1st Workshop on Advanced Visual Interfaces for Cultural Heritage

Advanced Visual Interfaces for Cultural Heritage

Cristina Gena
The University of Turin
Corso Svizzera 185
Italy, 10149
+390116706827
cristina.gena@unito.it

Berardina De Carolis
The University of Bari
"Aldo Moro"
Italy, 70126
+390805443284
berardina.decarolis@uniba.it

Tsvi Kuflik
The University of Haifa
Mount Carmel, Haifa,
Israel, 31905
+97248288511
tsvikak@is.haifa.ac.il

Fabrizio Nunnari
DFKI
Campus D3.2, 66123
Saarbrücken, Germany
+496813023393
fabrizio.nunnari@dfki.de

ABSTRACT

AVI provided an attractive opportunity for exploring novel visual interfaces for cultural heritage (CH). CH traditionally draws a lot of research attention when it comes to exploring the potential benefits from application of novel technology in realistic settings. At the same time, AVI focusses on exploring the state of the art visual interfaces and their application in various domains. The AVI-CH workshop nicely demonstrated the potential of combining these two aspects – the state of the art interfaces technologies with the information rich CH domain. The result was a number of high-quality submissions, with the diversity of topics presented by the papers accepted and discussed at the workshop.

Author Keywords

Advanced Visualization, Cultural Heritage, Workshop.

CCS Concepts

• Human-centered computing~Human computer interaction (HCI)

1. INTRODUCTION

The rapid development of information and communication technologies (ICT) and the Internet has enabled cultural heritage (CH) institutions to provide access to their collections in multiple various ways, both on-site and online, and to attract even wider audiences than those that visit the physical museums. A major driver/enabler of the above is the enormous growth in user interfaces modalities and in information visualization technologies. User interface technologies are growing and evolving by the day. They vary from tiny smart watch screens to wall-size large public displays and from mouse and keyboard to touch, voice gesture and gaze activated systems.

Regarding advanced virtual interfaces, there are several successful examples of 3D technologies for virtual museums. The use of (web) 3D in cultural heritage allows the general public to enjoy immersive experiences in virtual, reconstructed locations, such as ancient buildings and cities, and to visit existing, remotely located locations, such as world-wide cultural institutions (such as Google Art Project [1]). For preservation purposes, web 3D provides scholars and cultural heritage professionals with a way to consult and maintain visual repositories of real exhibits, with the possibility of visualizing, comparing and studying 3D digital equivalents of real artworks physically situated in different locations.

In spite of the potential benefits, cultural heritage is also a very challenging domain of application for such novel ICT technologies. It is ubiquitous – just look around you and see that you are surrounded by it. There is abundance of CH related information available, about almost every object we can think of. How can we access and enjoy this information in Ubiquitous Computing scenario?

Advanced and natural human-computer interaction is a key factor in enabling such access and visual interfaces, whether they are tiny mobile screens or large wall mounted displays, they can all be part of the CH IoT and be part of a ubiquitous CH infrastructure, where information can be personalized and displayed/projected, on screens or overlaid on real objects.

The goal of the workshop is to bring together researchers and practitioners interested in addressing the above-described challenges by exploring the potential of state of the art advanced visual interfaces in enhancing our daily cultural heritage experience.

2. CONTRIBUTIONS

The presentations and discussions at the workshop spanned a large variety of topics combining AVI and CH. We tried to discuss the submissions from several practical aspects, first of all looking at onsite vs. online points of view (that appears to be challenging given the augmented and virtual reality state of the art technology that can be applied both onsite and offsite) and then at the variety of interaction techniques and technologies that were presented.

The workshop started with an invited talk by Franco Cutugno that presented an advanced interface for CH exhibition design. He presented an example of interactive floor (PaSt project), which allows users to interact with the history by walking on a virtual carpet, and then discussed an approach based on Audio Augmented Interaction adopted in the CARUSO project. CARUSO is an Audio Augmented Reality android app based

on 3D audio that creates virtual soundscapes through the binaural reproduction of voices and sound effects. The user is free to move in the environment. The output follows her movement since the software works with interactive headphones, which detect head orientation by an inertial sensor and communicate via bluetooth with the device.

