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Design studios associated with hackerspaces

Estúdios de design associados ao hackerspaces

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ABSTRACT

This paper presents experiments of association between a hackerspace and a design studio at the Federal University of Santa Catarina. In two different semesters, students designed and constructed proposals for ephemeral and interactive small-scale spatial interventions using physical computing. The Tarrafa Hacker Clube members shared their collaborative environment with the students and tutors throughout these academic experiments. The dynamic infrastructure of the hackerspace introduced relevant methods and ethics for this collaborative and transdisciplinary work. This hybrid approach suggests meaningful possibilities for the future of architecture education and practice.

Keywords. Hackerspaces; transdisciplinarity; creative process; collaborative environment; physical computing.

RESUMO

Este artigo apresenta experimentos de associação entre um espaço de hackers e um estúdio de design da Universidade Federal de Santa Catarina. Em dois semestres diferentes, os alunos projetaram e construíram propostas para intervenções espaciais efêmeras e interativas em pequena escala, usando a computação física. Os membros do Tarrafa Hacker Clube compartilharam seu ambiente de

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colaboração com os alunos e tutores ao longo desses experimentos acadêmicos. A infraestrutura dinâmica do hackerspace introduziu métodos e ética relevantes para esse trabalho colaborativo e transdisciplinar. Essa abordagem híbrida sugere possibilidades significativas para o futuro da educação e prática da arquitetura.

Palavras-chave: Hackerspaces; transdisciplinaridade; processo criativo; ambiente colaborativo; computação física.

1. INTRODUCTION

The world today is defined by a constant state of crisis. In a context of economic, environmental, political and social transformations new creative practices emerge outside the limits of the established disciplinary fields. At the same time, the technological development grows associated with the accelerated changes we are experiencing. This occurs not only in more global aspects but also in how we perceive, think and act upon the world. Such changes have also an impact on our production, creation and learning relationships that are now placed under new paradigms. This scenario suggests directions towards shifts in architectural practice that goes through new learning processes for architecture and urban design.

Within this context, the hacker culture presents a creative and positive alternative towards technology. Actually its critics originate in the very basis of technology, reverting relations of power and authorship. One of the most recent manifestations becomes evident through the global spread of the hackerspace movement. At first, we can define hackerspaces as self-generated community workshops where people can meet and work in projects - often related with technology - share knowledge and expertise, seeking for other and better ways of doing things.

This paper presents a design studio experience with the theme “Interactive Technologies and Creative Processes”. The authors have associated the hackerspace Tarrafa Hacker Clube (Tarrafa HC) and this transdisciplinary design studio at the Department of Architecture and Urban Design of the Federal University of Santa Catarina. During two semesters, the hackerspace have played an important role in the studio’s development by sharing the necessary infrastructure for the experiment. Here we understand infrastructure not as a static set made by the physical space and equipaments, but as an active process in which people, information, tools and material interact and confront each other (Eriksson, 2011).

It is important to emphasize that the term hacker culture consolidates a comprehensive field that shares ethical commitments as well as a diversity of practices, which presents variations between them. Hackerspaces should not be seen as representative of all positions and practices associated with this term. Therefore, aware of the group specificities, we will treat, in this paper, only aspects related to the hackerspace movement.

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2. HACKER CULTURE AND HACKERSPACES

Despite the fact that hacker culture as we know it today and the terms hacker and hacking have their origins in the MIT computer labs between 1950s and 1960s, we can also find its principles in practices detached from this strictly computational context.

Linus Torvalds, one of the main developers behind the Linux operating system, says that "computer hackers themselves have always admitted this wider applicability of their ways. [...] In this sense, a person can be a hacker without having anything to do with computers." (Himanen, 2001, p. ix) Or, in the words of Otto von Busch, artist and design researcher: "hacking is an expanding a field of action, for many." (Busch and Palmås, 2006, p. 28).

