



A Hands-On Experience with Interactive Art within a Museum Scenario

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Abstract

This technical report presents preliminary results of the museum research scenario developed during the second year of the Socioenactive Systems project. In this report, we first briefly introduce the research scenario, then, we present an overview of our first workshop conducted at the Exploratory Science Museum of Unicamp, in which we exhibited three interactive artworks to be freely explored by participants, who afterwards were invited to build a technological artifact for themselves. Next, we show the preliminary results from the workshop, which include a qualitative analysis of recorded interactions with the three artifacts exhibited and an evaluation of the workshop itself. While the workshop was well evaluated by the participants, the qualitative analysis, in turn, suggests promising socioenactive qualities to be found in the exhibited artifacts, contributing in both theory and practice to the Socioenactive Systems project. We end the report with our concluding remarks and the next steps for the following year.

1 Introduction

Not long ago, computer use was limited to performing tasks that were well defined and most often spatially confined to individual offices. Today, digital technologies are present in many areas of our lives and are used for a variety of purposes at all times, everywhere, and by many people, in alignment with the concept of Ubiquitous computing, as proposed by Weiser [13]. However, from a social and practical perspective, current technologies are not entirely invisible. Making them imperceptible requires a different paradigm, one that transcends goal-oriented interaction models, and the traditional mouse, keyboard and (touch)screen Graphical User Interfaces (GUI).

The work of Kaipainen *et al.* [9], with what they call enactive systems, hints towards the idea of human and computer not as separate systems, but as a “coupling” between the two. Their premise, inspired by the seminal work from Varela, Thompson and Rosch [12], is that interactions are *embodied*. In other words, interactions are guided by the body’s involvement and the human agent’s spatial presence. An enactive system, as proposed, can detect both deliberate or unconscious information from body (*e.g.*, body movement or physiological readings) and respond accordingly. This, in turn, generates a response on the person, and the enactive cycle goes on.

This work is part of a five-year project, called “Socio-Enactive systems: Investigating New Dimensions in the Design of Interaction Mediated by Information and Communication Technologies”¹, which we will refer to as Socioenactive Systems project. The Socioenactive Systems project foresees three scenarios; one takes place in an educational context (a school), another in a healthcare context (a hospital) and the last one, in an artistic and scientific context (a museum). All the three scenarios

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share the same goal of expanding the concept of enactive systems, by adding the social element to it. The starting point for the methodological construction of the *Socioenactive Systems* project is the set of semio-participatory techniques [1]. Built upon methods and artifacts from Organizational Semiotics (OS) [11, 2], our methodology is applied to all activities that permeate the design process. It brings different stakeholders to the design process, and it looks at this process as a continuous cycle that cuts through three layers of the *semiotic onion*, illustrated in Figure 1. In this representation, the outer layer of the onion contains the informal interactions between people in society, in their daily lives and with their technological artifacts. The middle layer has the formal meanings and intentions through which society is organized, such as laws, models and regulations. Lastly, the inner layer represents the technical artifacts that mediate the actions from the other layers. Hence, the methodology we adopted in this work sees the design of systems from a social perspective, in a way that requires participation from formal and informal levels of a social group. Together, they construct a technical system, that goes back to the social world and causes impact on it.

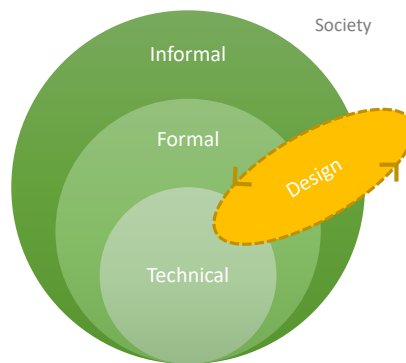


Figure 1: Design in the semiotic onion.

This technical report describes the activities conducted in the museum scenario during the year of 2018, which was the second year of the Socioenactive Systems project. We will focus our main activity during this period, which was the first workshop conducted within the museum scenario at the Exploratory Science Museum of Unicamp. This technical report is organized in the following manner: in Section 2 we present an overview of the first workshop conducted in the museum scenario, describing all its different phases and reporting how they went. In Section 3 we present preliminary results obtained from the workshop, including a qualitative analysis of the interaction with the three artifacts we exhibited during the workshop, and an evaluation of the workshop as a whole. Lastly, in Section 4 we present our main conclusions and directions for next steps.

