



A Case Study on Teaching HCI to Interactive Art Practitioners (and Learning from Them)

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Abstract. The fields of HCI and interactive art have long maintained an increasingly fruitful relationship of dialogue, exchange, cross-pollination, and complementation. From an art perspective, HCI knowledge and strategies deliver novel tools for offering experiences to the public and open new possibilities for artists to investigate and experiment. From the HCI perspective, artists contribute new representations and experimentations of forms of interaction, as well as bring closer the crossover of knowledge areas that are often far from the HCI radar.

This paper reports on an exploratory experience of teaching HCI concepts to interactive arts practitioners. The experience sought to promote a vibrant connection between both realms. We seek to understand the potential mutual influences between Interactive Art and HCI. We aim to identify the aspects of HCI that can benefit the artist's work and, in that process, recognize the insights that can be captured for the HCI agenda.

Keywords: HCI Teaching · Experiential learning · Interactive art

1 Introduction

The arts and sciences are two drivers of culture. Before the Renaissance, they were difficult to distinguish clearly. However, after that period the West embarked on a race of specialization that so profoundly divided art from science that they seemed to generate two irreconcilable cultures for a long time. Today we live in an exciting era, with intertwined visions between art and science that sometimes make it difficult to distinguish between techno-scientific work and artistic speculation [1]. There exists an increasing level of artistic activity using computers, the Internet, and the whole techno-scientific toolkit (see, for example, the artworks based on plants screaming and in the inter-species convergence [2, 3]). This situation suggests that it is impossible to understand the future of the arts without paying attention to science and technology, in the same way, that art cannot be disregarded when exploring new horizons of the socio-technical system.

While some artists assimilate the computer to their traditional media (treating it like a sophisticated brush or a fancy camera), many others recognize this machinic element as the tip of a techno-cultural iceberg leading to a post-human era. At the same time,

research on the quest for a human-computer *integration*, that subsumes the human-computer interaction approach [4], gets meaning and a source of inspiration from those artistic adventures.

The fields of HCI and interactive art have long maintained an increasingly fruitful relationship of dialogue, exchange, cross-pollination, and complementation. From an art perspective, HCI knowledge and strategies deliver novel tools for offering experiences to the public and open new possibilities for artists to investigate and experiment. From the HCI perspective, artists contribute new representations and experimentations of forms of interaction, as well as bring closer the crossover of knowledge areas that are often far from the HCI radar.

This paper reports on an exploratory experience of teaching HCI concepts to interactive arts practitioners. The experience sought to promote a vibrant connection between both realms. In reporting the experience, we seek to understand the potential mutual influences between Interactive Art and HCI. We aim to identify the aspects of HCI that can benefit the artist's work and, in that process, recognize the insights that can be captured for the HCI agenda. The artistic reflection and exploration presented in this work, as part of that dialogue HCI-Interactive Arts, seeks not only to contribute to the detection of the limits of that interaction but fundamentally to call attention to and question the use and exploitation of the body for the benefit of that interaction, as a kind of physiological extractivism in favor of a technification without limits.

This article is organized into four parts. After presenting the background of the investigation, we describe the Case Study that is the center of the work. Next, we discuss some lessons learned and end with the conclusions.

2 Background

Art and HCI have different objectives and approaches. However, they share several aspects that build a close relationship between the two, and that can benefit both. The evolution of HCI is often described in three waves (although some authors propose a fourth, based on entanglement, [5]). After the first wave, centered on human factors, a second one emerged, concerned with well-established, well-defined communities of practice (the workplace). The third wave then broadened and intermixed contexts such as private and professional life [6]. Within this wave, the relational turn [7], the embodiment [8], and the sensorial computing [9] have a strong relationship with the work presented in this article.

While HCI can assist artists (with evaluation methods, design principles, or information about human behavior), HCI concerns in interactive art go beyond the traditional perspective. For example, artists are not as concerned with task analysis, error prevention, or task completion times as they are with issues such as enjoyment, play, and long-term engagement. Meanwhile, HCI's concerns about experience design and understanding user engagement are especially relevant to interactive art. The artist is concerned with how the artwork behaves, how the audience interacts with it (and possibly with each other through it), and ultimately with the participants' experience and degree of engagement. In a sense, these issues have always been part of the artist's world, but in the case of interactive art, they have become more explicit and prominent within the entire canon of concern.

