excitement of interaction.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

After this experience, I look at the forest in a more conscious way.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

The flames followed my movements.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

Playing took precedence over environmental awareness.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

After this experience, I would like to follow the recovery of the forest in my phone.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

This installation promotes awareness on environmental sustainability.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

Games and interactive simulations of this kind contribute to attitude change.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

I would return to this installation.

          1 2 3 4 5 6 7

completely disagree ◯ ◯ ◯ ◯ ◯ ◯ ◯ completely agree

After this experience, I feel myself motivated to a closer contact with nature.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

This experience is just a game.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

I was pleased to play with fire.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

I was able to set fire to the forest.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

This experience made me aware about the consequences of forest fires.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

The forest takes as much time to recover from a fire as it took to burn.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

Playing with fire is just fun.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

The forest looked really burnt.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

In the installation, I realized what was supposed to do.

1 2 3 4 5 6 7

completely disagree ○ ○ ○ ○ ○ ○ ○ completely agree

Comments & Suggestions

In your opinion, what were "the best" and "the worst" of this installation?

If you wish, please leave your comments/suggestions here:

General Data

1. Age

[_____]

2. Gender
- ○ F
- ○ M

3.a. Birth place

[_____]

3.b. Home town

[_____]

4. Level of education
- ○ High School Graduate
- ○ University Graduate
- ○ Post-Graduate

5. Are you familiar with new media / technology?
- ○ Yes
- ○ No

6.a. How often do you use the computer?
(Select one option: 0 = never, 1 = every month, 2 = weekly, 3 = daily)

    0 1 2 3

never ○ ○ ○ ○ daily

6.b. How often do you use the mobile phone?
(Select one option: 0 = never, 1 = every month, 2 = weekly, 3 = daily)

    0 1 2 3

never ○ ○ ○ ○ daily

6.c. How often do you use console games?
(Select one option: 0 = never, 1 = every month, 2 = weekly, 3 = daily)

    0 1 2 3

never ○ ○ ○ ○ daily

6.d. How often do you use the Internet?
(Select the option: 0 = never, 1 = every month, 2 = weekly, 3 = daily)

    0 1 2 3

never ○ ○ ○ ○ daily

The team of this ARTiVIS experience thanks your participation Mónica Mendes, Pedro Ângelo, Valentina Nisi, Nuno Correia |
http://playwithfire.artivis.net

[Submit]

Powered by Google Docs

D. Photo Documentation Archive Published Online
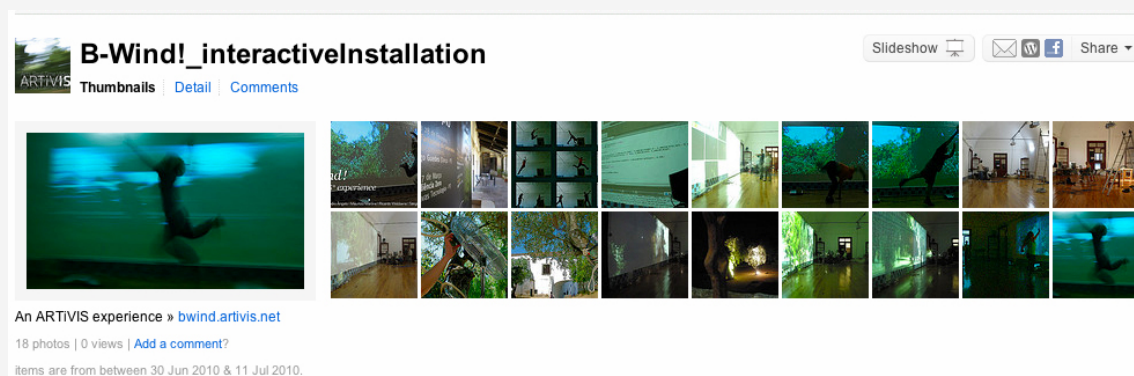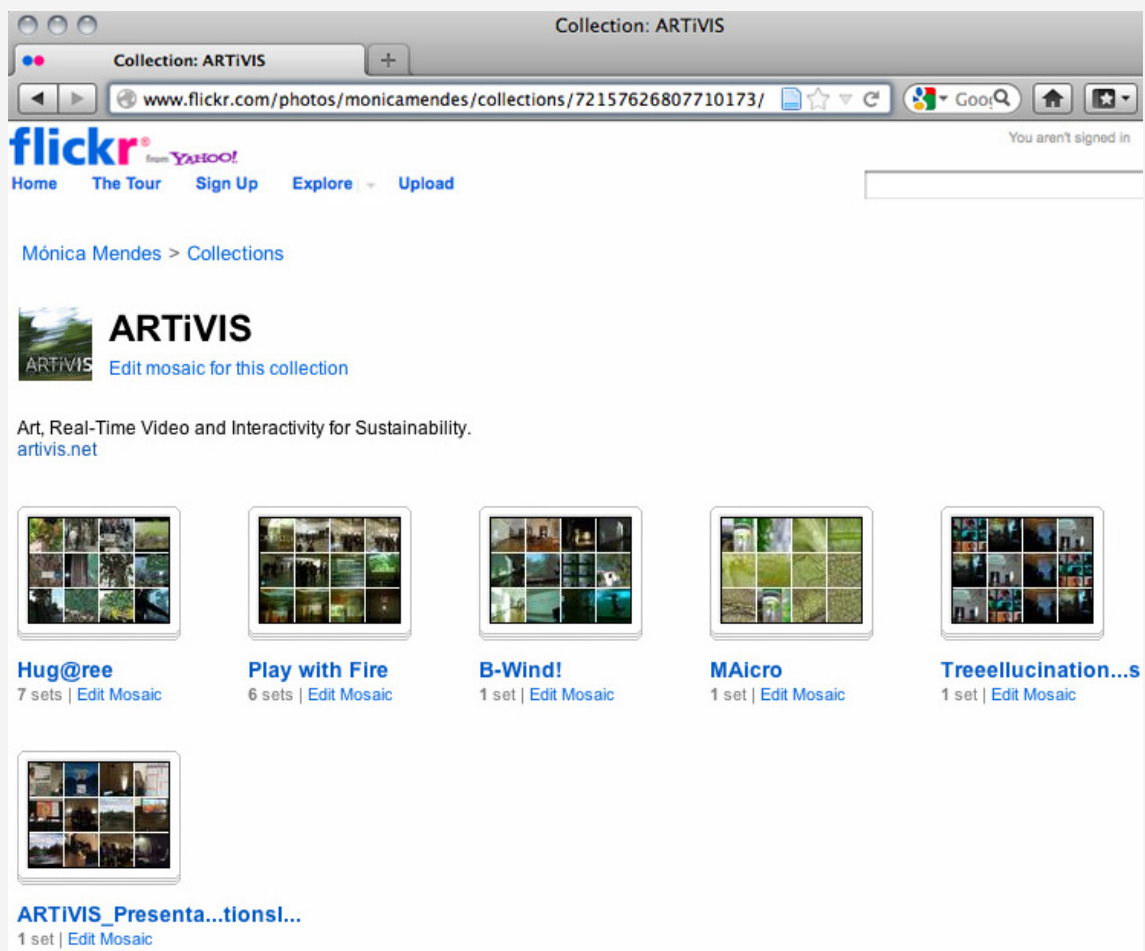
ARTiVIS photos index » http: / / artivis.net / archive / photos /

Hug@ree_AZsprint

Thumbnails | Detail | Comments

Have you ever…? Hug@ree and engage into a playful symbiotic relationship with nature, for "Everyone should hug a real tree every now and then"

Hug@ree is an interactive installation that provides an experience of complicity between urban beings and the forest. Participants hug a real tree, triggering their registration in the virtual world for further interaction.

87 photos | 51 views | Add a comment?

items are from between 24 Sep 2010 & 28 Sep 2010.
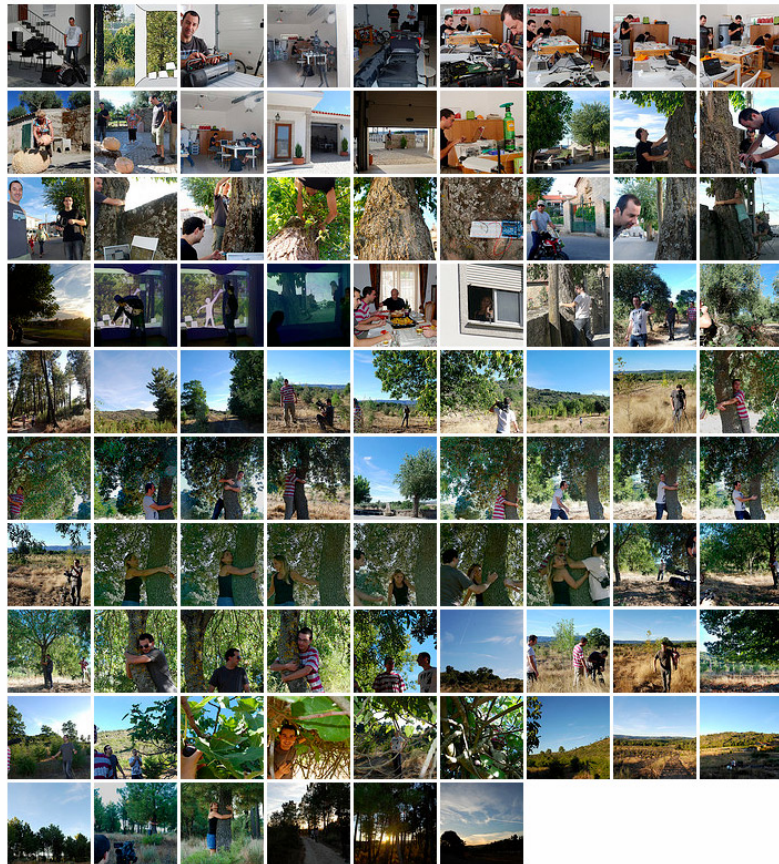
Hug@ree_PopupSetup

Thumbnails | Detail | Comments
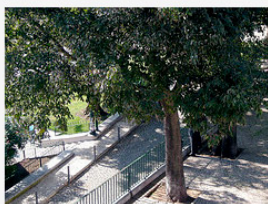
Setting up Hug@ree interactive installation for the Pop Up City Lisbon 2010 exhibition

37 photos | 75 views | Add a comment?

items are from between 21 Oct 2010 & 22 Oct 2010.
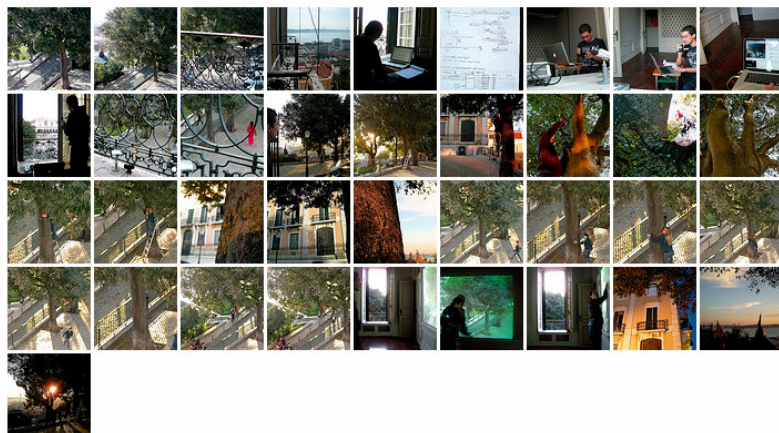
Hug@ree_PopUp tests days

Thumbnails | Detail | Comments

Slideshow | Share ▾
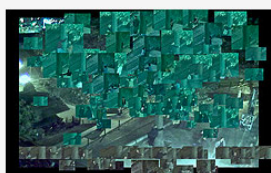
Hug@ree footage and user experience tests day. The interactive installation is setup at Pop Up exhibition, in Lisbon, Santa Catarina palace [2010, Nov4-Dec11]

A big RTiVISS hug to the participants
Thank you so much for the feedback and for spending some extra time with the tests :)

+ info on the research iterations blog »
www.rtiviss.com

53 photos | 26 views | Add a comment?

items are from between 01 Dec 2010 & 08 Dec 2010.
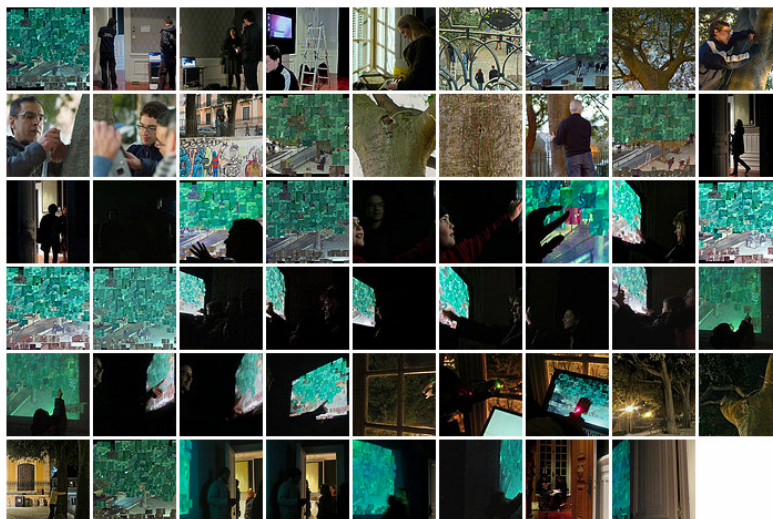
Hug@ree_PopUp final days

Thumbnails | Detail | Comments

Slideshow | Share ▾

Hug@ree footage and user experience during the last days at Pop Up exhibition. The interactive installation was setup in Lisbon, Palácio de Santa Catarina [Nov4-Dec11, 2010].