For Busch (2009) hacking is a practice of direct intervention, which comes primarily from an ability to open a system, access it and learn to master its circuitry, structures and defenses. Furthermore it is also a specific tactic to reclaim and alter a system, plugging into it and redirecting its flows to a more desirable goal, building a new improved system. And ultimately - referencing the motto of the hacker ethic "all information should be free" (Levy, 2010) - methods, techniques and tools present in the hack are freely shared, so that any interested person can change or develop new applications. In this sense, hacking is essentially a constructive and positive activity.

This concept of hacking becomes particularly relevant to us when we analyze practices found in hackerspaces. Blankwater (2011) reaffirms that the hacking of hackerspaces is not limit to computer hacking and should be understood as a mindset, a way to interpret and approach the world. While Busch's concept may not be consistent with all the manifestations that somehow relate to the hacker culture, in several hackerspace studies and in our own empirical analysis we see that his description is quite suitable.

Eriksson (2011) categorizes the most productive activities found in hackerspaces into three groups that, in a way, embrace Busch's concept of hacking and further expand it. The first group that he identified as "modification of closed system" basically refers to the understanding, modification and extension of a given system functionality. The second group "composition by simple means" refers to the creative process that makes use of basic components and elements (eg. sensors and actuators) often obtained from scrap or from other objects. As a third group of activities, "experimentation with hardware and open source software" reflects the growing use of already open source devices like the Arduino and 3d printers kits for the development of new projects.

For Eriksson (2011), hackerspaces are self-generated and not determined by external logic - they arise when people with different goals and motivations come together through a common practice and sharing of resources and knowledge. For him, hackerspaces are not means to meet previously

defined goals. They should be seen as places where goals, motivations and desires can be explored, discovered and constructed.

Schrock (2011) also agree that individuals who attend hackerspaces cannot be uniformly characterized and are quite heterogeneous in their motivations to use the space. According to this author, a collective identity defines the specifics of each hackerspace and is generated by the momentary interests of its members, its activities and events in common.

Moilanen (2012) notes that a simple and compact definition of hackerspace still does not exist, even among people within the movement. Although a consensus has not been reached, community discussions around the theme made possible for the author to establish general criteria of what being a hackerspace means: nonprofit spaces, owned and managed horizontally by its members, there is a strong spirit of invention and science, activities that are based on trial, error and free sharing of information.

Hackerspaces also function as learning spaces. As Blankwater (2011) says, without a formal hierarchy but with a flexible horizontal structure everyone is a potential sender and receiver of information: "Hackerspaces offer different modes of learning that involves being creative, searching for own sources, out-of-the-box thinking, decentralization, collaboration and mixing of disciplines." (Blankwater 2011, p. 115).

In similar settings to what we know today, the first hackerspaces emerged in Germany in the mid-1990s and soon spread through Europe. In 2007, the concept and model of European hackerspaces was imported to the United States, where it gained strength and popularity, with the founding of hackerspaces like NYC Resistor (New York) and Noise Bridge (San Francisco). Today the hackerspace movement has a global reach, with many independent and self-managed spaces in several countries. In Brazil the first hackerspace, Garoa Hacker Clube, appeared in 2010 in São Paulo and paved the way for the creation of others, including Tarrafa Hacker Clube in Florianópolis.

The exploratory case study discussed in this article addressed the learning and creative processes that emerged from the association of a hackerspace in consolidation with an architecture design studio. In order to contextualize this paper we will first describe some of the history of Tarrafa Hacker Clube.

3. THE TARRAFA HACKER CLUBE

The Tarrafa Hacker Clube structure facilitated the development of the pilot educational experiment reported in this paper. In late 2011, the group was kickstarted through a virtual discussion list. The first presential activities were carried out from 2012, seeking to gather more people interested and to spread the concept of hackerspaces. At one point, when a small regular group was already

formed, thematics meetings began to take place in the form of workshops in varied locations as coworkings and some of the participants' homes. Subsequently, in 2012's second semester, the association with the recently created design studio "Interactive Technologies and Creative Processes" at the Department of Architecture and Urban Design, has provided both a space in the university for their activities and the possibility for Tarrafa HC's members to interact with the design studio students.