2 Workshop Overview

On April 21, 2018, the first workshop under the FAPESP Thematic Project of Socioenative Systems was held at the Exploratory Science Museum of Unicamp, located inside the campus of the University of Campinas (UNICAMP). The museum has an audience quite involved in activities and workshops that are carried out there. Thus, the museum staff was responsible for inviting the public to participate in our first workshop. Several researchers from the Socioenactive Systems project helped in the planning and conduction of this first workshop, titled "A Magia da Ciência" ("The Magic of Science", in English). It was aimed at children and adolescents between 10 and 15 years old, however, parents were also invited to participate alongside their children. We had a

total of $N = 15$ participant children and adolescents. The workshop had an approximate duration of three hours, and was composed of five different phases: 1) reception, 2) exploration, 3) reflection, 4) construction, and 5) evaluation. We describe each of these different phases in the following subsections.

2.1 Reception

During the first 30 minutes of the workshop, we welcomed the participants and their parents as they arrived. The principal researcher was responsible for conducting the workshop and explaining to the participants and their parents about the activities that would be carried out. As the workshop is part of a project approved by the university's research ethics committee (CAAE 72413817.3.0000.5404), we explained and handed to the participants and their parents the appropriate assent and consent terms that they signed. The children and adolescents signed a term of free and clarified assent, written in a language according to their age range. The parents, in turn, signed a term of free and clarified consent.

2.2 Exploration

For the exploration phase, we used the space provided by the museum to create an exhibition with three interactive digital artifacts, which were created previously in a project called InterArt [4]. In such project, Computer Science and Computer Engineering undergraduate students attending a Human-Computer Interaction (HCI) course were tasked with creating interactive digital artifacts. To support the construction of the three artifacts, electronic kits were provided for the students, which helped them to think of new forms of interaction and expand what they understood as HCI. The three artifacts exhibited are illustrated in Figure 2 and described as follows:



Figure 2: The three interactive digital artifacts, Lobo-Guará, Memoção and Monolito, exhibited in the “A Magia da Ciência” workshop.

- **Lobo-Guará** (Maned Wolf, in English): named after the paintings *Lobo-guará I* and *Lobo-guará II* by Brazilian artist Felipe Abranches, the artifact is an interactive cardboard maned wolf covered with synthetic fur and designed for educational museums. The maned wolf artifact has hidden buttons in important parts (head, body, leg, and tail) that, when pressed or touched, present relevant information about the wolf. The participants must manipulate the artifact to find the hidden buttons, and the artifact provides auditory and visual feedback in a television positioned behind the physical artifact. There is also a proximity sensor in its head to detect an attempt to pet him. When petted, his eyes become red and he barks, a

behavior that is explained by the wolf being a wild and dangerous animal. Lobo-Guará was created by students Caio Krauthamer, Guilherme L. H. Rincão, Leandro A. F. Magalhães, Marcio I. O. C. Filho, Thomas J. Yamasaki, and Victor H. C. Teixeira, as their project in the HCI course.

- **Memoção:** (Memotion, in English): the artifact is a black box with textures inside, that intend to evoke emotions associated with Internet memes. Inside the black box there are six buttons covered by different textures (*e.g.*, rough, soft, gooey), and when someone puts her hand inside Memoção and presses a texture on one of the buttons, a related meme is projected on a screen, along with a corresponding sound. For instance, pressing the gooey texture evokes a disgust meme and sound. To keep the experience non-repetitive, the meme and sound are selected randomly from a curated collection of 10 memes and 2 sounds for each emotion. Memoção was created by students Daniel H. P. de Oliveira, João P. Cardenuto, João V. F. Silva, Mateus S. Kimura, Matheus S. Ataíde, Pedro S. P. C. Gomes, and Vitor K. Aoki, as their project in the HCI course.
- **Monolito:** (Monolith, in English): the artifact is inspired by the Academy Award-winning film *2001: A Space Odyssey*. The artifact is a miniature monolith that is used to interact with scenes from the movie. While a psychedelic part of the movie is projected in a loop sequence, the audience can pick up the monolith and move it in the air. An accelerometer and a gyroscope capture the movement, used to control the projection accordingly (*e.g.*, by speeding up or slowing down the playback rate and adding a red filter proportional to the speed). Monolito was created by students Carlos A. F. F. Carvalho, Giovani N. Pereira, Ignacio E. Ribeiro, Luan E. Ferreira, Nathália H. Kuromiya, and Seong E. Kim, as their project in the HCI course.