A big RTiVISS hug to all the visitors
Thank you for participating on this RTiVISS experience and for your feedback {[()]}

+ info on the research iterations blog »
www.rtiviss.com

79 photos | 41 views | Add a comment?

items are from between 04 Dec 2010 & 20 Dec 2010.
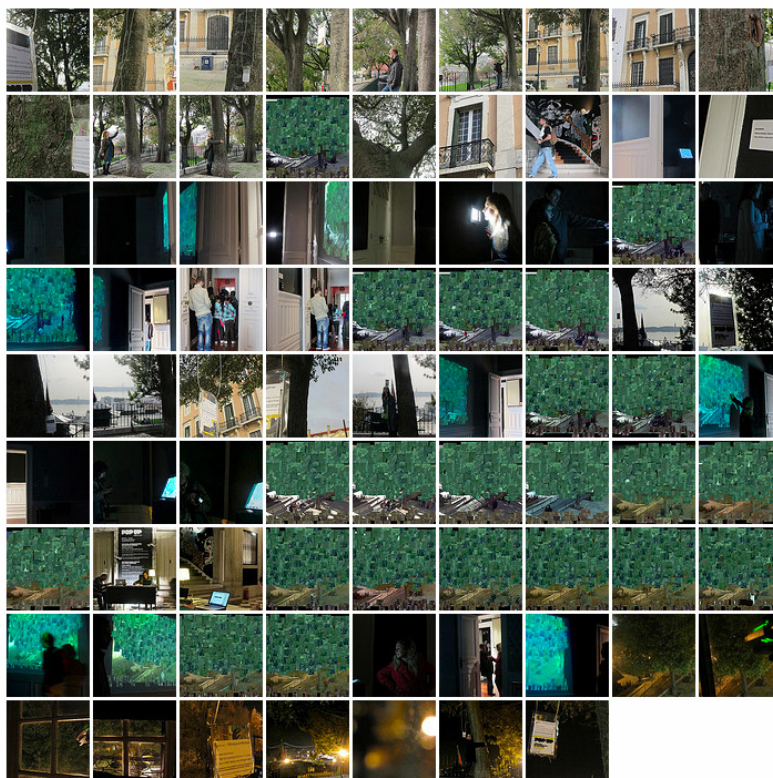
Hug@ree_mostra AZ

Thumbnails | Detail | 1 comment

Share ▾

At the AZ Labs hackmeet and exhibition
www.audienciazero.org we had the the need
to bring a tree indoors, since we didn't have
any outside. This was the opportunity to
premiere the Hug@ree portable version with a
5-year old elm bonsai. Special thanks to all
altLab, LCD and xDA members who have
been collaborating in this interactive
installation :)))

65 photos | 142 views | Add a comment?

items are from between 18 Dec 2010 & 28 Dec
2010.
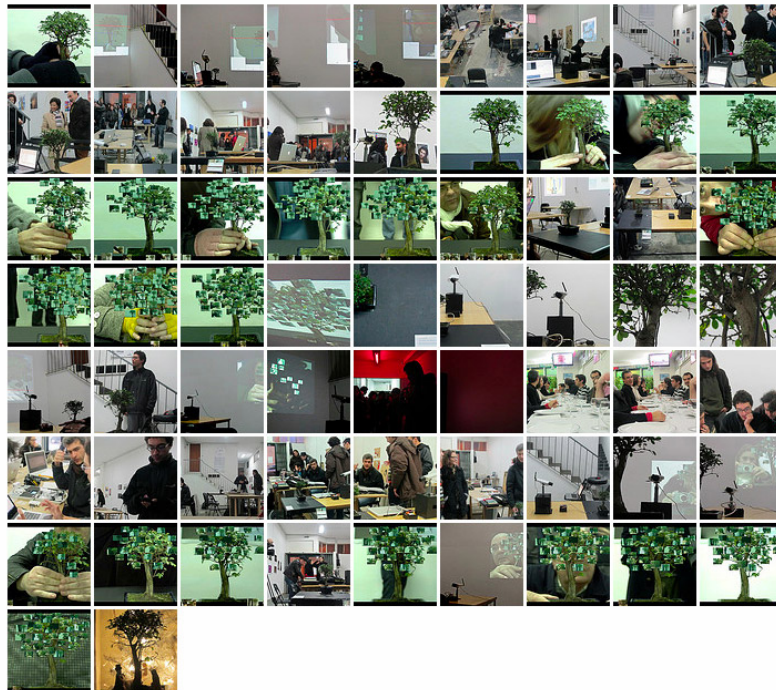
Hug@ree_TEI

Thumbnails | Detail | Map | Comments

Slideshow

Share ▾

The RTiVISS experience Hug@ree at TEI
2011 in Madeira, Jan23-26 2011.
+info » hugatree.artivis.net and check the blog
posts, too »
monicamendes.wordpress.com/category/rtiv
iss/hugree-rtivis...

74 photos | 62 views | Add a comment?

items are from between 21 Jan 2011 & 20 Aug
2011.
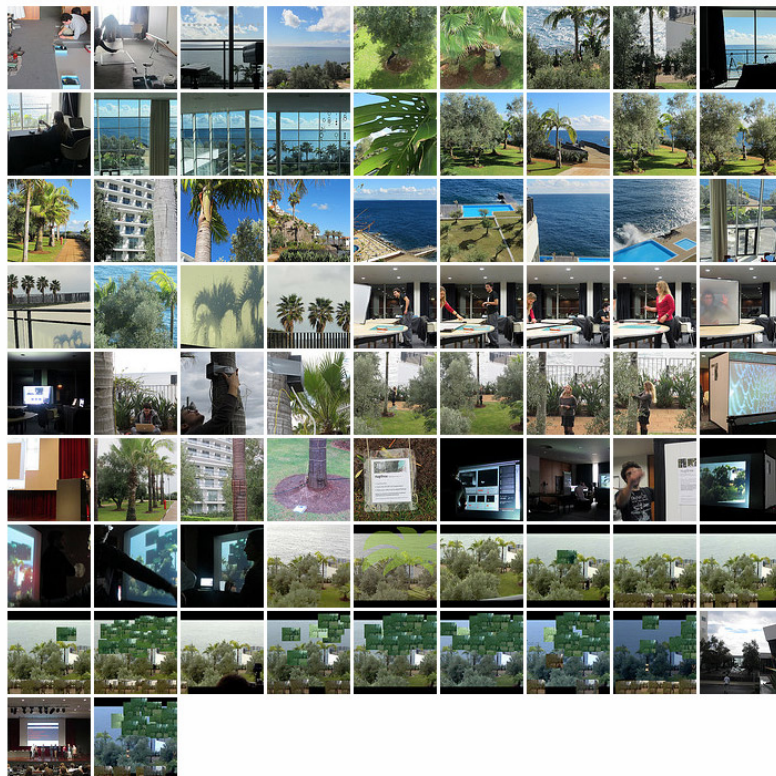
Hug@ree at Sci|Art, UCLA

Thumbnails | Detail | Comments

Share ▾

A Hug@ree node was installed at the UCLA Court of Sciences in the scope of the Summer Institute program of the Sci|Art NanoLab. The instrumented tree is a "Bidwill Brachychiton", from Australia, and in the whole week of play it was our special tree.

Hug@ree at Sci|Art "Imagine the impossible– exploring Art and Science in Los Angeles", June 2010 »
hugatree.artivis.net/hugatree_sciart.htm l

73 photos | 0 views | Add a comment?

items are from between 20 Jun 2011 & 01 Jul 2011.

Hug@ree at ArtropoCode 20110716-17

Thumbnails | Detail | Comments

Share ▾

Hug@ree was demonstrated during ArtropoCode, "1º Encontro de tecedeiras de código livre" (1st meeting of libre code weavers), a digital art and open source software event.
In the chillout extension, Hug@ree became an extra entertainment during the night, grabbing surprising screenshots with the VJ performance and the participants dancing scenario!

Santiago de Compostela, July 15-17, 2011

Get the full story from the blog »
monicamendes.wordpress.com/2011/07/17/hu gree-demo-at-artr...

90 photos | 191 views | Add a comment?

items are from between 15 Jul 2011 & 17 Jul 2011.
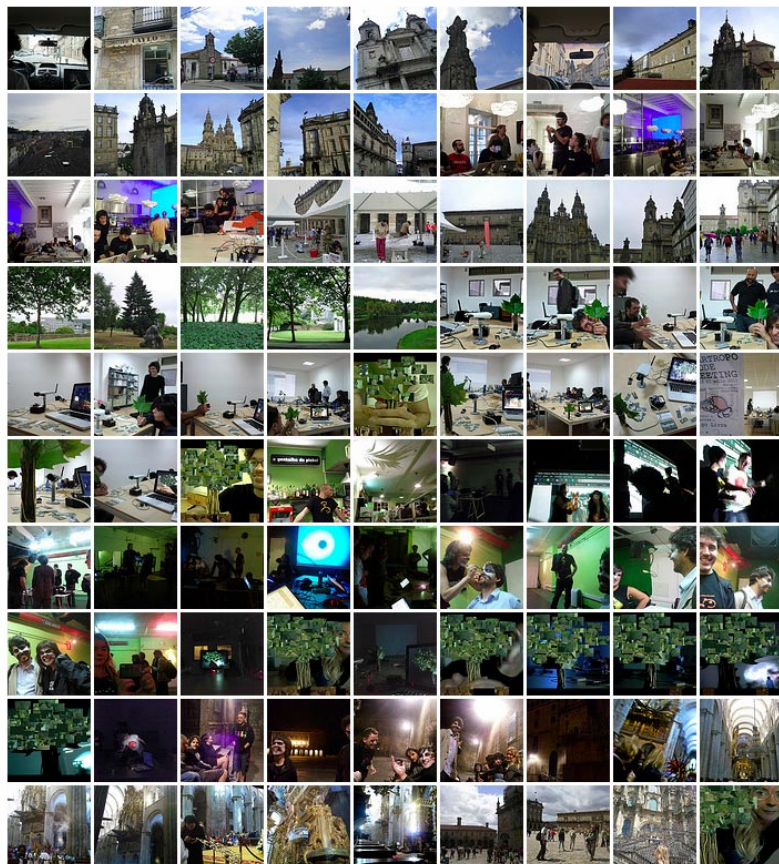
20110812-27_Hug@ree_Summer at Macal do Chao

Thumbnails | Detail | Comments

Slideshow | Share ▾

Hug@ree interactive installation during Summer Holidays at the main tree in the village center of Maçal do Chão, a small village in the inland North of Portugal.

In this public presentation, the text input feature was added. From this version on, when users touched the videoloop on the ground, a transparent keyboard layer appears as an overlay on the real-time video of the tree on the screen. This interface enabled participants to input a name on their video and leave their email in order to be contacted for future Hug@ree updates. After these steps, the user is able to drag the videoloop to the tree.
Questionnaires were also done, mainly outdoors under the "interactive" tree.