The Tarrafa HC's operation is in many ways similar to other hackerspaces, with regular activities that take place through meetings, individual and collective free projects and with specific activities such as lectures and workshops. As a peculiarity, we have the fact that the Tarrafa HC share its space with a formal educational institution, and does not enjoy full independence. This fact places the Tarrafa HC in a position of certain fragility, but also of interesting potential.

Like others hackerspaces, it is a place generated and maintained by its members (a nonprofit association) where critical and creative practice is mainly around technology and curiosity. The Tarrafa HC incorporates the concept of a dynamic and relational infrastructure. Such infrastructure served to the development of the architecture design studio reported bellow and allowed the consolidation of its physical existence (Fig. 01).

Fig. 01 - View of the Tarrafa Hacker Clube headquarters

4. DESIGN STUDIO - INTERACTIVE TECHNOLOGIES AND CREATIVE PROCESSES

The main objective of the architecture design studio "Interactive Technologies and Creative Processes" has been to explore the connections of the practices developed in a hackerspace, in this case the Tarrafa HC, and the design studio. These experiments were proposed as elective courses in the Department of Architecture and Urban Design opened to all students of the Federal University of Santa Catarina (UFSC).

Conducted over two semesters the experiment was based on precedents performed in different institutional contexts. The main reference was the "Integrated Architecture Studio" taught at the Federal University of Minas Gerais (UFMG) that has the support of laboratory LAGEAR, coordinated by José dos Santos Cabral Filho. However, unlike the studio offered by the UFMG, the experience portrayed in this article was not restricted to students of the course (UFMG course is part

of the mandatory curriculum of Architecture and Urban Design and offered to freshman students), but also stimulated participation of students from other areas such as Computer Science, Electrical Engineering, Electronics and Automation. The transdisciplinary nature was given by the combination of complementary knowledge coming from different areas in building a shared experience that resulted at the end of each semester in the production and documentation of interactive installations in public spaces within the university.

A significant factor that certainly gives novelty to the experience is the engagement of hackerspace processes with the dynamics of a design studio. The students constructed physical and spatial installations using available resources within the framework offered by Tarrafa HC. In this sense, more than the discussion of principles and theories regarding the insertion of an installation as a work of art in a public space, priority was given to the discourse of doing, thinking and producing as a group and in a collaborative environment. Thus, the installations were used as a stimulus to creatively solve common problem. The goal of each group was fully defined by its members, as well as the choice to apply specific resources, technologies and knowledge.

In the two semesters in which the studio was offered the working methods were similar, with practical classes and workshops for basic instrumentation in physical computing - notably Arduino - which were soon followed by the final group work development. Two virtual spaces were used in parallel to these activities: a blog[1] and a discussion group on Facebook[2].

In the first semester, with a smaller number of students, we chose to work on one single group. The participation of the tutors and collaborators (Tarrafa HC's members) was more intense, integrated in the work and decision-making process.

The second semester, in turn, had a larger number of students, requiring some adjustments in the adopted work model of the previous semester. This semester decisions about how to develop group projects were made only by the students, and tutors and collaborators' participated as facilitators.

The process over the two semesters in which the studio was offered is detailed below, with an emphasis on the procedures, results and more significant differences between the two moments.

Design Studio 1 - 2012/2

Our approach was to optimize the time in the studio for collaboration and projects' development by taking advantage of the Internet to deliver content and maintain only the activities and discussions in class. A blog for the discipline and a discussion group on Facebook were created to facilitate the interaction between the participants.