Interaction is relevant to the core of both interactive art and HCI. When designers and artists are sensitive to the unique effects of each type of interaction, they can choose the most appropriate for their purpose and provide richer user experiences. Revisiting interactivity with an emphasis on user participation, social interaction, and multi-sensory effects can not only enhance storytelling but ultimately improve the entire interactive art and HCI experience. Research in the intersection of art and HCI requires focusing on issues that are partly new to HCI research, for example, the user research processes typical of participatory design (traditionally, the creative process of art has been a secretive and private endeavor, only contacting the audience when it is released).

In the third wave of HCI, embodied cognition has become a theoretical foundation for research. As Dourish stated, the history of interaction design shows a progression toward greater use of the body and a greater understanding of its importance [8]. From the original command line interfaces (CLI) to today's ubiquitous tangible user interfaces (TUI) to graphical user interfaces (GUI). Theories of embodied and enactive cognition deny mind-body dualism and expand the design space for interaction to consider the whole body. With this embodied interaction, representations of computing and interactions with computing can be achieved through perception, planning, and performing actions with the body, which is the artists' area of expertise. HCI researchers can learn how artists see and interpret objects in the world and how they interact with the world [10].

Penny [11] argued that contemporary art strategy should shift from a "representational" model to a "performative" one. Therefore, applying embodied interaction to interactive art offers a new paradigm of aesthetic practice involving behavioral design. Theories of embodiment raise new issues for artists and researchers to consider in their interaction design [12]. First, users can learn by doing. They think by gestures and movements and easily identify constraints and implicit problems. Second, users can act through an artifact rather than acting on it. They perceive the artifact as an extension of their body rather than as an independent object. This explains the increased importance of emotions and affects in interaction design [13]. Third, users can easily perceive the state and response of other users, as suggested by distributed cognition theory [14]. Embodiment facilitates learning by participating in a community of practice and enhances coordination based on peripheral participation. Fourth, embodiment brings the previously unavailable opportunity to integrate the physical and digital worlds. This integration creates malleable materials and experiences.

The importance of the pedagogical strategy of learning by doing and its reflective component in teaching interaction design has been opportunely pointed out by Klemmer et al. [12]. They note the convenience of including in the courses the embodied aspects of learning, situated reasoning, thinking through the prototyping, and the implicit risk in action. All of these are natural components of an interactive art studio. The Experiential Learning Framework has been proposed by Kolb (later revised by Morris) as a systematic way to achieve this objective of learning by doing [15]. This framework is based on five themes: "learners are involved, active participants; knowledge is situated in place and time; learners are exposed to novel experiences, which involve risk; learning demands inquiry to specific real-world problems; critical reflection acts as a mediator of meaningful learning" [15]. The framework organizes the teaching into four stages: a

contextually rich concrete experience, critical reflective observation, contextual-specific abstract conceptualization, and pragmatic active experimentation. This organization into stages of doing and reflecting are aligned with the basic mechanism of reflective design [16] and can contribute to facilitating the inclusion of HCI/UX knowledge in the practice of the interactive artist.

Reflecting on HCI teaching practices is not new to the community. For several years now, a community of practice on the subject has been developing with the endorsement of SIGCHI [17]. Among others, this community considers answering questions such as what it means to teach HCI, and what the most impactful and effective ways to learn HCI are [18]. This community offers lines of contributions that are relevant to the work presented here but, at the same time, presents gaps to be filled. On the one hand, different pedagogical approaches to engage students and deepen their understanding of HCI concepts, skills, and methods have been proposed. On the other, teaching HCI skills to different populations (e.g., training sketching and graphic design skills to computer science students [18]). However, in all cases, it is about teaching HCI to populations that will use that knowledge in traditional professional development for the field. The literature has identified several lessons from artistic research from which HCI can benefit, for which joint and reciprocal actions are necessary, such as teaching topics from one of these areas of knowledge to practitioners from the other [13].

3 Case Study

3.1 Goals and RQs

Stimulating the creativity of interaction designers is a recurring concern on the HCI agenda. For this, it is necessary to understand the designer's creative processes of both those that use creativity "without borders" (as is the case with art) and of those that show some restrictions for the development of innovations (such as "boundary conditions" or "edge cases" found in science and technology). For example, Fisher observed how the study of optical illusions could provide information on the process of visual perception and how the errors induced by these illusions effectively stimulate creativity [19].