The participants were invited to freely explore the three artifacts in any order and manner they wanted to, and with minimum intervention from the researchers (we stayed around to make sure the artifacts were working properly, and to solve possible technical problems that might arise from normal use). The participants had approximately 30 minutes to explore the interactive digital artifacts exhibited, and we video recorded these interactions for further analysis.

2.3 Reflection

For the reflection phase, we mediated an open discussion with the participants about what kinds of technologies they inferred to exist behind the three artifacts they had explored earlier. This discussion and reflection phase lasted approximately 30 minutes. When questioned about what technology was behind Lobo-Guará and Memoção, one of the youngest children who participated answered “buttons!”, and when asked what kind of buttons, he promptly replied: “technological buttons!”. Afterwards, an adolescent who participated in the workshop provided a more comprehensive answer regarding the sensors in Lobo-Guará: “There was one [sensor] in the tail and one on the side [...] there was one [sensor] in the head that said not to pet it because it is a wild animal, I think it was just that.”. Lastly, another child then complemented about the Lobo-Guará interactive artwork: “Each button provided information about that specific part [of the maned wolf]. There were buttons in the tail, side, paw and head.”

The participants were not able to guess low-level technical details about the artifacts, such as the use of microcontrollers, Wi-Fi communication through the Internet and specific sensors. However, the participants did perceive that the Lobo-Guará and Monolito interactive artworks had some form of wireless communication, and that all the three artifacts somehow communicated with a

traditional computer to display images and information in both text and sound. Regarding sensors, the buttons on Lobo-Guará and Memção were relatively easily perceived by all the participants, while the inner workings of the Monolito (accelerometer and gyroscope) remained a mystery for most participants, probably due to the more abstract and subtle nature of the artwork.

2.4 Construction

After conjecturing and discussing the technology behind the three interactive digital artifacts explored earlier in the workshop, we invited the participants themselves to create an interactive artifact with similar technology. We proposed the idea of creating a “magic potion” that could only be activated by a “magic wand”, and contextualized this idea with a short excerpt from the Harry Potter and the Philosopher’s Stone movie (released in 2001), in which the protagonist, a young wizard, chooses his very first magic wand at the Ollivanders Wands shop in Diagon Alley. To realize this concept, we designed a “magic potion” composed by a blinking, color-changing LED triggered by a magnetic sensor, and a “magic wand” consisting of a tightly rolled paper sheet with a small magnet glued on the tip. The required components, illustrated in Figure 3, are all fairly simple and affordable (approximately USD\$ 1 for each set of potion and wand):

- A CR2032 3V “coin” battery;
- A support for the battery;
- A few jumper cables;
- A blinking, color-changing LED;
- A reed switch (plastic casing recommended); and
- A small magnet (neodymium recommended).



Figure 3: Components used for the construction of the “magic potion” and “magic wand”.

We guided the construction of the potion and wand set step by step. We started by talking about the battery, involving the concepts of electricity and polarity of direct current found in batteries, as opposed to alternating current commonly found in power outlets. We followed the activity by showing how to light up a LED by connecting it to the battery. Next, we introduced the idea of a switch, to control when the LED should be powered on or off, using the analogy of a wall switch to turn on or off a lamp in one’s own house. We followed by proposing the idea of a “magic” switch,

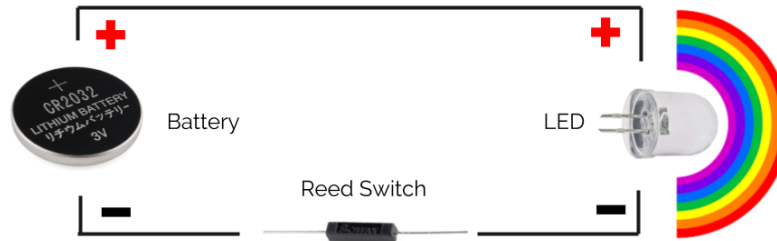


Figure 4: Circuit for the “magic potion”.

one we do not have to touch to turn on or off, by using magnetism. To create our “magic” switch, we briefly explained the concept of magnetism and demonstrated it with the use of magnets, and then we showed how to attach a magnetic sensor (reed switch) to the circuit with the battery and the LED. Lastly, we showed participants how to activate their magnetic switches using a rolled paper sheet with a magnet glued to the tip, concluding the electronic construction of the artifact. This part of the construction phase is illustrated in Figure 5, and the “magic potion” circuit that was built with participants is illustrated in Figure 4.