[1] http://tecnologiasinterativas.wordpress.com

[2] https://www.facebook.com/groups/124828460997644/

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Through the blog, texts for discussion and online resources of basic electronics and Arduino were provided, as well as project references involving computers, electronics and the city space. The blog also recorded the activities and evolution process of during the semester. After the semester a video about the installation developed by the group was edited as documentation.

At the beginning of the semester some activities were held outside of class hours and were open to the community. One of the most interesting was the Basic Electronics and Arduino Workshop experience, with the participation of people not enrolled in the studio - total of 14 participants including students of Architecture and Urban Design, Electrical Engineering, Computer Science and Information Systems.

The interaction between students, teachers and collaborators was very close throughout the semester, reinforcing a non-hierarchical structure. After the workshop, we worked together on the interactive installation project for a public space in the university campus. The contributions of the different members appeared especially during prototyping. Through the installation developing and prototyping process design intentions allied to practical issues were approached. After development throughout the semester, the work was completed with the intervention in the university space on the last day of class.

The resulting installation was an intervention in a pedestrian and small vehicles tunnel under a heavy traffic road that connects two parts of Federal University of Santa Catarina's campus. A sound sensor captured the cars' noise on the road and transmitted to an Arduino microcontroller, which trigger two headlights and a MP3 Player with a sound of heavy traffic, bringing the external environment sense of chaos into the tunnel (Fig. 02).

Fig. 02 - Work process and result in the installation of 2012/2

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The installation was tested for 3 hours and during this time the group observed the reactions of the public that passed through the tunnel - mainly university students and staff.

Design Studio 2 - 2013/1

In the second edition of this experience, we had the participation of a greater number of students - about 20 students of various courses (Architecture and Urban Design, Automation and Control Engineering, Electronic Engineering, Computer Science and Administration). Following the same model of advertising, a digital poster was published in discussion lists and social networks, and indications were made by some of the students who participated in the previous edition.

We continue using the same blog and discussion group, taking the opportunity to propose a link between the two groups (participants of the previous group maintained access to the group and the blog and still followed the evolution of the new studio). The readings, references and previous records served as the initial basis for this new semester. In this semester the discussion group had more intense use by students and somehow ended up replacing the blog, which remained more as a reference than as a site for record and information exchange.

Because of the larger number of participants, the semester has developed itself in a slightly different way from the previous, with greater students' independence for exchange information among themselves and for engaging more effectively with the Tarrafa HC's infrastructure. The three groups developed distinct proposals of spatial installations using physical computing. Associating Arduino or Raspberry Pi with sensors and actuators to structures created with simple materials such as wood and and fabrics and reactive motion graphics programmed with Processing, students designed and built three works for the university public space, seeking to explore the spatial experience in a playful manner.

Group 1 worked with in the main circulation axis, engaging the public through the construction of translucent panels that together formed a fragmented screen to support a digital animation of silhouettes. These silhouettes were driven by the presence of people, creating a playful combination of colors and shadows that mixed physical and digital aspects (Fig. 03).