2.1 On site interaction (I would delete it since the first talk was also about on-site interaction)

A large and diverse number of the submissions focused on supporting museum visitor(s) onsite, making use of a diverse set of technologies for different applications. Emmanouil Zidianakis presented the design and implementation of a technological framework based on Ambient Intelligence to enhance visitor experiences within real or virtual CH Institutions by augmenting two-dimensional real or virtual paintings. Among the major contributions of this work is the support of personalized multi-user access to exhibits, facilitating also adaptation mechanisms for altering the interaction style and content to the requirements of each visitor. A standard compliant knowledge representation and the appropriate authoring tools guarantee the effective integration of this approach to the CH context. They suggested the use of QR codes for two ways interaction with the environment – providing personal profile and a possible way of getting personalized information, in addition to information projection (or tablets) as means for personalized information delivery to museum visitors. [14]

Mokatren and Kuflik in a follow-up to [11, 12] examined the potential of using a mobile eye tracker for indoor positioning and intuitive interaction. They presented the results of a preliminary study that explored the potential of mobile eye-tracking and vision technology for enhancing the museum visit experience. Their hypothesis is that the use of eye tracking technology enables natural and intuitive interaction of the visitor with the information space. Satisfactory preliminary results from examining the performance of a mobile eye tracker in a realistic setting were presented. The technology has reached a reliable degree of maturity that can be used for developing a system based on it.

Starting from a collaboration with a worldwide famous Italian designer, Calandra, Di Mauro, Cutugno and Di Martino [2] defined a Natural User Interface to explore 360° panoramic artworks presented on wall-sized displays. Specifically, they let the user to "move the head" as a way of natural interaction for exploring these large digital artworks. To this aim, they developed a system including a remote head pose estimator to catch movements of users standing in front of the wall-sized display. With natural user interfaces, it is difficult to get feedbacks from the users about the interest for the point of the artwork he/she is looking at. To solve this issue, they complemented the gaze estimator with a preliminary emotional analysis solution, able to implicitly infer the interest of the user in the presented content from his/her pupil size. Preliminary results of a user study with 51 subjects show that the most of the subjects were able to properly interact with the system from the very first use, and that the emotional module is an interesting solution, even if further work must be devoted to address specific situations.

Gena [4] presented a specific aspect of the large-scale WantEat project. She presented a reward-based field evaluation of the interaction model developed for the project, which puts together real and virtual words [5]. Real objects are used as gateways for accessing the cultural heritage of a territory. Hence, they designed an intelligent interaction model that allows users to explore the region starting from a real contacted object. In particular the interaction model support the visualization and the exploration of identifiable objects of the real world and their connections with other objects. It proposes a paradigm that enables a personalized, social and serendipitous interaction with networked things, allowing continuous transition between the real and the digital worlds. They illustrate the procedure and the results of such evaluation, carried out with a prototype application with no active users' community. Results show that the interaction model stimulates the exploration of the objects in the system and their networks, and partially promotes the interactive features of the application, as social actions. For more details see also [15].

Antonio Origlia presented a human-robot interaction setup where people actively choose how much information concerning the available topics they would like to access. To provide engaging presentations, the humanoid robot exhibits a behaviour modelled on the basis of a human presenter. Monitoring the evolution of the interactive session allows estimating users' general interest towards the available contents. The results show that people were very satisfied by the interactive experience and that the level of interest detected automatically by the system were found to be consistent with the one declared by the users. Both subjective and objective metrics were used to validate the approach [12].

Unfortunately, Nicola Orio who was supposed to report the results of an initial experiment on the acoustic description of the city of Padova (soundscape) was unable to attend the workshop. Still, the results of a study about a group of users that has been involved in recording the sounds of the city and in tracking their position in space and in time using a web based interface is reported in the paper. Collaboration and coordination among participants has been promoted using a wiki, where participants could assign themselves the locations to be recorded and define the standard to be followed. The result is the creation of an acoustic map of the city of Padova, which can be navigated in space and in time through a web interface. A mobile version of the interface is currently under development [13].

2.2 Online interaction (delete?)

There were a few online-only systems. Again, these were quite diverse. As an extension of [9], Lanir presented a system that visualizes online visitors' behavior onsite to museum director. Data collected from automatic tracking of visitors' movements in the museum and their interaction with a context aware

museum visitors' guide system was collected and served as a basis for the analytic visualization. Using this information, they provide an interface that visualizes both individual and small group movement patterns, as well as aggregated information of overall visitor engagement [10].

Alan Wecker, following [7][8], introduced the idea of ongoing events collection – a "scrapbook" for future use. He presented the idea concerning the utility and makeup of an application to collect cultural heritage experiences. The features for such an application and possible visualizations are discussed [17].

2.3 Interaction techniques and technologies

As far as technologies, the diverse set of papers spans a large variety of presentation and interaction techniques, including conventional desktop display [10], through the use of mobile guides for information delivery [15], the use of eye tracking as a natural interface for positioning and interaction [12][2], virtual and augmented reality [14][2][2], natural language interaction [17], audio-based interaction [13] and even human-robot interaction [12].

3. SUMMARY

The workshop proved to be successful in promoting discussion on variety of novel AVI technologies and their application to CH. The wide diversity of aspects and the technologies and their combination triggered discussion about both opportunities and challenges in the application of these technologies for CH. The interaction leaded discussions about possible future collaboration among AVI-CH participants as well as a decision to follow up on future results of the studies presented at the workshop, aiming for a special issue in a leading scientific journal.