Here is the timelapse of the screenshots displaying participants interaction throughout the several days » vimeo.com/31851793

145 photos | 8 views | Add a comment?

items are from between 13 Aug 2011 & 27 Aug 2011.
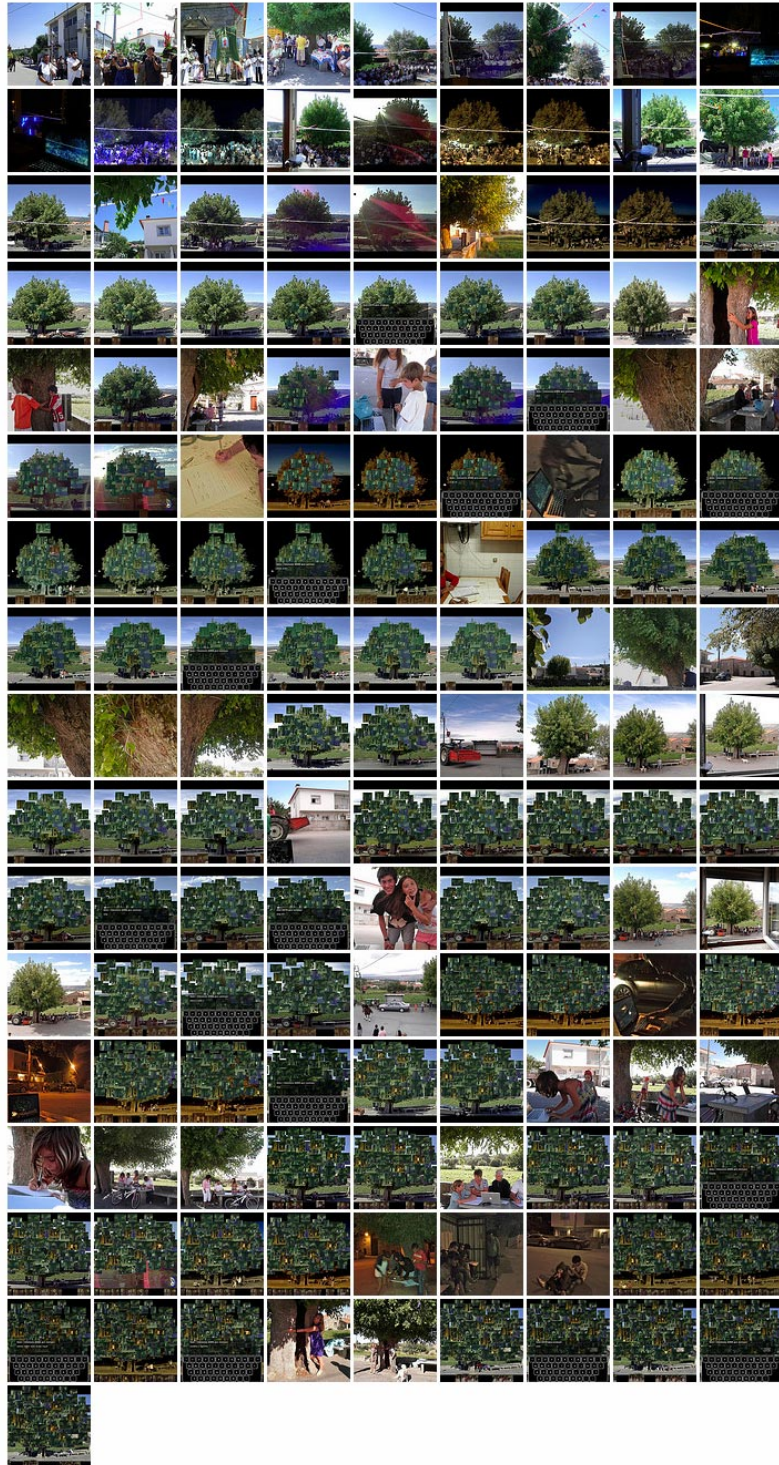
Play with Fire AZ residency at Montemor-o-Novo 20110304-06

Thumbnails | Detail | Comments

First part of the AZ artistic residency for the Play with Fire interactive installation at Saudação Convent.

Most of the images report the team work done on user interaction tests with Valentina Nisi and Vítor Lago.

114 photos | 4 views | Add a comment?

items are from between 04 Mar 2011 & 06 Mar 2011.

Play with Fire residency and exhibition at Montemor-o-Novo 20111022-27

Thumbnails | Detail | Comments

Second part of the AZ artistic residency, followed by public exhibition of the Play with Fire interactive installation at Saudação Convent displaying the montado forest in Montemor-o-Novo.

We started the use of forest surveillance infrastructures with first video capture and streaming tests at the forest surveillance tower through mobile Internet access using UStream.
Observation was also done with while guiding students groups during the exhibition at O Espaço do Tempo in Montemor-o-Novo.

110 photos | 0 views | Add a comment?

items are from between 16 Oct 2011 & 14 Nov 2011.
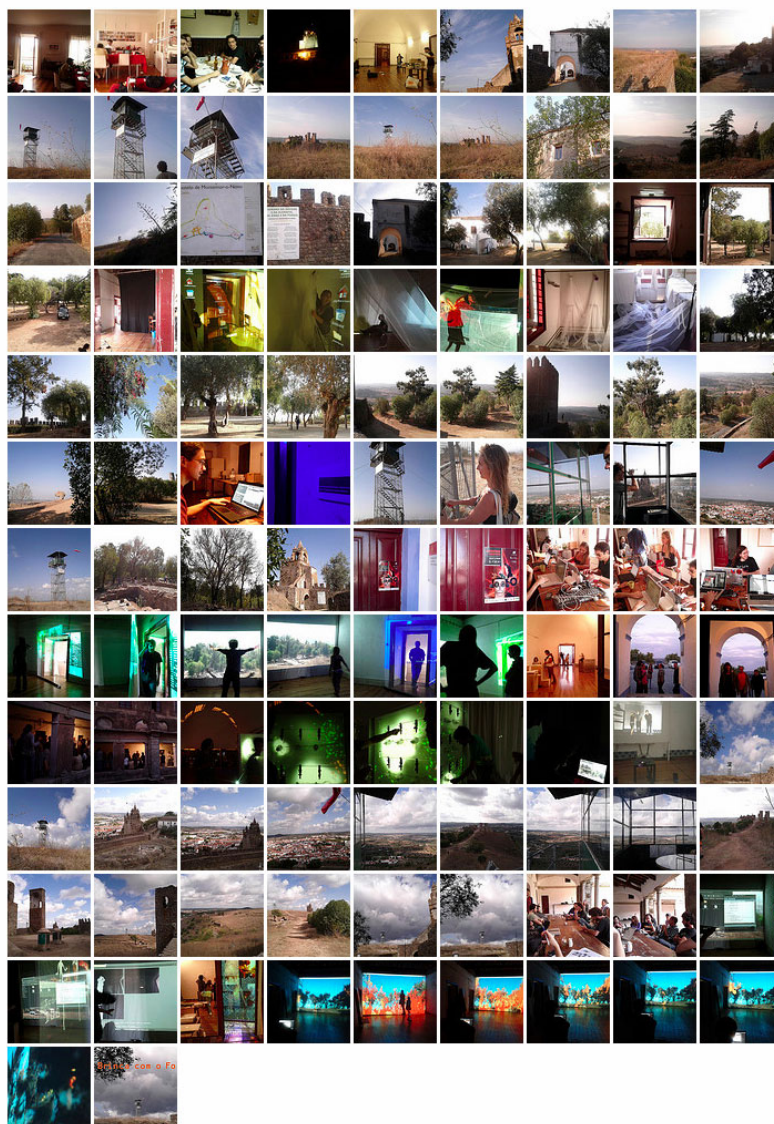
Play with FIre at Mostra AZ, Guimarães 20111218

Thumbnails | Detail | Comments

Click here to add a description

31 photos | 0 views | Add a comment?

items are from between 16 Dec 2011 & 16 Mar 2013.
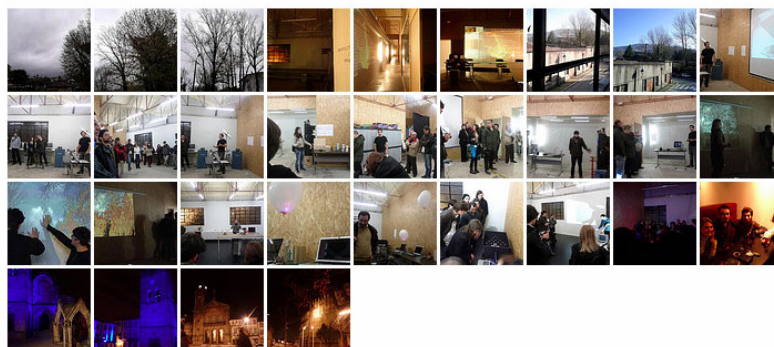
PlayWithFire_AlgoritmosCriativos_2012020626

Thumbnails | Detail | 2 comments

Slideshow | Share ▾

The interactive installation Play with Fire is part of "Algoritmos Criativos" (Creative Algorithms) exhibition, a project promoted by Ciência Viva and O Espaço do Tempo in colaboration with Audiência Zero

Play with fire is an ARTiViS experience by Mónica Mendes, Pedro Ângelo, Valentina Nisi, Nuno Correia + Collaborations: Filipe Cruz [mobile app], Ricardo Webbens [sound design]

Pavilhão do Conhecimento | Lisbon, 2012.02.06-26

+ info » playwithfire.artivis.net

44 photos | 104 views | Add a comment?

items are from between 03 Feb 2012 & 07 Feb 2012.
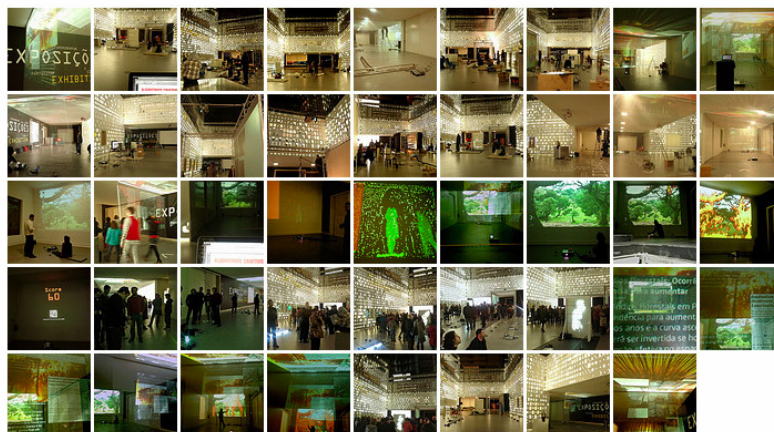
AlgoritmosCriativos_studentsVisits_20120223-25

Thumbnails | Detail | Comments

Slideshow | Share ▾
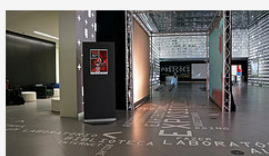
Here is a set of photos of the visit of my Digital Media + Multimedia Project II students (FBA, University of Lisbon) visiting "Algoritmos Criativos".

This exhibition is a project promoted by Ciência Viva and O Espaço do Tempo in collaboration with Audiência Zero.

Play with Fire is part of the projects presented, an ARTiViS experience by Mónica Mendes, Pedro Ângelo, Valentina Nisi, Nuno Correia + Collaborations: Filipe Cruz [mobile app], Ricardo Webbens [sound design]

Pavilhão do Conhecimento | Lisbon, 2012.02.06-26

+ info » playwithfire.artivis.net

76 photos | 87 views | Add a comment?

items are from between 02 Jan 2011 & 05 Jan 2011.
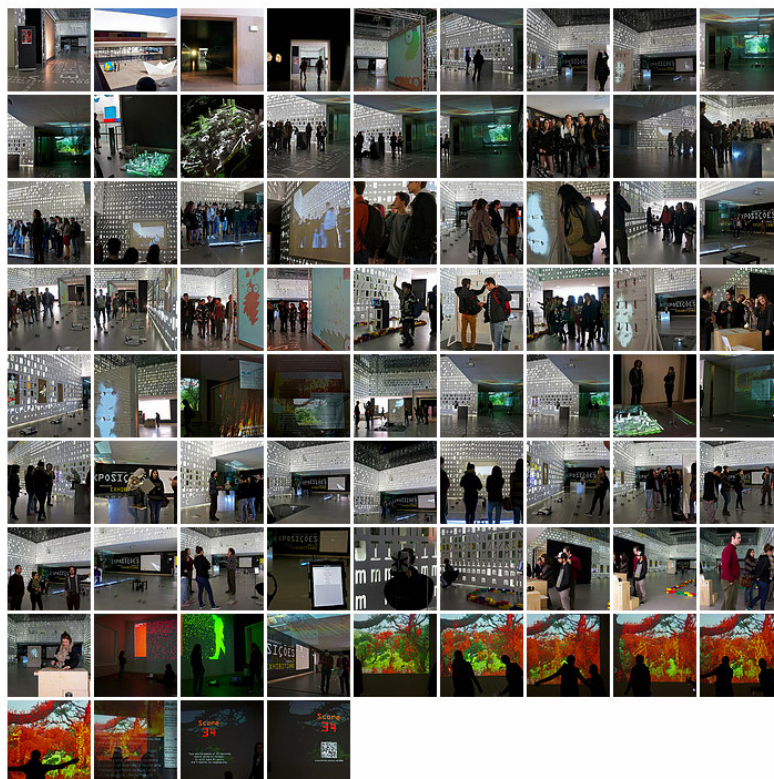
PlayWithFire_AlgoritmosCriativos_finalDays20120224-26

Thumbnails | Detail | Comments
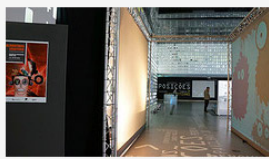
This photos set is focused on the Play with Fire interactive installation last days at the "Algoritmos Criativos" exhibition, a project promoted by Ciência Viva and O Espaço do Tempo in colaboration with Audiência Zero

Play with fire is an ARTiVIS experience by Mónica Mendes, Pedro Ângelo, Valentina Nisi, Nuno Correia + Collaborations: Filipe Cruz [mobile app], Ricardo Webbens [sound design]

Pavilhão do Conhecimento | Lisbon, 2012.02.06-26

+ info » playwithfire.artivis.net

73 photos | 169 views | Add a comment?