In HCI and UX Design, user-centered methods are essential. For example, they are essential in adapting the conceptual model of the system to the user's mental model [20]. In Interactive Art, artists can also benefit from knowing the abilities and limitations of their audience or public to make decisions informed by that knowledge. However, due to the nature of their work, they rarely seek to satisfy people's needs or demands. An observation of how artists use that knowledge in their work can spark new and interesting ideas for HCI and UX. Benford's discussion of user interfaces that make people uncomfortable shows something to be learned from the art: making the user comfortable is not the only option, and it may not always be the best [21]. That work shows the cyclical way in which he draws on HCI and psychology to create art and then gains insights that can, in turn, contribute to HCI. In the same sense, the work of Subversive Ergonomics shows questions about the habitual "trainer" approach in Human Factors to offer the "normal user" an experience of discomfort or disability [22].

These relationships between interactive art, audience engagement, and UX design make up a significant and fruitful area of research. Studying at such a crossroads can

benefit both interactive digital arts and HCI. From the artist's perspective, it can lead to a better-informed use of the perception and cognition of the artwork and its context by the human participant. This does not necessarily imply that artworks are created to meet consumer demands but rather that the artist will have a greater ability to challenge perception and cognition, to disturb, to alarm, or to confuse participants. Or to relax them, to please them, or to influence them if that is her choice. From the perspective of the interaction designer, there is a growing interest in fostering and even exploiting the creativity that users put into play. This exploitation can manifest itself through increased engagement and interest through the provision of more creative experiences. After much debate, the notion of UX (adding hedonic aspects to pragmatic usability) seems to have reached that privileged place. For good experience design, HCI might have something to learn from the artists [23].

Therefore, we sought to provide answers to two main research questions:

- **RQ1. What lessons can HCI give to Interactive Art?** Can interactive artists incorporate HCI knowledge into their work process?
- **RQ2. What insights can HCI get from the work of Interactive Art practitioners?** Can knowledge relevant to the HCI agenda be found in interactive art?

3.2 Method

Context. The Case described here corresponds to the last module of a set of 3 included in a Master's program in Interactive Arts offered by the National University Tres de Febrero in Argentina¹. Modules are titled Digital Design (DD), Programming Interactive Sensory Environments 1 (PISE1), and Programming Interactive Sensory Environments 2 (PISE2). DD and PISE1 must be taken in the first year, PISE2 in the second one. This set of modules was designed from two premises: a) provide HCI content with an increasing progression of embodiment, b) use an experiential learning approach.

DD is an introductory programming module for artists. Processing² is used as a programming language and platform. Practice and assignments are organized around the study of optical illusions to present visual perception from an artist-friendly point of view and the development of a simple interactive application. This course takes advantage of the Processing low threshold of access to introduce GUI-based interfaces. During the second semester, students take PISE1, an advanced programming course for artists with a focus on computer vision (CV) and gestural interactions. These two modules serve as an introduction to basic HCI experiential teaching strategies. With this background students address the course that is the focus of this article in the third semester: PISE2.

PISE2 focuses on teaching haptic and enactive interactions (EI). It is organized around the idea of Umwelt and sensory substitution and augmentation to experiment with creating and prototyping integrated multi-sensory interactions [24–26]. Sensory substitution and augmentation involve offering information to the user through an unusual sensory modality, for example, converting visual data into tactile stimuli. These types of strategies are essential for the creation of EI. For the course's final project, students self-organize in groups (minimum of three members, maximum of four). Their assignment

¹ <https://maestriaae.net/>.

² <http://processing.org>.

is to design an EI with sensory substitution to provide the user one of the following: “*visual perception through hearing*”, “*visual perception through touch*”, “*embodied perception of some remote physical environment or some digital environment*”, “*multi-sensory enactive interaction*”. The group’s design must be developed into an interactive prototype. The course is organized into ten weekly meetings with a studio format, lasting four hours each.

The course is organized at micro and macro levels following the Experiential Learning process as revised by Morris [15]. Students go through the four phases throughout the course and within each meeting.