4. REFERENCES (ADD REFERENCE TO COTUGNO TALK???)

[1] https://www.google.com/culturalinstitute/project/art-project

[2] Davide Maria Calandra, Dario Di Mauro, Franco Cutugno and Sergio Di Martino (2016). Navigating Wall-sized Displays with the Gaze: a Proposal for Cultural Heritage, *AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage*, Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[3] Fabio Marco Caputo, Irina Mihaela Ciortan, Davide Corsi, Marco De Stefani and Andrea Giachetti. (2016). Gestural Interaction and Navigation Techniques Aimed for Virtual Museum Experiences, *AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage*, , Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[4] Federica Cena, Luca Console, Cristina Gena and Alessandro Marcengo, Amon Rapp (2016). A Field Evaluation of an Intelligent Interaction Between People and a Territory and its Cultural Heritage, *AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage*, , Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[5] Luca Console, Fabrizio Antonelli, Giulia Biamino, Francesca Carmagnola, Federica Cena, Elisa Chiabrando, Vincenzo Cuciti, Matteo Demichelis,Franco Fassio, Fabrizio Franceschi, Roberto Furnari, Cristina Gena, Marina Geymonat, Piercarlo Grimaldi, Pierluigi Grillo, Silvia Likavec, Ilaria Lombardi, Dario Mana, Alessandro Marcengo, Michele Mioli, Mario Mirabelli, Monica Perrero, Claudia Picardi, Federica Protti, Amon Rapp,Rossana Simeoni, Daniele Theseider Dupré, Ilaria Torre, Andrea Toso, Fabio Torta, Fabiana Vernero. Interacting with social networks of intelligent things and people in the world of gastronomy (2013). *TiiS* 3(1): 4.

[6] De Carolis B., Palestra G., Gaze-based Interaction with a Shop Window. In Proceedings of AVI '16: International Working Conference on Advanced Visual Interfaces, June 2016, Bari, Italy.

[7] Tsvi Kuflik, Judy Kay, and Bob Kummerfeld. (2010, June). Lifelong personalized museum experiences. In Proceedings of Workshop on Pervasive User Modeling and Personalization (PUMP'10) (pp. 9-16).

[8] Tsvi Kuflik, Alan Wecker, Joel Lanir and Oliviero Stock. (2015). An integrative framework for extending the boundaries of the museum visit experience: linking the pre, during and post visit phases. Information Technology & Tourism, 15(1), 17-47.

[9] Joel Lanir, Peter Bak and Tsvi Kuflik. (2014, June). Visualizing Proximity-Based Spatiotemporal Behavior of Museum Visitors using Tangram Diagrams. In Computer Graphics Forum (Vol. 33, No. 3, pp. 261-270).

[10] Joel Lanir, Tsvi Kuflik, Nisan Yavin, Kate Leiderman and Michael Segal. (2016) Visualizing Museum Visitors' Behavior, AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage, , Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[11] Moayad Mokatren and Tsvi Kuflik. Exploring the potential contribution of mobile eye-tracking technology in enhancing the museum visit experience. In proceedings of the The First Joint Workshop on Smart Connected and Wearable Things, co-located with IUI 2016, Sonoma, Ca, 10.3.2016. Available online at: https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxzY3d0MjAxNnxneDoyMGJjMDM2MzFjNzJmOTU0

[12] Moayad Mokatren and Tsvi Kuflik (2016). Exploring the potential contribution of mobile eye-tracking technology in enhancing the museum visit experience, AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage, , Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[13] Antonio Origlia, Antonio Rossi, Maria Laura Chiacchio and Francesco Cutugno. (2016). Cultural heritage presentations with a humanoid robot using implicit feedback, AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage, , Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[14] Nicola Orio. (2016). Padova Soundscape: a Crowdsourcing Approach to Describe the Sound of a

City, AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage, , Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[15] Nikolaos Partarakis, Margherita Antona, Constantine Stephanidis and Emmanouil Zidianakis. (2016). Adaptation and content personalization in the context of multi user museum exhibits, AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage, , Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[16] Amon Rapp, Federica Cena, Cristina Gena, Alessandro Marcengo, Luca Console (2016). Using game mechanics for field evaluation of prototype social applications: a novel methodology. Behaviour & IT 35(3): 184-195 (2016)

[17] Antonio Sorgente, Paolo Vanacore, Antonio Origlia, Enrico Leone, Francesco Cutugno and Francesco Mele. (2016). Multimedia Responses in Natural Language Dialogues, *AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage*, , Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073

[18] Alan Wecker, Tsvi Kuflik and Oliviero Stock. (2016). CHEST: Cultural Heritage Experience Scrapbook Tool, AVI*CH, the first Workshop on Advanced Visual Interfaces for Cultural Heritage, Bari, 7th of June 2016, CEUR-WS.org, ISSN 1613-0073