Figure 5: Construction of the “magic potion” and “magic wand” circuit.

For the activity to be more playful and meaningful for the participants, we invited them to ornament their potions and magic wands. Participants had available a variety of stationery materials that were provided and could be freely used to embellish their projects according to their own tastes and creativity. This part of the construction phase is illustrated in Figure 6. At the end of the workshop, the participants were allowed to take home the potions and magic wands they had created and played with. The entire construction phase lasted approximately 1 hour.

2.5 Evaluation

At the end of the workshop, we invited the participants to evaluate their experience regarding the workshop as a whole. We used two different evaluation instruments. The first is an adaptation of the AttrakDiff questionnaire [7], that seeks to measure hedonic, pragmatic and attractive qualities in an interaction. While pragmatic qualities refer to functional aspects of interaction, hedonic



Figure 6: Customization of the “magic potion” and “magic wand”.

qualities refer to the product attributes to evoke pleasure. The adapted questionnaire, illustrated in Figure 7, is composed of 20 items distributed in seven pairs whose poles are opposing adjectives (e.g., "complicated - simple", "boring - captivating", "bad - good"). The original English terms of the questionnaire were translated to Brazilian Portuguese and we used terms more suitable for children. Some word pairs in the original questionnaire that we considered not relevant to the workshop in the original questionnaire were removed, and the instrument was presented in printed form.

The second evaluation instrument, aimed at surfacing self-assessed emotions, is based on Hayashi *et al.*'s Emoti-SAM [8], which in turn is an adaptation of Bradley and Lang's Self-Assessment Manikin (SAM) [3]. The Emoti-SAM consists of 15 emoticons, representing the three dimensions: pleasure, arousal, and dominance, as illustrated in Figure 8. We adapted the Emoti-SAM instrument in the following manner: we printed multiple copies (at least one for each workshop participant) of every symbol from Emoti-SAM and presented them to participants inside a wooden box. We then asked each participant to pick the symbol that best represented his emotional state towards the workshop and then to deposit it in an urn. After the evaluation was complete, which lasted for approximately 30 minutes, completing the three hours of the workshop, the workshop was officially concluded, and the participants could take home the “magic potion” and “magic wand” that they made earlier.

3 Preliminary Results

We conducted a qualitative analysis of the video recordings from the exploration phase of the workshop. Our main objective was to better understand what kind of interactions are evoked by or emerge during the exploration of the three artefacts exhibited: Lobo-Guará, Memção, and Monolito. Our analysis methodology was inspired by the Grounded Theory method [6] and the way it is presented by Lazar, Feng and Hochheiser [10, p. 299-327]. Keeping in mind the context of the Socioenactive Systems project, Figure 9 illustrates the coding schema we emerged from our data. In the following subsections we present our analysis for each of the three interactive artworks.

Adaptado de  AttrakDiff

Com a ajuda dos pares palavras, aponte o que você considera a descrição mais apropriada da Experiência.

Humana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Técnica
Agradável	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Desagradável
Simples	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Complicada
Profissional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Antiprofissional
Feia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Atraente
Prática	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Impraticável
Estilosa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Brega
Previsível	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Imprevisível
Alienante	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Integradora
Me aproxima das Pessoas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Me Separa das Pessoas
Apresentável	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Inapresentável
Desinteressante	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Convidativa
Sem Imaginação	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Criativa
Boa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Ruim
Confusa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Claramente Estruturada
Inovadora	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Conservadora
Tediosa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Cativante
Pouco Exigente	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Desafiadora
Motivadora	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Desencorajadora
Nova	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Comum

Figure 7: Adapted AttrakDiff questionnaire.