Contextually Rich Concrete Experience. For students to realize that knowledge is situated in context, the course is run as a studio where students build their final project from the first day, working in groups. The classroom provides the necessary tools and materials for the work. However, the students usually also bring their own tools and take the sketches and prototypes home to continue working. This work experience in real situations of ideation, construction, and evaluation provides the appropriate context so that the IE design experience is concrete, rich, situated, and specific to the environment of each group.

Critical Reflective Observation. To contribute to experiential learning, reflective observation must be critical: students must take the stance of challenging the adequacy of abstract conceptualizations (new or preexisting) against what they experience in the real world (since the problems are context-specific). In this sense, at the macro level, the assignments have pedagogical objectives that are communicated at the beginning. Still, they are open-ended, and teachers accept the natural impulse of artists to guide their work also based on their motivations (which can change during the course). In this context, students need to critically review all the knowledge conceptualized from the dissertations of each of the topics (Haptics, Umwelt, Sensory substitution, etc.). It is not enough to understand themes and concepts. Students must incorporate them into their practices through critical observation and reflection. This requires a setting where students feel comfortable with the ambiguity and uncertainty that the project goes through until its completion.

Context-Specific Abstract Conceptualization. This is probably the most important stage for our goals. We intend that students can conceptualize what they have learned in a way that is beneficial to their artistic practice. To do this, this conceptualization must be approached in a context-specific manner. All the HCI knowledge that is provided is adapted in each course to the path that the different projects take. For example, in some past courses, projects quickly became organized around vibrotactile interactions and wearable devices. In these cases, the conceptual dissertations were organized around practical constructions of the “sketching haptics” style [27] that enabled students to jump to the abstract concepts of haptic interaction from the specific context of each group. We try to get students to conceptualize the HCI approaches fully but in their own way, thus reinforcing their own active experimentation.

Pragmatic Active Experimentation. A key benefit of context-specific abstract conceptualizations is that they enable students to act pragmatically, basing their actions on active experimentation to find a new concrete experience. It implies proving if the conceptualization they arrive at can be applied or not to their new concrete experiences.

All experiential learning takes students out of their comfort zone so that they realize that conditions change, sometimes very discretely, through time and place. To do this, they need to experiment actively, push to the limit of the newly acquired knowledge through concrete experimentation, and continually evaluate their practice against the assignment's goals, their own goals, and the criticisms of other students. Each meeting ends with instances of critique. The course is organized to guarantee at least three cycles of iteration, testing, and critique for each project.

Over 100 students have taken the course ($N = 101$, cisgender women = 44, cisgender men = 53, transgender women = 4) with diverse backgrounds (architecture, visual and electronic arts, design, computer science, and engineering). All of them were active practitioners in their areas of expertise at the time of classes. The participants are mostly from Argentina (approximately 50%) with a wide variety of other origins: Brazil, Chile, Colombia, Ecuador, Spain, Italy, Mexico, and Venezuela. The average age is 32.1 years ($SD = 5.09$).

We use participant observation as a research tool during the studios. This method requires two complementary activities to be done by the researcher: observing everything that happens and participating in the activities of the study population [28]. Therefore, the first author (with a design background) performed as Participating Observer (PO) in the role of an external design consultant for each group. Meetings between each group and the PO were video audio recorded. The PO took personal written notes. At the end of each edition of the course, we did an analysis of the data collected to create a record with the *People-Activities-Time-Space Model* (PATS) [28]. This model records “who”, “how many” and performing “what roles” are there (People); “what” is going on, “what” are the predominant activities, “what situations are frequent” (Activities); “when” and for “how long” they are carrying out each activity (Time); “what” the place is like and the “which objects” they are managed (Space).

3.3 Results

Along the instances of the course, 29 projects were completed. Table 1 presents the list with titles and a brief description. We now briefly describe two of those projects.

Project 16. Sending Hugs

In this project, the students began with a phenomenological analysis of the hug, far beyond the mere instrumentality of the act of hugging and based on the experience they lived during the confinement during the COVID pandemic. At that moment the hugs ceased to exist temporarily, so they asked themselves “What would we give to recover the old hugs”. This way of approaching the work, apparently far from the instructions of the course, is an approach that is repeated in all the projects and shows the natural rebellion, the defiant attitude, the critical position that is common in artistic work.