items are from between 02 Jan 2011 & 06 Jan 2011.
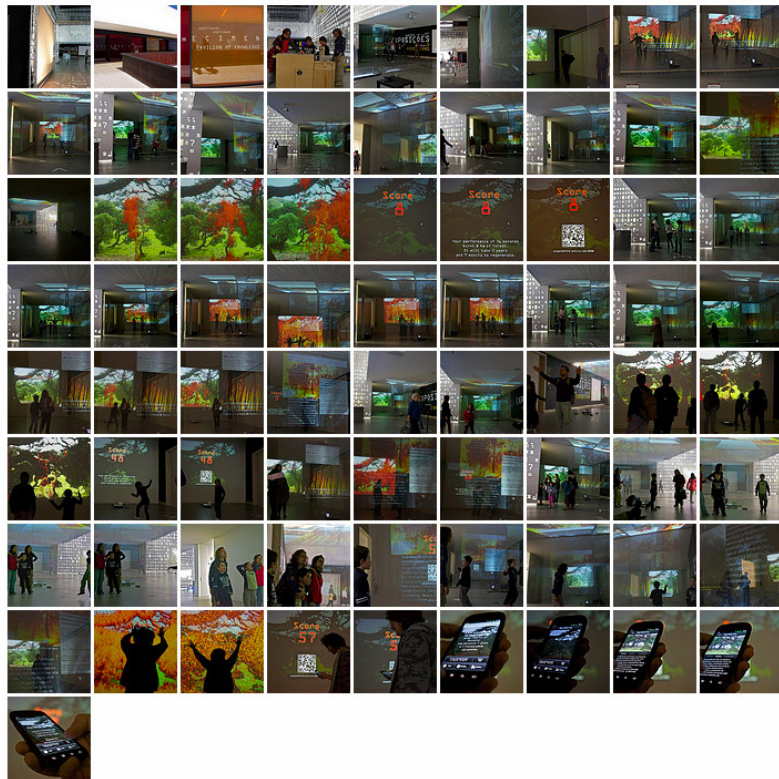
Play with Fire at Maçal do Chão 20120406-07

Thumbnails | Detail | Comments

Play with Fire was presented at the community hall of Maçal do Chão, a small village of Guarda district, in April 2012.
Participants played with fire to burn the (real-time video) forest, the performance score was displayed, and the application in the mobile phone was accessed.

This ARTiVIS experience was followed by the evaluation questionnaires to test Play with Fire in a rural environment.

63 photos | 3 views | Add a comment?

items are from between 05 Apr 2012 & 06 Nov 2012.
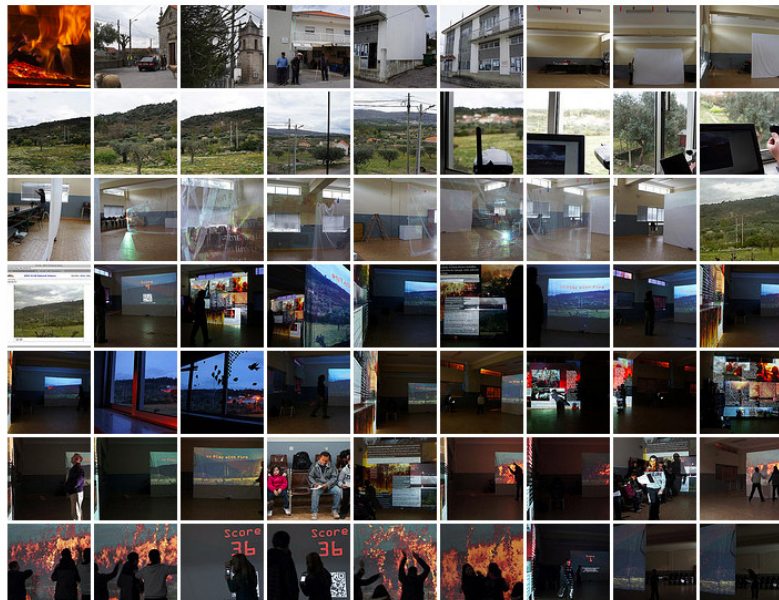
20120326-02_PlayWithFire at Popup Guimaraes2012

Thumbnails | Detail | Comments

Slideshow | Share ▾

Play with Fire interactive installation at Pop Up market exhibition in Guimarães 2012 European Capital of Culture.

30 photos | 3 views | Add a comment?

items are from between 23 Mar 2012 & 23 Apr 2012.

20120123-30_SINAIS residency in Madeira

Thumbnails | Detail | Comments

Slideshow | Share ▾

ARTiVIS project participating in an Artist in Residency program at the University of Madeira in close collaboration with the SINAIS eco feedback project team.

+ info »
monicamendes.wordpress.com/2012/01/30/si nais/

48 photos | 29 views | Add a comment?

items are from between 24 Jan 2012 & 31 Mar

ARTiVIS_PresentationsInConferences

Thumbnails | Detail | Comments
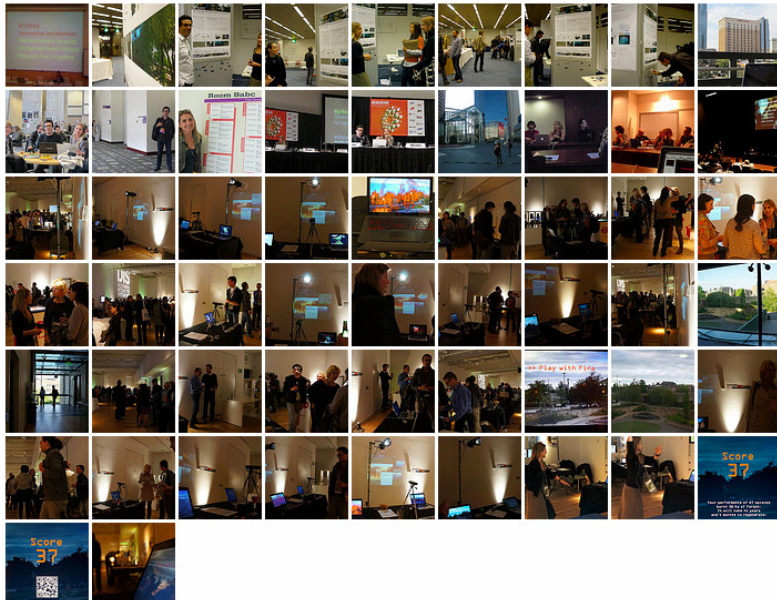
Slideshow | Share ▾

This set integrates the photos taken during presentations and demos at the following events:
Artech 2010, ACM MM 2010, SXSW 2011, ISEA 2011, ACE 2011, and DIS 2012.
Some of the presentations, such as the ones at SXSW, ISEA and DIS, have other photos regarding the cultural and social context, so take a further look at the correspondent sets.

56 photos | 1 view | Add a comment?

items are from between 28 Oct 2010 & 11 Sep 2012.
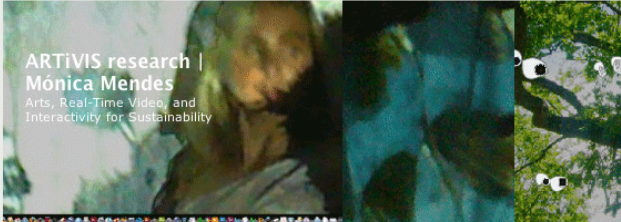
E. Video Documentation Archive Published Online
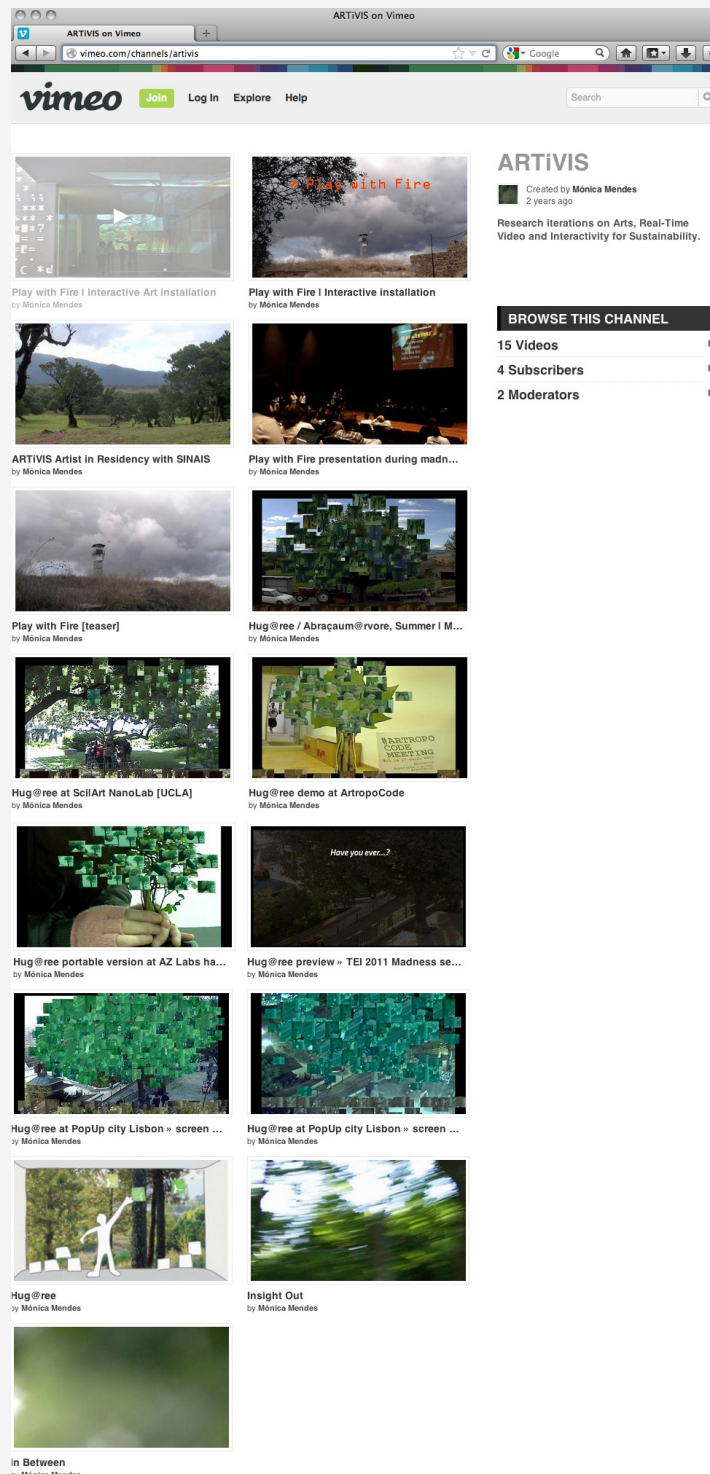
ARTiVIS channel on *vimeo* » http: / / vimeo.com / channels / artivis | Videos index » http: / / artivis.net / archive / videos /

F. Blog Posts – ARTiVIS Research Iterations

ARTiVIS research | Mónica Mendes
Arts, Real-Time Video, and Interactivity for Sustainability

Archive for September, 2009

Activist RTiVISS

2009.09.21 at 09:58 · Filed under Digital Media, Environmental arts, Forests protection, PhD research, Sustainability and tagged: Activism, context, PhD, RTiVISS

RTiVISS proposes innovative ways of conceiving both digital media arts and cutting edge environmentally sustainable practices through critical research and experimental approaches. Multiplatform devices will provide access to real-time networked video for users to "adopt" selected forests. The interactive system feeds a broad community sharing "the emotion of real-time" and the challenge of uncertainty, remotely monitoring natural environments for forests protection and aesthetic exploration.

An activist facet sparks due to the potential of contributing to forests preservation and, ultimately, to a more sustainable world.

Comments

RTiVISS

2009.09.17 at 16:43 · Filed under Digital Media, PhD research, Real-time video, Sustainability and tagged: context, PhD, RTiVISS, UT-Austin Portugal Program

Real-time Video Interactive Systems for Sustainability is part of a PhD research in Digital Media in the framework of the UT Austin-Portugal Program by Mónica Mendes, with Nuno Correia and Sílvia Chicó as advisors.
RTiVISS proposes innovative use of real-time video in artistic contexts, simultaneously contributing to help forest protection. Assuming a surveillance metaphor, can we conceive a project that is both artistic and functional?

Comments

Hello world!

2009.09.17 at 15:52 · Filed under PhD research and tagged: context

Hi, I'm a digital media phd fellow, and this is my repository for ongoing research activities!

Comments

Pages
ABOUT
ARTiVIS [Arts, Real-Time Video and Interactivity for Sustainability]
B-wind!
Hug@ree
Play with Fire
Treeellucinations
UT AUSTIN-PORTUGAL

Archives
August 2012
June 2012
March 2012
February 2012
January 2012
December 2011
November 2011
October 2011
September 2011
July 2011
February 2011
January 2011
December 2010
November 2010
October 2010
September 2010
August 2010
July 2010
June 2010
April 2010
March 2010
February 2010
January 2010
October 2009
September 2009

Categories
ACE
ACM Multimedia
Activism
Algoritmos Criativos
altLab
ARTiVIS
ArtropoCode
Austin
AZ labs
AZ residency
AZ sprint

Search

Category Cloud
Activism altLab ARTiVIS Austin AZ labs AZ residency AZ sprint B-wind Conferences Digital Media Environmental arts Exhibitions Forests protection Hug@ree Implementation Interactive installations Local culture Networking Online platform PhD research Play with Fire Presentations Real-time video RTiVISS Sustainability SXSW System architecture TEI Uncategorized UT-Austin Portugal Program

Blogroll
altLab
LCD
SummerJOL 08
WordPress.com Blog
xDA

Blogroll
altLab
LCD
SummerJOL 08
WordPress.com Blog
xDA

Email Subscription
Enter your email address to subscribe to this blog and receive notifications of new posts by email.
Join 7 other followers

Sign me up!