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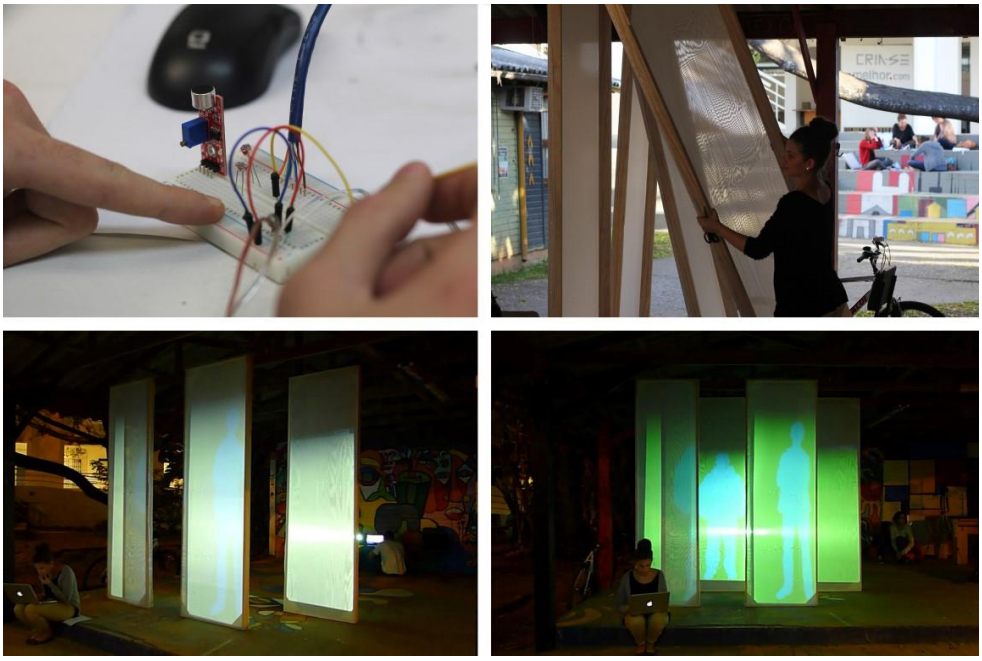

Fig. 03 - Work process and result in the installation of 2013/1 - Group 1

Group 2 aimed at a ludic relationship of space with soap bubbles and projections: the final version of the work consisted of three buttons that activated an animation of circles ranging in diameter and color and devices built with fans that threw soap bubbles, creating a corridor of sensations (Fig. 04).

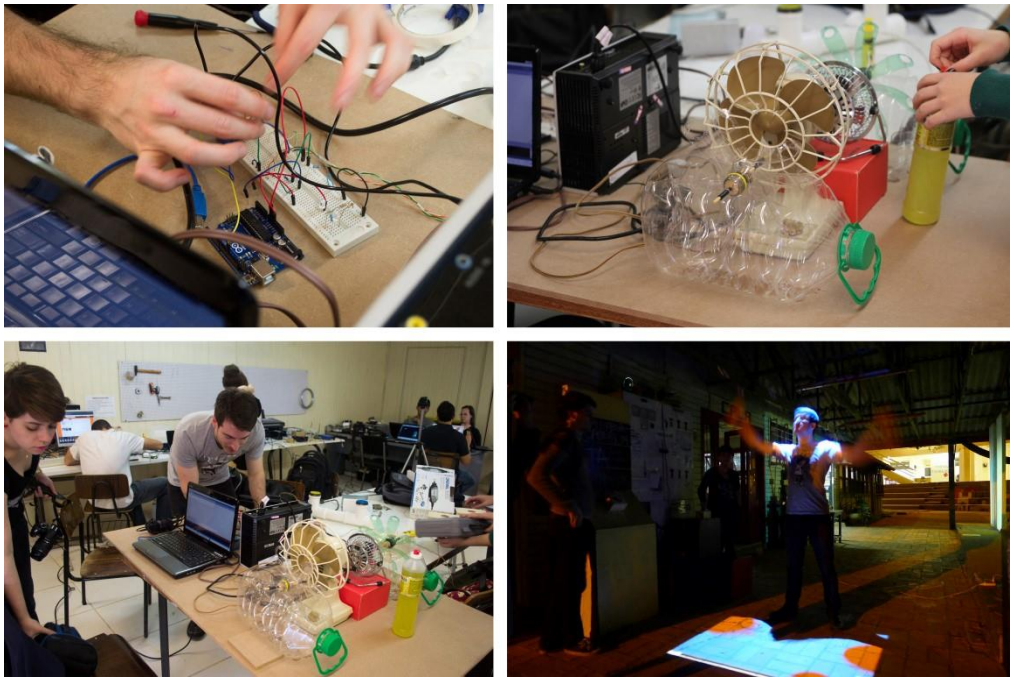

Fig. 04 - Work process and result in the installation of 2013/1 - Group 2

Finally, group 3 developed an intervention considering the pre-existence of a graffiti mural in the entryway of the building, adding a focus light and sounds to drawings of animals and objects that

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composed the mural, who were also activated by the presence of those who crossed the path (Fig. 05).