After that, the analysis of the lost experience of the hug was translated into usual interaction design practices: identify who hugs, when they do it, what does the act of hugging consist of, how does it end, and how can it be stored in virtual memories? This analysis, so typical of the specifications of the “empathizing” stages of design thinking, continued with a decomposition of possible elements to integrate into a “machine to

store and receive hugs”, the configurable parameters, the possible forms of storage and transmission, etc.

The initial sketches to define the shipping scenario, which they themselves defined as “a WhatsApp of hugs”, soon led to formal explorations and construction techniques. In all the steps, it was obvious to see how each member of the group sought to experience in their own body what would be a desired and desirable experience.

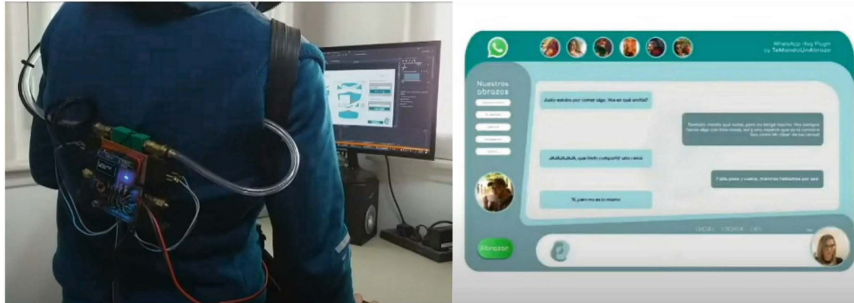


Fig. 1. Sending hugs project. Left: final prototype of vest. Right: “Whatsapp of hugs” proposal

The discussion around the haptic stimulation format to provide in the “delivery” of the virtual hug was very interesting. They began with extensions of the small exercises shown in the vibrotactile actuation course with ERM motors. However, they quickly abandoned those actuators because they did not believe in the ability of this technology to deliver “the wealth of stimuli that a good hug deserves” (sic). They then began to explore pneumatic actuation by adapting tire-inflating-style pumps, which they continued to use until the closure proposal.

The final prototype (see Fig. 1) and its presentation accompanied by a video³ is a perfect combination of “Ode to the Hug” artwork and the typical demonstration of an interaction design proposal.

Project 23. Olorin

The students sought a multisensory interaction: centered on olfactory interaction and supported by visual and haptic perception. They raised a speculative design on devices to bring calm through the recording, storage, and reproduction of aromas of loved ones. The work was approached with a process much closer to design thinking, with the exploration of possible requirements among the other students of the course and the compilation of previous proposals in the technological field on the registration or reproduction of aromas (see Fig. 2).

They quickly zeroed in on possible alternatives to increase engagement with the scents generated. The device ceased to be the center of the work to become “the experience”. They explored a thousand and one technological ways to generate aromas (they even cannibalized an electronic nebulizer). Finally, they opted for a playful experience,

³ See the video at <https://youtu.be/cKap-G3E0zE>.

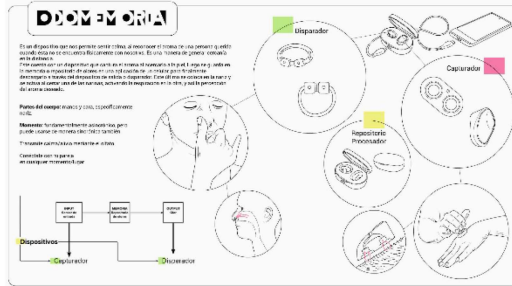


Fig. 2. Olorin project. Initial approach for an automatic memory device

which in part arose as an opportunistic design. They found a portable electronic lemon-shaped aromaterizer and with that discovery, they triggered several alternatives of pendant dolls, leading to the birth of Olorín.

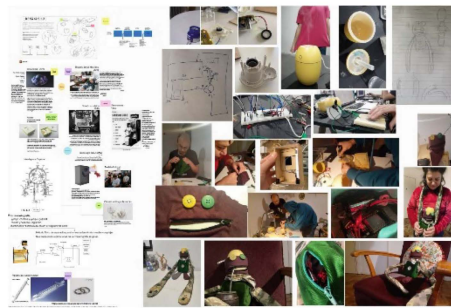


Fig. 3. Olorin project. Visual journey of the project

This project was the clearest case of something that was repeated in more than half of the jobs: to commit to something and feel like your own, you need to interact (and play) with it all the time. Members of this group (and many others) once they reached a prototype state with a certain functionality, they spent almost the entire class individually interacting with that design (see Fig. 3). The combination of smells, toy appearance, and large hand-sewn arms made Olorín the “pet” of that course.