Meta
Log in
Entries RSS
Comments RSS

Credits

ARTiVIS blog URL » http://monicamendes.wordpress.com | Archived version of the blog as it was presented during this research » http://artivis.net/archive/blog/

G. Published ARTiVIS Project Websites

G.1 ARTiVIS Online Platform Website

ARTiVIS online platform | Design in progress » http: / / artivis.net

G.2 ARTiVIS DIY Forest Surveillance Kit Website

Keep an eye on your forest and share it with the world...

The design of an open source hardware and software DIY forest surveillance kit is one of the ARTiVIS project outcomes. The kit aims to repurposes surveillance technology to bring people and their communities together to protect their forests. The kit is common to all the ARTiVIS projects' interactive experiences. Resulting video streams and collected data are expected to be uploaded and then become part of the online platform network for crowdsourced surveillance and artistic manipulation purposes.

When available, the kit will also be a seed for community workshops to provide the skills and resources to help deploy new ARTiVIS nodes for artistic experimentation in research centers, festivals, hacklabs and local landmarks.

KIT DESIGN AND DEVELOPMENT

An ARTiVIS kit is composed of a series of hardware modules that can be chosen from common off-the-shelf parts depending on cost, power, network bandwidth or infrastructure restrictions. These hardware modules are controlled by a set of software modules connected to the ARTiVIS online platform

In technical terms, the kit is provided as:
» an open specification for building hardware compatible with the platform
» an open hardware reference implementation that can be used for community workshops and for the interactive experiences
» open source software that runs on the kit and interfaces with the platform.

The image shows the prototype of the ARTiVIS forest surveillance kit with the CPU module based on the Raspberry Pi platform, using a USB HD camera as camera module, and a USB mini Wifi adapter as network module.

HARDWARE COMPONENTS

Power Module provides power to the whole kit. For the kit's intended function in remote forest locations it is important that it is autonomous in terms of power. This can be accomplished by using a rechargeable power supply, such as a lead or solid state battery coupled with a generating power source like a solar panel, a small wind turbine or a fuel cell.

CPU Module is the brain of the system, it connects to all the other hardware modules and runs the ARTiVIS node software. Since the kit's design should take into account both portability and energy efficiency requirements, our first prototypes are being built with the Raspberry Pi, an ARM-based single-board Linux6 computer.

Camera Module connects to the CPU Module and provides the images to the CPU for live video streaming. At its simplest configuration, the Camera Module can just be a good USB webcam connected to the CPU Module, but for a more integrated solution we will test interfacing high quality image sensors like the 1080p Leopard image sensor directly to the CPU Module.

IO Module interfaces the CPU Module with a set of sensors and actuators that can be read and/or controlled remotely. For this we can use an Arduino board or a similar microcontroller-based IO hardware like the TI Launchpad or rely on the CPU module's native GPIO (General Purpose Input/Output) functionality. For early development this module was skipped since it's not essential for the kit's video streaming functionality.

Network Module provides an interface to the Internet for the CPU Module. For early prototyping we used any network connectivity available to the test machine, but for the final reference design we will make use of external USB modems that provide 3G or 4G/LTE connectivity as these are more likely to be available in remote forests than WiFi or wired Ethernet.

SOFTWARE COMPONENTS

The kit's CPU Module runs a set of software applications that allow the kit to perform its task and interface the hardware with the online ARTiVIS server.

Streaming Service The streaming service is the heart of the system. At its core it's a video processing pipeline based on the GStreamer framework that captures the live images off the Camera Module, encodes them using a Free lossy codec like Ogg Theora or Webm and streams them to the ARTiVIS server for online distribution. It could also optionally record the video locally for backup purposes.

IO Service interfaces with the IO Module hardware, multiplexing access and providing to applications an API that abstracts the underlying hardware, thus permitting access to the sensors and actuators connected to the IO Module.

Web Service a web application that runs on an embedded web server on the CPU Module and provides a simple way for the kit's owner to control and configure it. It also provides a REST API that would allow for external control and connectivity to and from the ARTiVIS server to allow uploading of sensor data to the platform and the downloading of actuator commands.

ARTiVIS Open Source
Repositories
at Gitorious »

ARTiVIS DiY kit Open Source
repository section »

REFERENCES

FAO Food and Agriculture
Organization of the United
Nations (2004) "Involving
local communities to prevent
and control forest fires"

RIZKALA, C. E., J. Therien,
A. Savage (2009)
"Observations of Nesting
Short-Tailed Hawks in
Central Florida", Florida Field
Naturalist, vol. 37, no. 1, pp.
1–32.

Refarm the City – Tools for
Urban Farmers

VIGILIA Open Design

Open IP Camera – ARM7
and ARM9 embedded ARM
device IP Camera Wiki

Apertus – Open Source
Cinema

Raspberry Pi

GISS – "Free streaming
tools for free media"

ThingSpeak – Internet of
Things

ARTiVIS *DIY Forest Surveillance Kit* | Prototype and ongoing research website » http: / / diy.artivis.net

What is the feeling of becoming the wind, an invisible power with a visible physical effect on trees? Will you cherish the leafs, or will you trigger a hurricane? B-Wind!

ARTiVIS Online Platform
DiY Forest Surveillance Kit | Live
INTERACTIVE INSTALLATIONS
 B-Wind!
  Hug@ree | *Virtual Hug*
  Play with Fire
  MAicro | *Water Flow*
  Treeellucinations
  Enchanted Forest
  View with a House
  Let it Rain

**Interactive Installation
2010~2011**
Mónica Mendes
Pedro Ângelo
Nuno Correia

Collaborations
Maurício Martins (electronics)
Ricardo Webbens (sound)
Sérgio Ferreira (live broadcasting)
Tiago Serra
Members of the three Audiência Zero
creative labs: LCD, altLab,
and xDA

**Technical Assistant
@ *O Espaço do Tempo***
António Costa

**Exhibition Guide
@ *O Espaço do Tempo***
Francisco Gomes

Research Advisors
Professor Nuno Correia
Professor Sílvia Chicó
Professor Teresa Romão

In the scope of
Digital Media PhD
AZ labs artistic residency
B-wind project blog posts

Contact
bwind@artivis.net

Acknowledgements
FCT [SFRH/BD/42555/2007]
AZ Labs altLab, LCD and xDA
O Espaço do Tempo
UT Austin|Portugal Program
/ Media Ground

In the *B-wind!* interactive installation, users have the opportunity to play an invisible character, the wind, triggering visual effects on the onsite projected footage of the forest and at the remote forest itself. It aims to bridge the physical and the digital world, connecting users to the forests and raising awareness on environmental sustainability

B-Wind! embodies a choreographic approach to raise awareness on nature and the poetry of movement, engaging its public by demonstrating a real immediate interaction effect between their actions and the chosen natural setting. The B-Wind! prototype couples the effects of the participant's movement with the projected installation footage.

User's physical presence is subtracted from the visual interface, and the result of their actions is presented in the real-time video through emphasized visual effects. The performative potential and the human scale motivate a choreographic approach that raises awareness on the poetry of movement, whereas simultaneously empowering the users by demonstrating a real immediate interaction effect.

The installation is implemented as two connected spaces. One is the projection of a video stream of a remote forest space where the user motion controls the rendering of visual effects. The other, at the remote location, is where software controls wind fans that influence the real trees.

The main challenge is to make this interaction happen in a remote place in a meaningful way. This proposal is connected to the metaphor of Edward Lorenz's "butterfly effect" [Dizikes08], in which the wind waves provoked by the subtle flickering have the "hurricane effect" in a remote place. A prototyped component includes the power to apply the wind effect to the forest – the motion tracking in the installation having a real amplified effect on the real trees and in real-time.

Confronted with such possibilities, multiple questions arise on the user experience: is this pleasant, is it strange? Will the participants "spread the wings" and feel the freedom to cherish the trees? Will they explore the superpower of generating wind? Or, as children, exploding in energy, will they join the celebration of nature without processing causes or consequences – just being?... the wind!

+ info

PRESENTATIONS & RESIDENCIES

Exhibition » AZ residency @ O Espaço do Tempo exhibition, Montemor-o-Novo, Jul 12-30| Photos

Audiência Zero multidisciplinary artist residency with its three laboratories (altlab, LCD, xDA), O Espaço do Tempo, Montemor-o-Novo, Mar 1-7 + Jun 14-23
Part I - AZ residency video
Part II– AZ residency June report

PUBLICATIONS& RELATED WORK

MENDES, Mónica [2010] "RTiVISS Real-Time Video Interactive Systems for Sustainability", Artech 2010 Conference Proceedings, 5th International Conference Artech 2010 "Envisioning Digital Spaces", April 22-23, Guimarães, Portugal Awarded the best Portuguese paper of the Conference »

Paper "Video Based Environments – State of the Art Foreseeing B-wind Interactive Installation" in the scope of the Digital Media PhD course Media Technology by Professor Nuno Correia.

Work developed in the scope of the Digital Media PhD course Media Lab by Professor Teresa Romão

ARTiVIS experience *B-Wind!* website » http:/ / bwind.artivis.net

G.4 Hug@ree Interactive Installation Website

"Everyone should hug a real tree every now and then…", so Hug@ree and engage into a symbiotic relationship with nature

Hug@ree is an interactive experience in which participants hug a real tree, bonding urban dwellers with nature. We are exposing the positive side of coming in contact with something, restoring trust in the sense of touch.

The tree is instrumented to record and transmit a video loop of each hug to a real-time interactive video collage, which exists online and as a touchscreen in the exhibition space. People can interact by positioning their own video loop on the tree branches. Multiple Hug@ree instances around the world collect tree hugs that are uploaded to an online platform, composing a global shared embrace of nature.

ARTiVIS Online Platform
DIY Forest Surveillance Kit | Live
INTERACTIVE INSTALLATIONS
   B-Wind!
   Hug@ree | *Virtual Hug*
   Play with Fire
   MAicro | *Water Flow*
   Treeellucinations
   Enchanted Forest
   View with a House
   Let it Rain

___
**Interactive Installation
2010-2012**
Mónica Mendes
Pedro Ângelo
Nuno Correia

Collaborations
AZ labs: Ricardo Lobo,
João Carvalho [AZ sprint],
Margarida Faria [*Virtual Hug*],
Maurício Martins [electronics].
Local support at Maçal do Chão:
Fernando Mendes,
Valter Cruz, João Correia.

___
Acknowledgements
FCT [SFRH/BD/42555/2007]
UT Austin|Portugal Program
/ Media Ground
AZ Labs altLab, LCD and xDA
Subvertice
Support at PopUp Lisbon:
Bruno Canas, Ferdinand Meier, João
Ferreira, Paulo Martins
Support at Sci|Art UCLA:
Victoria Vesna, Adam Stieg

The Hug@ree experience encompasses two distinct moments. In an outdoor space, a tree – instrumented with conductive wires ergonomically distributed around its trunk forming a capacitive sensor –detects participant's hugs. A microcontroler attached to the wires triggers a hug when most of the sensors detect the participants' contact, sending a signal through a wireless radio transmitter to the indoor installation space. While a camera continually records the tree outside, custom software captures and keeps the last few seconds of video. When a hug trigger reaches the wireless radio receiver, the software saves the video and sends it to an interactive tangible projection. Then, participants place the video loop of their own hug on the screen tree, becoming leaves of a collective experience in a videoloop hugs gallery.

**EXHIBITIONS
PRESENTATIONS**

Summer Maçal do Chão,
Guarda, Aug 2011

Sci|Art UCLA, Los Angeles,
Jun 2011

ArtropoCode
Santiago de Compostela,
Jul 2011

TEI'11 Art Explorations
Funchal, Madeira, Jan 2011

**Portable Hug@ree
at AZ Labs Hackmeet**
Porto, Dec 2010

**eARTh "10/10/10
Global Work Party"**
350.org, Worldwide,
Oct 2010

**Codebits hackathon:
Hug@ree Virtual Hug**
Lisbon, Nov 2010

Pop Up City Lisbon
Santa Catarina, Lisbon,
Nov-Dec 2010

+ info

Hug@ree was designed to be deployed all over the world in such a way that all instances collect tree hugs that become part of the same virtual world. The installation was exhibited at the Pop Up City exhibition in Lisbon, a bonsai "portable" version premiered at AZ Labs creativity exhibition in Porto followed by TEI'11 Art Explorations, and a demo at the Artropocode meeting in Santiago de Compostela, and it was also presented at the UCLA Summer Institute program Sci|Art. The most recent node was implemented at the small village Maçal do Chão, premiering the registration feature and usability tests. We now proposing to set up new Hug@ree nodes.