Fig. 05 - Work process and result in the installation of 2013/1 - Group 3

The design processes varied from group to group as well as with each individual student - which was already somewhat expected given their diverse backgrounds. One group demonstrated greater facility in working collectively, and structured a clear design that went through technical adjustments. However, due to the characteristics of the project this same group has not developed many effective activities within the hackerspace, which was instead used to discuss the steps, tasks, and promote the exchange of information and collaboration with other colleagues. Another group displayed more difficulties in defining clearly their design intent and spent much of the semester testing possibilities in hackerspace, taking advantage of the infrastructure. By the smaller scale of the parts involved in the installation, the whole process was actively developed within the hackerspace, experiencing many trial and error moments, demonstrating a more speculative process rather than an objective one. However, one of groups had difficulties to assimilate the proposed association with the hackerspace with less involvement in the class activities, developing their work completely disconnected from the other colleagues.

5. CONCLUSION

The resulting installations constructed by the students should not be regarded isolated from the process. Their processes were actually the most important contribution of the two experiments. The students, and even the tutors, had often to face the condition of lack of information that others in the

group had. The leadership within the groups and in the classes was always changing. Technology knowledge often drove the classes' format and students from different areas assumed the position of lecturer in various moments. The groups had to grow with their human resources and shared information.

Our engineering students do not have course such as a design studio that integrates knowledge from different areas in a creative project. In addition to that, the interaction with architecture students is not easy and the hackerspace offered a space and open methodology to support bridging these gaps. The construction and experimentation processes at the hackerspace actually presented a much richer place for interaction than those developed at design studio space. Failure and adaptation were important tools for developing their ideas.

The Tarrafa HC developed several simultaneous activities that were not related to the design studio, but presented new possibilities for the students' projects. The hackerspace introduced more life than what they had at their design studio. The messy desks, with different experiments developed by the Tarrafa HC's members, were also an inspiration and source of knowledge.

As we have identified a genuine interest in the students of the studio, the delivery schedule and needed group meetings went beyond the limited class time. In our case, time became an obstacle to the development of the work and the exploitation of resources and tools. Moreover, we also realized that the Tarrafa HC infrastructure was strongly reflected in the students' work process, becoming one of the most valued aspects according to reports collected at the end of each semester.

At the same time, there was a clear contradiction between the students' expressed desire to have more autonomy in the construction of their learning process and the difficulty in dealing with a more open and horizontal focused on work processes structure. According to the students' reports, we observed that the vast majority of them felt stimulated by the proposed speculative practices and experiences, hardly found in courses of the engineering and other technological curricula and even in the course of architecture and urban design. However, we also identified cases where students suggested the desire for a more rigid and oriented structure.

We conclude that the hybrid infrastructure constituted by the articulation of the Tarrafa HC with the presented design studio had a positive impact, displaying and promoting another possible approach to the design process. By identifying the abstract models of procedures and processes present in hackerspaces we can incorporate them to professional practice and to the architecture education process.

We can take lessons at two different levels: as an alternative form of appropriation of available technologies and technological development, as well as a wider appropriation of observed values -

assuming more open, decentralized, collaborative and shared actions through direct interventions motivated by curiosity and interests, although sometimes not oriented to a specific purpose.

Finally, we would like to point out the challenges and importance of transdisciplinary initiatives involving experiments related to technology, stimulating the formation of a communication base between students and professionals from different fields of knowledge. The hackerspace have presented a different environment for all students. It somehow dislocated them from their known zone. The stimulus for ideas exchange, open information and innovation were the greatest contribution for having students from different areas sharing goals and discoveries.

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