Table 1. Projects developed.

ID	Title	Description
1	Granny	Playful adaptation as a puppet of the Enactive Torch
2	Nightmare catcher	Parody of the dream catcher
3	Haptic mouse	Vibrotactile augmented mouse
4	Border area	Perceiving in the body the sensations of a migrant
5	Body clapping	Feeling in the body a received applause
6	Touching the soul	Device for visually sensing another person's heart rate
7	Sphaira	Playful object with different vibrotactile responses
8	Haptic image	Device that turns vision into touch
9	Sonar for the blind	Vibrotactile transduction of physical obstacles
10	Color by heat	Vest to convert color into thermal stimulus
11	Sneakers for the blind	Decoding the ground into vibrotactile signals
12	Characters on the fingers	Glove for turning audio into vibrotactile
13	4.7k haptic beam	Turns light into caressing the skin
14	Empatheia vibratio	Installation for the campaign about legal abortion
15	Remote caresses	Wearable to generate haptic stimuli at a distance by internet
16	Sending hugs	Vest to send and receive hugs by internet
17	Good waves	Vibrotactile augmented emojis
18	Andres's bar	Virtual bar with haptic vests
19	Hapticode	Turning air gestures into vibrotactile stimuli
20	Cafunet	Speculative Design of Cranial Tactile Stimulation
21	Aquae vivae	Speculative design of sexual tactile stimulation
22	Neon veil	Haptic Neon Veil
23	Olorin	Wearable multi-sensory toy
24	Podal landscape	Foot tactile stimuli pathways
25	Pulsotron	Heartbeat pen drives
26	Affection lollipop	Lollipop with vibrotactile stimuli
27	Bat cave	Installation to explore a bat cave
28	Caresses from far away	Device for exploring remote affective touch
29	Hold my gaze	A sustained gaze gets warmth and tactile stimulation

4 Lessons Learned

This work aimed to answer two separate research questions: **RQ1. What lessons can HCI give to Interactive Art?** and **RQ2. What insights can HCI get from the work of Interactive Art practitioners?** During this exploration, our first finding is that the

answers to each of these questions have a flip side that contributes to answering the other. The relationship that emerges from our explorations between Interactive Art and HCI is one of mutual potential influence. The very process of teaching HCI topics to interactive art practitioners sheds light on possible agenda items for HCI research or joint research between both fields. For interactive digital art, the experience and feelings of the public are key factors, but it's not about how a work looks or sounds; it is about what the public experiences while interacting with the artwork. It is therefore not surprising that the growing body of practice-based research in interactive digital art is pushing the boundaries of our knowledge about what is known as UX Design as the practitioner side of HCI [34]. Among the topics of an investigation that relates HCI, digital art, and the experience of the participants, we can ask several questions on which there are no agreed or complete answers: when is something attractive? What makes it attractive? What impact does familiarity have? What are the appropriate methods for evaluating interactive experiences? HCI and interactive digital art have a lot to offer each other, but what exactly can be transferred in each direction?

Digital art is increasingly interactive. Part of this is based on interactions that evolved from computer games and device use. Much of it is aimed at engaging the audience in some form of interactive experience that is a key element in the aesthetics of art. Problems related to HCI could be considered as important to the creation of interactive art, as are problems related to paint colors. Concerns related to experience design, user or audience understanding, and engagement are especially relevant. But it is also important to know about haptic sensations and perceptions, the sciences that explain them and the technologies that stimulate them, their integration into UX design.

Below we detail the main lessons that intertwine potential learning and mutual pollination between HCI and Interactive Art that this work yields.

4.1 The Designer's Experience Matters

Some interactive artworks put into play two experiences. That of the public or audience and that of the artist as performer. In some cases, they are simultaneous; in other cases, the performance of the artist gives way to that of the public or vice versa. Despite the HCI mantra "know thy user" [29] (sometimes translated as "the designer is not the user"), we can learn much from the artist's first-person experience as a performer. It can open spaces for methodological innovations in the exploratory phases with techniques such as body-storming or design with the body [30].