A portable version of Hug@ree was born from the need to present Hug@ree in a limited space and when there's no trees around, such as certain parts of cities or conference demos. It does keep the *real tree* factor, only in a different scale and body contact.

CONTACT
hugatree@artivis.net

Online, participants will be able to upload a photo of themselves, but their hug will only be made part of the world when a participant hugs a tree for real.

**CONCEPT FRAMEWORK
& DEVELOPMENT**

References
BUNTING, M. 2009. Rethink
— Contemporary Art & Climate
Change exhibition,
guardian.co.uk
GRADZIK, A., SZOSTALOIN,
W. 2009. Treehugger Project
PRASCHAK, D. 2010. oneHug,
Hochschule Darmstadt,
Germany
2010. Talking Tree, Collab
between EOS Magazine and
Happiness Brussels | Making
of »

Technical specifications
Arduino Playground, Capacitive
sensing library
Arduino: Forum, Arduino as
capacitive sensor

Sprint AZ Blog posts
Abraçaum@rvore » Sprint AZ
[Dia 0] [Dia 1] [Dia 2]
Saberes & sabores do Maçal
do Chão | Sprint AZ: 1
finalFeliz em 2 videos e 3'- |
Sprint Project report, our
adventures developing
Hug@ree »

ARTiVIS experience *Hug@ree* website » http: / / hugatree.artivis.net

G.5 *Play with Fire Interactive Installation Website*

Challenging constraints, "don't play with fire" was the motive for this provoking experience, assuming both wild and innocent sides, rebellion and protectionism

Play with Fire triggers controversial feelings by combining the "wonder and danger" of a forest on fire, effecting attitude change towards environmental protection.

Play with Fire was designed as a digital art experience that happens over three different stages: a mashup of forest fire news, followed by the participants playful interaction with fire on the forest projection through a gestural interface, and a reflective part where Play with Fire connects to its audience mobile phones granting access to a user specific web application depicting the forest they burnt, regenerating in real-time. Depending on the user's performance, the forest will take from some months to years to revolve to its original state.

Living in Portugal, a place that has been extremely exposed to forest fires, makes us very sensitive to the destruction of forest patrimony by fire hazards, which also applies to a world scale. As researchers exploring arts practices, we can play a role as promoters of change in people's behavior regarding forests protection. *Can digital art foster awareness and respect for nature?*

As a step in answering this question, we seek to pose a constructive approach to the destructive dynamics of fire that aggravate climate change. This research is part of the ongoing activity of ARTiVIS, an online platform for open sharing of real-time video streams of forests. In order to test, use and progress the ARTiVIS platform, we created a series of interactive experiences that make use of the platform, as digital contexts of aesthetic contemplation of nature. Play with Fire as one of the interactive experiences, is making use of the tension created by the installation itself, to foster control over danger and functional monitoring for forest protection in a surveillance system.

+ info

Here is the blog post on the Algoritmos Criativos exhibition last days »
and the photos slideshow of the Play with Fire presentation at Algoritmos Criativos, Pavilhão do Conhecimento – Ciência Viva, Lisboa »

Sidebar (left)

ARTiVIS Online Platform
DIY Forest Surveillance Kit | Live
INTERACTIVE INSTALLATIONS
   B-Wind!
   Hug@ree | *Virtual Hug*
   Play with Fire
   MAicro | *Water Flow*
   Treeellucinations
   Enchanted Forest
   View with a House
   Let it Rain

Interactive installation 2010~2012
Mónica Mendes
Nuno Correia
Valentina Nisi
Pedro Ângelo

Collaborations
Filipe Cruz [mobile app]
Ricardo Webbens [sound design]

Technical Assistant
@ *O Espaço do Tempo*
Nuno Motta

Contact
playwithfire@artivis.net

An **ARTiVIS** experience
in the scope of
UT Austin|Portugal Program
Acknowledgements
FCT [SFRH/BD/42555/2007]
AZ Labs altLab, LCD and xDA
SINAIS
O Espaço do Tempo
Ciência Viva
Colab / UT Austin|Portugal Program
Subvertice

Sidebar (right)

PRESENTATIONS

Demonstration and tests, Maçal do Chão, Guarda, Apr 6-7, 2012

Exhibition » Pop Up market, Guimarães 2012 European Capital of Culture, Guimarães, Mar 23-April 1, 2012

Exhibition » *Algoritmos Criativos*, by Ciência Viva and O Espaço do Tempo in colaboration with Audiência Zero, Pavilhão do Conhecimento, Lisbon, Feb 6-26, 2012
» UTAustin|PortugalNews
» Colab newsletter (p. 4)

Exhibition » *Algoritmos Criativos*, O Espaço do tempo, Montemor-o-Novo, Oct 22-27, 2011

Artist in Residency » Pairing with Fire with SINAIS project, Funchal, Madeira, Jan 24-30, 2012

Showcase » Mostra AZ Labs, Guimarães, Dec 17 » LCD video »

PUBLICATIONS

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2012) "Digital Art, HCI and Environmental Awareness: Evaluating Play with Fire", NordiCHI 2012, Copenhagen, October 14-17

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2012) "Play with Fire", DIS – ACM conference on Designing Interactive Systems | Newcastle, June 13, 2012 Demonstration

MENDES, Mónica, ÂNGELO, Pedro, NISI, Valentina, CORREIA, Nuno (2011) "Play with Fire", Creative Showcase and Interactive Art, ACE 2011 – 8th International on Advances in Computer Entertainment Technology, November 08-11, Lisbon, Demonstration | Madness session presentation video »

MENDES, Mónica, CORREIA, Nuno, NISI, Valentina, ÂNGELO, Pedro (2011) "Play

ARTiVIS experience *Play with Fire* website » http: / / playwithfire.artivis.net

H. Technical Riders of the Interactive Installations

H.1 *B-Wind! Interactive Installation Technical Rider*

B-WIND!
Interactive installation technical rider

Technical Contacts
Pedro Ângelo <http://void.io> | Mónica Mendes <monica.mendes@fba.ul.pt>

Technical Requirements

Space
The installation requires two separate spaces, one indoor and one outdoor. The indoor space should be wide and high enough for two three meter tall projections placed side by side, and at least tree meters deep. The outdoor space requires a tree or set of trees robust enough to support large wind fans and a spot to position an IP Camera overlooking the tree.

Acoustical
The installation produces generative sound, and this is a key element of the experience. The space should be quiet enough for the sound to be audible.

Lighting
The indoor part of the installation is highly sensitive to IR light. The room should have controlled lighting, and preferably be completely dark. If the installation is to run during the night, lighting should be provided for the trees outside.

Equipment
1 IP camera with outdoor protection box
2 ps3 eye cameras
1 computer with an OpenGL 2.0 capable discrete GPU (AMD or NVIDIA)
2 high luminance projectors (4000 lumen or better)
3 long VGA cables + 1 TripleHead2Go video splitter
1 Two channel powered speaker system
1 DMX Dimmer
3 large electric fans

Networking
The installation must have available either wired ethernet or IEEE 802.11 wireless networking to stream video from the IP camera to the indoor installation.
The fans are controlled using the DMX protocol. A suitable dimmer should be provided as well as cables to connect it to the fans outside.

Power
The installation requires enough power sockets for one IP camera, two projectors, one computer and a DMX dimmer capable of providing suitable power to the fans outside.

Safety
The installation has no outstanding safety issues. However, care must be taken to assemble the fans outside at a proper height to avoid accidents.

HUG@REE
Interactive installation technical rider

Technical Contacts
Pedro Ângelo <http://void.io> | Mónica Mendes <monica.mendes@fba.ul.pt>

Technical Requirements

Floor Plan
Not applicable – the layout of the installation resources is flexible and can accommodate different spaces and layouts depending on the venue.

Space
The outdoor part of the installation requires a tree that will be instrumented for participants to hug. A natural tree is ideal but we can accommodate small potted trees, like bonsai, indoors. Close to this location, a small space overlooking the tree is needed to setup a camera.
The indoor part of the installation requires a wall to setup the interactive screen. This wall could be in a room or in a common space like an entrance or a corridor. Depending on the type of technology used for the interactive screen, in addition to wall space, the installation might need enough room to accommodate a projector in front of the wall. The indoor and outdoor space can be separate locations but due to wireless communication constraints, there should be line of sight between them and they should be a maximum of 100 to 400 meters of each other.

Acoustical
The installation uses audio to complement the interactivity by either playing sound from the outdoor tree surroundings or field recorded audio clips. Usually, it is set up to use audio if placed in a quiet room, but it can be completely silent if needed for placement in a public space.

Lighting
The installation doesn't generally require any specific lighting conditions, but preferably the indoor installation room lighting should be adjustable according to the desired brightness for the interactive screen.

Timing
Both the indoor and the outdoor parts can be used by multiple persons at the same time. The installation works continuously during the exhibition time, recording interactions and uploading videos to the online platform.

Equipment
The installation involves custom hardware and software and is flexible enough to adapt to use different cameras and interactive screens. The authors will provide the tree sensor, the camera and a computer configured to run the installation. Depending on the available space and the chosen interactive screen setup, a projector might be required.

Networking
The indoor part of the installation must be connected to the Internet to upload interaction videos to the online platform. The network access can be either wired or wireless, but should have reasonable bandwidth to upload video. Since the video uploading doesn't need to happen in real-time, the connection to the online platform won't need to be permanent.

Radio Frequencies

The outdoor tree sensor communicates with the indoor computer via a small radio frequency device operating at 434 MHz that can be used by 1.5 to 12 V power, usually 5V.

If a wireless IP camera is used, it will transmit video over an ad-hoc 802.11x wi-fi network.

Power

The tree sensor outdoors can be powered by a battery or from a 12v power source connected to a standard power socket. If an IP camera is used, it will also require a power socket.

For the indoor part, the installation will require enough power sockets for the installation computer, the interactive screen components (usually a projector) and the sound speakers.

Safety

The custom electronics use low power components isolated from the mains that are installed away from the users. The remaining electronic equipment is off the shelf material that conforms to security standards.

PLAY WITH FIRE
Interactive installation technical rider

Technical Contacts
Pedro Ângelo <http://void.io> | Mónica Mendes <monica.mendes@fba.ul.pt>

Technical Requirements

Space
Ideally, the installation requires a space of about 4x4 meters wide and about 2.5~3 meters high, but can be accommodated on larger or smaller spaces. A room with three walls is preferred to a completely open space.

Acoustical
The installation needs a quiet space as it produces sound.
Lighting
The installation needs a dark space with controlled lighting.

Equipment
TThe installation requires the following equipment:
1 computer, dual core i3 CPU or better, Nvidia or ATI OpenGL 3.0 graphics card, 2G RAM,
   Wired ethernet or Wi-Fi card
1 computer with Internet access, capable of running at least firefox 4.0 full screen
1 Projector, minimum 2000 ANSI Lumen, 1024x768 or better
1 Projector 2000-4000 ANSI Lumen, 1024x768 or better, preferably with short throw
1 set of powered speakers
1 Kinect sensor
1 Transparent screen, usually a sheet of tulle with about 3x3 meters
---
We are able to provide for this equipment if proper insurance and transportation is provided.

Networking
The installation requires Internet access to function properly. A wired connection is preferred to a shared wireless connection due to the need to stream video.

Radio Frequencies
The installation does not produce any abnormal radio frequencies.

Power
The installation requires enough power sockets for two projectors, two computers, one Kinect sensor and one set of powered speakers. If our equipment is used, the sockets should be 220 VAC with European schuko plugs or have the appropriate adapters.

Safety
The installation presents no outstanding safety issues.

I. Workshop Proposal | ARTiVIS DIY Forest Surveillance Kit

ARTiVIS DIY FOREST SURVEILLANCE KIT
Workshop Proposal

Description

Living in a country that has always been extremely exposed to forest fires, makes us very sensitive to an issue which also applies to a world scale. The whole planet is being affected by the consequences of the destruction of the forest patrimony by fire hazards, and most of all fires are caused by various human activities. Despite previous measures, an attitude towards prevention seems pertinent and urgent. To prevent and control destructive forest fires, the involvement of communities is crucial. Combining physical and digital worlds, ARTiVIS is a research project that explores real-time video technologies to offer participants ways to experience and to remotely access the natural environment. The objectives of the overall research are: to create digital contexts of aesthetic contemplation of nature by exploring the beauty and danger of trees and forest fires; to raise awareness on the natural environment by establishing a bond between people and forests, using technology in artistic contexts; to help prevent forest fires by extending surveillance systems to online communities through "the emotion of real-time" monitoring.
These systems feed a global community that enables self-sustained surveillance and explorations with digital media in interactive installations to engage the audience senses in unconventional ways.

One of the project outcomes is an open source hardware and software DIY forest surveillance kit common to all the projects' interactive experiences. This kit repurposes surveillance technology to bring people and their communities together to protect their forests. Resulting video streams and collected data will be uploaded and become part of the online platform network for crowdsourced surveillance and artistic manipulation purposes. The kit is also a seed for community workshops to help deploy new ARTiVIS nodes for artistic experimentation in research centers, festivals, hacklabs and local landmarks. We propose this ARTiVIS community workshop to teach participants how to assemble and setup their own ARTiVIS node and explore with them the possibilities offered by real-time video streams of forests.

Objectives

To teach how to assemble and setup an ARTiVISS forest surveillance node
To empower local populations with a way to share the beauty of their forests
To explore new ways to use real-time streaming video for awareness, activism and artistic purposes
To foster awareness and respect for nature.

Format

The workshop is divided in two parts. In the first half, participants will learn about the ARTiVIS forest surveillance kit and will form groups to assemble, deploy and test their own nodes. In the second half participants will learn how to access the video and data provided by the node and will come together to propose and implement creative explorations.

Length

This is a 1 day workshop, approximately 8h, divided into two 3.5h sessions + 1 hour lunch break.

Preferred Audience

Local populations living in the vicinity of forest sites, forest protection activists, artists interested in forest surveillance and working with real-time video.

Requirements | Budget

ARTiVIS hardware kit: $100 each (estimated) | Workshop space | Trees nearby | Computers (or participants bring their own).

J. Printed Media | Cards and Captions

RTiVISS [Real-time Video Interactive Systems for Sustainability] is a research project proposing innovative ways of using and conceptualizing real-time video in artistic contexts, simultaneously contributing to help forest protection through community creation and engagement. Assuming a surveillance metaphor, *can we conceive a project that is both artistic and functional?*

The RTiVISS experience **"tree ellucinations"** is an interactive installation that triggers perceptual reactions by empowering users to influence the environment through active participation. The prototype potencially spreads a seed for future forests networked systems – ultimately, a grassroots movement to positively impact local groups & work with institutions... leading the shift to an *enjoyable* world!

[GMT+0 | lat 40°42'0", lon 7°18'0"] **Maçal do Chão** is a village near Serra da Estrela, a Northern interior natural protected region in Portugal, where forest fires have dramatically devastated its unique shades of green – a decreasing trend in recent years due to reforestation local projects and maintenance cleaning works, as is the case of the RTiVISS monitored places Quintas das Mestras, Bocas, and Santo André

In Portugal, **Future Places** may include the romantic world natural heritage Sintra, and Serralves Park, a priviliged landscape in the courtyards of Porto's cultural icon | Worldwide, RTiVISS implementation target critical "lungs of the world" as Brazil's Amazónia [GMT-6], California [GMT-8], Indonesia [GMT+5], Angola [GMT+1], India [GMT+8], Australia [GMT+10]

RTiVISS requires iterative development processes of articulated working prototypes in several stages as part of an ongoing PhD research – with Nuno Correia and Sílvia Chicó as advisors – in Digital Media in the framework of the UT Austin-Portugal Program funded by FCT.

Research, concept and design: **Mónica Mendes**

Arts | Usability | Real-time Video Interactive Systems for Sustainability **[RTiVISS]** | Social Responsibility | Forest Protection | visual phenomena | Electronic visual hallucinations | Perception psychology | Caleidoscope effects | Cinetics | Optical illusions | Local cultures | Future Places | Network ||

Special thanks Alexandre da Silva, altLab, Catarina Mota, CIEAM, Fernando Mendes, Maria de Lourdes Mendes, Moisés Coelho, Ricardo Costa, Tiago Henriques, Susana Gateira, Uniquepoufs || Music: Ricardo Webbens, Polar

monica.mendes@rtiviss.com

*What is the feeling of becoming
the wind, an invisible power with
a visible physical effect on trees?
Will you cherish the leafs, or will
you trigger a hurricane?* **B-wind!**

Qual a sensação de ser o vento, uma força invisível,
com um efeito físico visível nas árvores? Irás acariciar
as folhas, ou provocarás um furacão? *Sê o vento!*

B-Wind!

Mónica Mendes / Pedro Ângelo / Maurício Martins
Contributors: Ricardo Webbens / Sérgio Ferreira / Tiago Serra
Research Supervisors: Nuno Correia / Sílvia Chicó
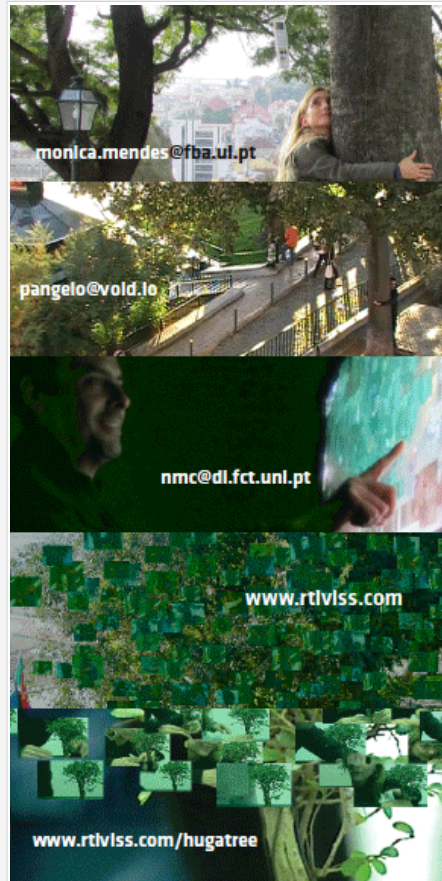
ESTÁ A SER FILMADO
A instalação interactiva *B-wind!*
está a ser transmitida em tempo real

YOU'RE BEING BROADCASTED
B-wind! *interactive installation
is being streamed live*

www.ustream.tv/channel/bwind

Captions presenting the *B-Wind!* interactive installation at the *AZ Labs* exhibition at Montemor-o-Novo, and surveillance camera warning for the *B-Wind!* observation stream and tests.

Hug@ree at TEI 2011 – Cards and caption placed indoors by the touchscreen and caption outside at the foot tree waterproof for the demonstration rainy day.
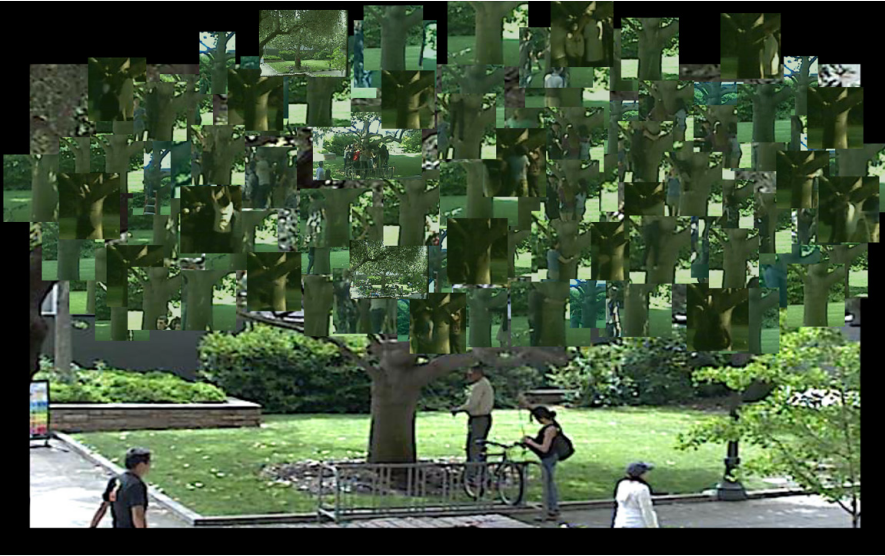
Hug@ree at UCLA caption hanging at the tree and screenshot showing the last screenshot before the caption disappeared, and printed cards given to *Sci / Art* participants and the installation passers by.

PLAY WITH FIRE

Mónica Mendes, Pedro Ângelo, Valentina Nisi, Nuno Correia

"Play with Fire" is an interactive art installation encouraging participants to ignite virtual fires over live streaming video of selected forests. The experience paradoxically encourages playing with fire in order to foster awareness and prevention of fire related damages to the forests.

#Play_withFire | http://artivis.net | http://playwithfire.artivis.net/00

"Globally, 95 percent of all fires are caused by human activity"

FAO | Food and Agriculture Organization of the United Nations
www.fao.org/newsroom/en/news/2004/48709/

Play with Fire captions and cards used at the exhibition in Montemor-o-Novo (PT version instead), ACE, DIS and Madeira SIS.

K. Clipping – The ARTiVIS Research in the Media, Announcements and Feedback
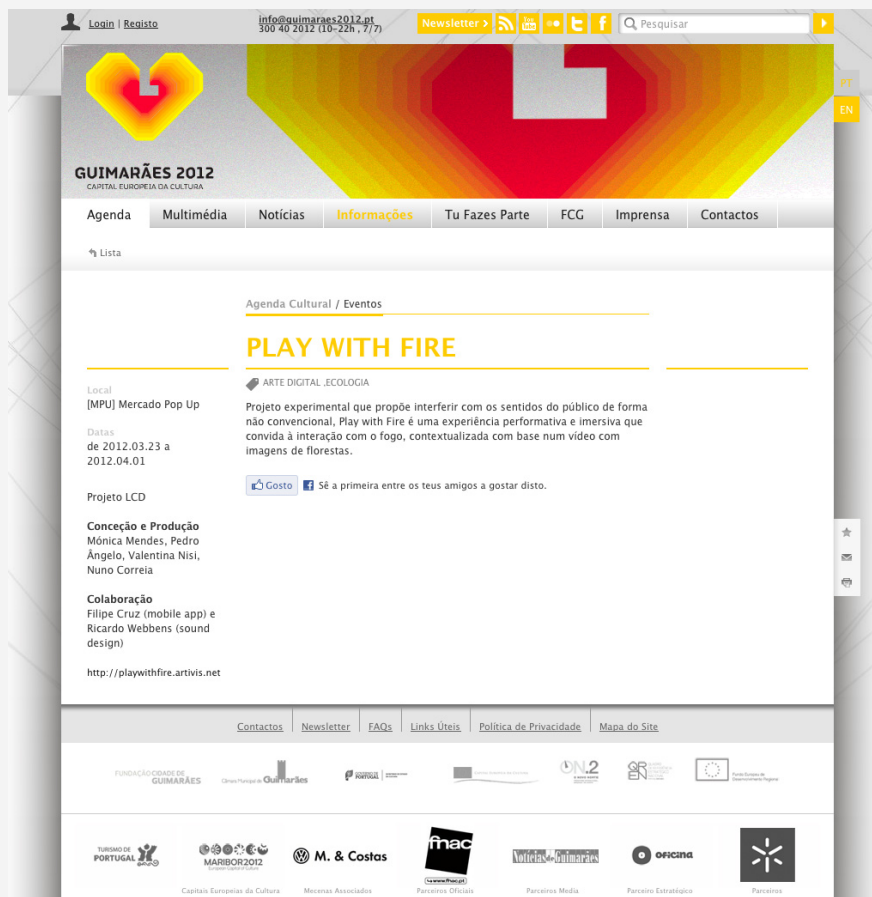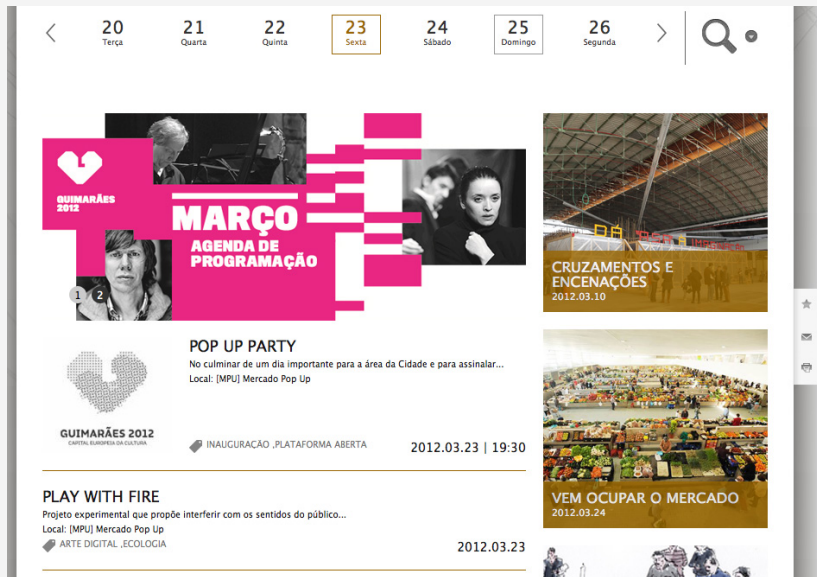
Guimarães 2012 European Capital of Culture site page announcing the *Play with Fire* installation at *Pop Up Mercado*
http: / / www.guimaraes2012.pt / index.php?cat=191&item=35935 and "ecology" tagged events including *Play with Fire*.