4.2 Engagement, Multimodality, Usage Time, and Boredom All Compete in the Same League

What shape can the interaction have to make it more interesting or challenging from the user's point of view? Is there any modality or combination of modalities that have a predictably greater capacity for commitment? An artist can watch the audience interact with her work and find out if her work generates high or low engagement. However, the assumption that someone who interacts for long periods of time with artwork is more engaged than someone who jumps in and out quickly does not seem like an appropriate strategy. It is equivalent to doing a test with users presenting prototypes and just asking:

do you like it? To further understand the relationship of both with the work, some specially designed methods to obtain information in HCI may be necessary, such as questionnaires, interviews, focus groups, etc. Do these practices make sense in art?

However, if we assume that when we talk about attractive interaction in art, we are talking about a similar phenomenon in HCI, we could get information for the exploratory phase of UX design. For example, we could analyze the way artists manage to dissociate their authorial character from their performative capacity when analyzing options at the stage of sketches and prototypes. Artists tend to assume forms of evaluation in the first person that refer to the dialectic of sketching proposed by Goldschmidt (see that-see how) [31]. This approach could give rise to new evaluation methodologies for embodied and enactive designs. Part of this challenge has been undertaken, for example, by the work of Kristina Höök on designing with the body [30].

Familiarity with an artwork sometimes decreases engagement. For example, the initial pleasure and excitement of a simple, well-designed interaction can turn to boredom after 100 repetitions. The audience may come to want the system to do something different. At HCI we know that a user's level of expertise changes with time of use, and UX design must consider the skills and knowledge of all users, from beginners to experts. But becoming an expert relies, among many things, on system consistency (getting the same output for the same input ever). So, what about the hedonic, emotional aspects of the UX? Of course, some artworks change their behavior over time, but a change in behavior implies at least the possibility of a change in the level of engagement. From the art, some frameworks have been developed to keep and increase the engagement along the interaction with the artwork. They could provide good inspiration for new UX design methodologies [32].

4.3 You can't Evaluate What You can't Measure. And You Cannot Measure What is not Defined

Is it possible to fully understand the audience interaction experience? Does it make sense to ask for a verbal articulation of feelings? Is memory reliable? Are there any objective UX measures? Evaluation methods are the answer to these questions. For this to be possible, two tasks are necessary: understanding the UX and making it manageable and measurable. Although there have been substantial advances, we still do not have a widely agreed upon definition of UX [23]. The development of evaluation methods based on the practice of the UX concept can be a valid path toward a better understanding of the UX. "UX is what we measure" could be one approach while there is no accepted definition of UX. However, this approach requires some reflection on evaluation needs and practices. By discussing the notions implicit in the requirements and evaluation methods, we can better articulate what the user experience really should be. Works from HCI and arts are trying to build a comprehensive notion [33, 34].

5 Conclusion and Future Work

In this exploratory work, we presented evidence that the relationship between HCI and Interactive Art can be mutually fruitful. We have described an investigation that explores the possibilities of enlightening the artistic work with the pedagogical practice from HCI,

which at the same time allows extracting elements of interest for research in the creation of interactive technologies.

The relationship between experience design, the user or audience understanding, and engagement constitutes a particularly relevant and enriching intersection for both Interactive Art and HCI.

In Interactive Art we can expect an informed use of the perception and cognition of the audience and its context. This does not mean that the artwork is made to please or meet the demands of the users. Rather it implies that the artist will be better able to challenge perception and cognition, disturb, alarm, or confuse the participants (see for example [22]), as well as relax or please them if that is their choice (see for example, [35]).

In HCI, UX, and the design of interactive technologies, the search for creative user behavior based on a better understanding of the creative process delivered by interactive arts can occupy a relevant place not only for the development of creativity support tools (see for example, [36]) but also to explore new relationships with agency systems such as the new Generative Artificial Intelligence.

The current wave of HCI oriented towards corporeality, social interaction, and experience design gives a fertile field for the conscious incorporation, adaptation, and appropriation of the creative techniques offered by Interactive Art.

To deepen this line of work, we will undertake two simultaneous actions. On the one hand, sustaining the continuity of the MAE courses that gave rise to this work will allow the exploratory research begun to be furthered. At the same time, we are planning reciprocal actions to those described here with the participation of Interactive Art practitioners as lecturers in a new postgraduate career in HCI recently started at the UNLP College of Informatics.

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