■COLABSQUARE

UT Austin | Portugal International Collaboratory for Emerging Technologies, CoLab

■ STUDENT HIGHLIGHT – Mónica Mendes – "RTiVISS » Real-Time Video Interactive Systems for Sustainability" (Digital Media)

Mónica Mendes is a Digital Media PhD student researching on the implementation of real-time video for sustainability and artistic experimentation. She holds a Masters in Multimedia Educational Communication, the degree is in Communication Design, and she is a Multimedia Arts educator at the Faculty of Fine Arts of the University of Lisbon, and Interface Design for Mobile Devices instructor. Additionally, she developed projects as a designer, and she is also founder of the hackerspace *altLab* and a *CIEAM* multimedia research center member. An activist facet sparks due to the potential in contributing to forests preservation to a more sustainable world through critical research and experimental artistic approaches. Living in a country extremely exposed to forrest fires, makes us very sensitive to an issue which also applies to a world scale. Despite previous measures, an attitude towards prevention seemed pertinent and urgent: how can we propose constructive approaches to the destructive dynamics of fire that aggravate climate change? Can art foster awareness and respect for nature? Combining physical and virtual worlds, Real-Time Video Interactive Systems for Sustainability (RTiVISS) offer participants a way to remotely monitor natural environments for forest protection. This exploratory research project proposes experimental design methods at the intersection of art and technology, with professors Nuno Correia from Sciences and Technology and Sílvia Chicó from Fine Arts as thesis advisors.

Collaboratively developed by artists, activists and technologists, these new systems strengthen environmental awareness through "the emotion of real-time" and enable artistic explorations with digital media in interactive experiences, engaging the senses in unconventional ways. RTiVISS' outcomes include an online platform, displaying open real-time forests videos and correspondent artistic exploration, and interactive installations for public exhibition with real-time video of the forests as raw material. She is now focused on the design and technology of specific RTiVISS instances such as the interactive installations "Play with Fire" and "Hug@ree".

The interactive installation "B-wind!" was developed with the collaboration of members of AZ labs and was exhibited recently at the transdisciplinary arts centre *O Espaço do Tempo*. Previously, "Treeellucinations" premiered RTiVISS at the Future Places exhibition in 2009, and "loev", the live events multidisciplinary team project, was commended for its commercial potential at the 2008 Future Places exhibition. The overall research proposal has recently been distinguished as the best Portuguese paper at "Artech" international conference on Digital Arts, and was selected for presentation at ACM Multimedia this year. RTiVISS comprises a strong dimension on social and natural sciences combined with New Media, and with a challenging technological component – for the design of a better world.


+ info & research iterations
www.monicamendes.info | www.rtiviss.com

Research news on *CoLab Square* August 2010 » http: / / utaustinportugal.org / newsletters / CoLab–newsletter–2010.08.pdf

APPENDIX A**49**

■ Hu@ree – A RTiVISS experience on tour

Hug@ree, an interactive installation by Mónica Mendes, Pedro Ângelo and Nuno Correia, has recently premiered at the Pop Up City in Lisbon, from November to December 2010 (**http://goo.gl/7mzAq**). The participation in this exhibition was followed by a portable version at AZ Labs hackmeet in Porto (**http://www.audienciazero.org**), and is also confirmed to be at the conference on Tangible, Embedded, and Embodied Interaction – TEI'11 – Art Explorations in January 23-26, 2011 (**http://goo.gl/3meTA**).

Hug@ree is an experience to provide a bond between urban beings and the forest. In an outdoor space, participants hug a real tree instrumented with capacitive sensors that communicate with an indoor installation space. When a hug trigger reaches the wireless radio receiver, the video is sent to an interactive tangible projection. Then, participants may access and place the video loop of their own hug on the displayed real-time video projection of the tree, becoming leaves of a collective experience.
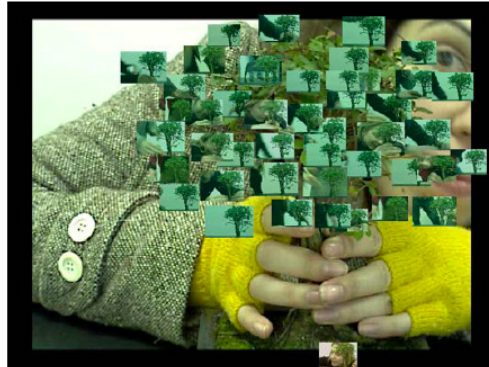
Hug@ree is part of Real-Time Interactive Video Systems for Sustainability — RTiVISS – Mónica Mendes' PhD in Digital Media exploratory research in the scope of the UT Austin | Portugal Program. The project proposes to investigate innovative concepts and design methods regarding environmental and sustainability issues, with Nuno Correia and Sílvia Chicó as thesis advisors.

Hug@ree was developed with the collaboration of AZ Labs members Ricardo Lobo, João Correia, Maurício Martins, and Margarida Correia, and the support from Subvertice, FBAUL and Media Ground for the exhibition equipment.

Here is the resulting screen timelapses at PopUp: **http://vimeo.com/18009040** and at AZ hackmeet: **http://vimeo.com/18268496**, and the photos on and after implementation: **http://www.flickr.com/groups/hugatree**. The project page is **http://www.monicamendes.info/rtiviss/hugatree**.

■ Colab panels accepted for SXSW Interactive 2011

Two panels proposed by Advanced Digital Media collaborators in Portugal have been accepted for South by Southwest Interactive, March 11-15, 2011 in Austin.

"Big Brother Goes Green: Surveillance for Sustainable Forests" was proposed by PhD student Mónica Mendes and UNL professor Nuno Correia. Their panel will explore their research on Real-Time Video Interactive Systems for Sustainability (RTiVISS), systems which offer participants a way to remotely monitor natural environments for forest protection. Collaboratively developed by artists, activists and technologists, these new systems strengthen environmental awareness through "the emotion of real-time". For more on their panel, see: **http://tinyurl.com/26dfm2u**

"Neither Moguls nor Pirates: Grey Area Music Distribution" was proposed by futureplaces director Heitor Alvelos of the University of Porto. The panel will discuss emerging modes of music distribution which cannot easily be lumped with either side of the conflict between music piracy and the music industry.

See: **http://tinyurl.com/6f2kzzh**

In addition, former UT Austin | Portugal post-doc Derek Lackaff, now Assistant Professor of Communications at Elon University, has organized a panel for SXSW 2011 entitled "Rebooting Iceland: Crowdsourcing Innovation in Uncertain Times". The panel will reflect his research on Iceland's experiments with models of governance emerging from social media and the tech entrepreneurial sector. See: **http://tinyurl.com/2dr8tpz**

Mónica Mendes attended SXSW 2010 as part of an exploratory visit of Austin funded by the UT Austin | Portugal Program. Her experience at the conference inspired her to make a panel proposal about her own research. You can read her blog posts from SXSW 2010 at: **http://monicamendes.wordpress.com/category/sxsw**

To discuss how your interests could be turned into a proposal for a future edition of SXSW, feel free to contact Prentiss Riddle of the UT Austin CoLab office (**priddle@ic2.utexas.edu**).

SXSW and *Hug@ree* news on *CoLab Square* » http: / / utaustinportugal.org / newsletters / CoLab-newsletter–2011.01.pdf
January 2011

Big Brother Goes Green: Surveillance for Sustainable Forests

The panel "Big Brother Goes Green: Surveillance for Sustainable Forests" (http://schedule.sxsw.com/events/event_IAP6736) was presented by Mónica Mendes and Nuno Correia on Saturday, March 12, 5pm, at the Austin Convention Center.

After an introduction on surveillance and the use of real-time video in artistic contexts, Mónica and Nuno focused on the issues raised from the questions proposed, presenting the premises and progress of their research project developed in the scope of the UT Austin | Portugal Program, RTiVISS (Real-Time Video Interactive Systems for Sustainability).

The presentation showcased the design and technology of the specific RTiVISS interactive installations "Play with Fire", "B-wind!", and "Hug@ree", combining physical and virtual worlds. These examples were followed by their proposals on usability and evaluation. Collaboratively developed by artists, activists and technologists, these new systems strengthen environmental awareness through "the emotion of real-time" – a case study of what happens when tinkerers, open-source coders, and new media artists work together for a better world.

The presentation raised interesting questions, from the development of the RTiVISS software and hardware kit in the context of the work developed with the hackerspace members, to the paradoxical proposal of playing with fire for environmental purposes.

The SXSW audience responded enthusiastically, and future collaboration with an Austin environmental institution may follow. Additionally, the presenters received suggestions to submit the current research for further academic and technological events.

Research interactions of the project presented are continuously posted on www.rtiviss.com and the twitter feedback is available at #BBgoesGreen.

Nuno Correia and Mónica Mendes

■ UT Austin | Portugal PhD students presented their work at Pavilhão do Conhecimento

Every day we interact with the most sophisticated technological tools. Inevitably, arts have not escaped a fascination for this digital world. In Portugal, a new generation of creators, thinkers and cultural mediators are using these new languages in a reliably way.

"Algoritmos Criativos" (Creative Algorithms) was an exhibition of 12 works in diverse areas such as interaction design, physical computing, robotics, artificial intelligence and systems engineering.

This was a project launched last year between Ciência Viva (a Portuguese government funded institution promoting science and technology awareness), Espaço do Tempo (a cultural association in Montemor-o-Novo that promotes artistic residencies in a beautiful local convent in a castle to further emergent artistic practices in performing and digital arts) and Audiência Zero (a Portuguese association promoting creative technologies, knowledge sharing and collaborative development in the edge between art, science and technology). The final result was displayed at Pavilhão do Conhecimento in Lisbon during February 2012.

• Play with Fire by Mónica Mendes, Pedro Ângelo, Valentina Nisi, Nuno Correia + collaboration Filipe Cruz and Ricardo Webbens
http://playwithfire.artivis.net

Play With Fire is an interactive installation that asks participants to paradoxically set generative fires over live streaming video of forests to stimulate environmental awareness, created and developed by Mónica Mendes, Valentina Nisi, Nuno Correia and Pedro Ângelo, with the collaboration of Filipe Cruz for the mobile application and Ricardo Webbens in sound design.

More than the participation in this exhibition, the whole de-
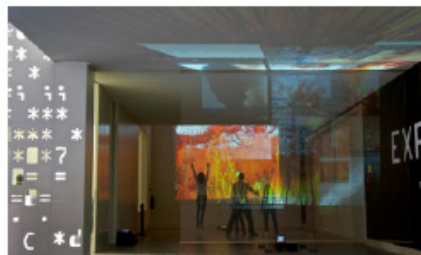
Play with Fire

velopment process and the support and collaborative work environment provided by the organizations was very important in furthering our research work, both for Mónica at a time where documenting the work and performing user testing is paramount, as for Pedro, already gathering important information and insight about the needs of digital creators for his research on next generation creative programming tools.

SXSW and *Play with Fire* news on *CoLab Square*, March 2011 » http: / / utaustinportugal.org / newsletters / CoLab-newsletter-2011.03.pdf and February 2012 » http: / / utaustinportugal.org / newsletters / CoLab-newsletter-2012.02.pdf

Hug@ree announcement at the *AZ Labs* website » http: / / audienciazero.org / index.php?option=com_cct&task=view&id=135

350.org What is 350?   ABOUT   CAMPAIGNS & PROJECTS   RESOURCES   MEDIA   SIGN UP   DONATE

Hug@ree

Submit Action Report

Sunday, 10 October, 2010 (All day)

Have you ever...? Hug@ree and engage into a playful symbiotic relationship with nature :)

We are getting to work on the climate crisis with task analysis and usability tests towards RTiVISS most recent experience, the interactive installation Hug@ree.
Through an artistic approach in an experimental investigation, we are actively reflecting on the questions: how can we propose constructive approaches to the destructive dynamics of fire that aggravate climate change? Can art foster awareness and respect for nature?

On the 10/10/10, participate and help us to reach further – simply hug a real tree anywhere in the world, and then send the 5 to 10 seconds video or a photo to **rtiviss.hugatree@gmail.com** !

This action on 10/10/10 will trigger your registration in the Real-Time Interactive Video Systems for Sustainability virtual world and screen you at the interactive installation we will be exhibiting at Popup Lisbon. Hug@ree will be symbolizing the complicity between urban beings and the forest to express cities' new values regarding sustainability.

Event Website: http://www.monicamendes.info/rtiviss/hugatree/101010.html

How to Get Involved Planning the Event: Email rtiviss.hugatree@gmail.com with a proposal or simply participate by hugging a real tree + sending your video or photo!

Event Host: http://www.rtiviss.com/rtiviss

Location Information
Lisbon, 1170-251
Portugal

Event Organizer
Mónica M

Join Us:
Email
Country
City

SIGN UP FOR UPDATES

FEATURED PROJECTS

350 Local
A global network of local climate activist groups.

Climate Leadership Workshops
Training the next generation of climate leaders.

eARTh: Climate Art
Using art to spark a global climate movement

Like Mónica Mendes, Rosa Chaves and 209,197 others like this.

Follow @350 106K followers

The Science of 350
CO2 +391.57 Scientists say that 350 parts per million CO$_2$ in the atmosphere is the safe limit for humanity. Learn more about 350—what it means, where it came from, and how to get there. **Read More »**

WE'RE HERE 392ppm
WE NEED TO GET BELOW: 350ppm

CO$_2$ in the atmosphere

Climate Movement Success Stories

Related Files: (to download, right-click and "Save As...")

hugatree_img.jpg (173kb)
hugatree_photos4_101010.jpg (148kb)

Hug@ree participation at *350.org* event "10 / 10 / 10 Global Work Party" » http: / / www.350.org / en / hugree