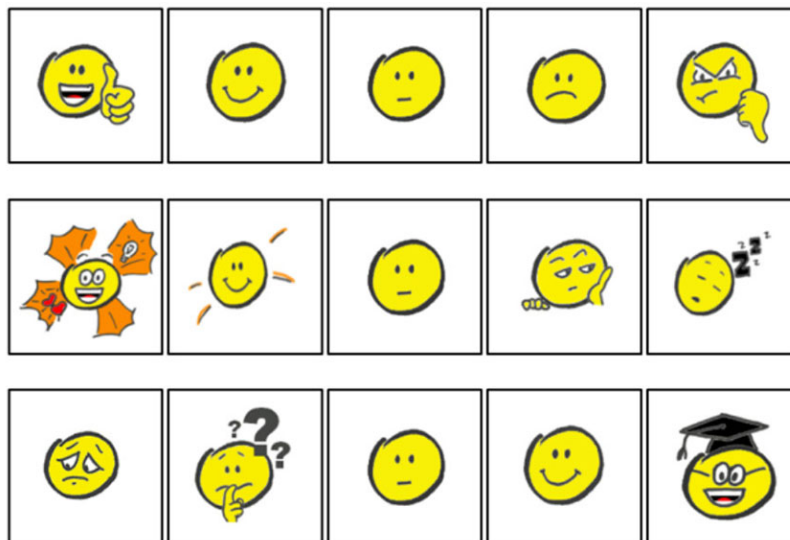


Figure 8: Original Emoti-SAM.

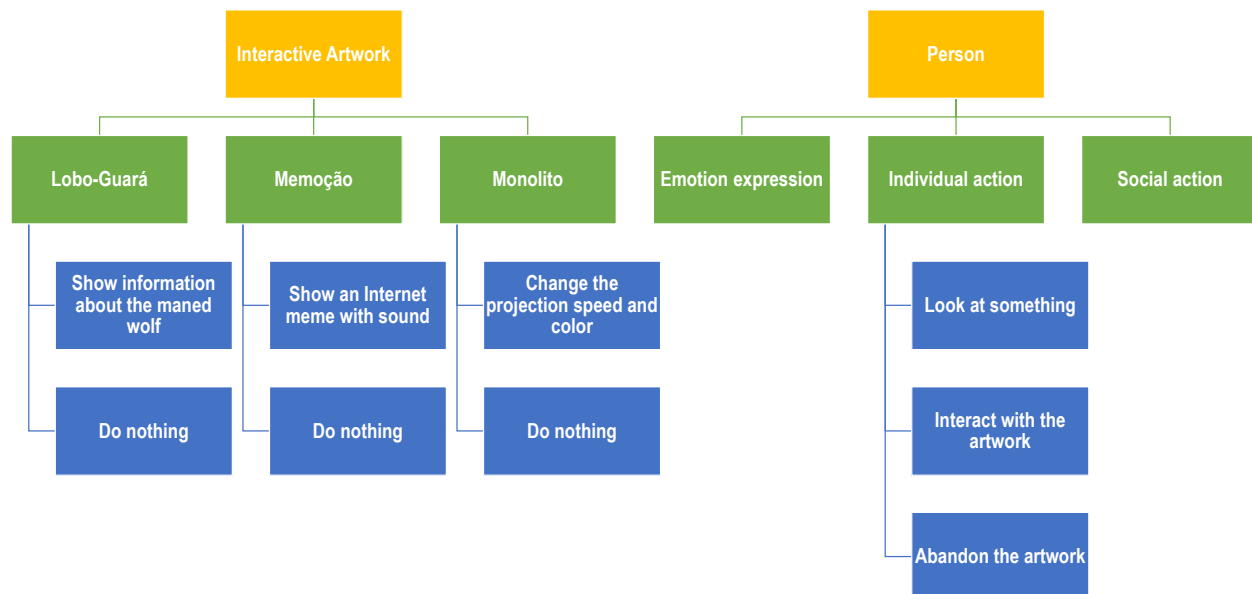


Figure 9: Coding schema for qualitative analysis.

3.1 Lobo-Guará

For Lobo-Guará, we analyzed a video recording with 32 seconds length in which three different children and one adult interact with the artwork. The events observed in the video, and their coding according to our coding schema, can be seen in their entirety in the Appendix A. At first, the three children were playing with Lobo-Guará at the same time. However, we did not identify more significant collective actions within this analyzed video recording. Among the individual actions, we identified 5 actions of touching the artwork in different parts without triggering any sensors – as is expected when no button is pressed – 1 action of touching that results in triggering a sensor, which resulted from the pressing of the tail button, 9 actions of looking at either the physical artifact or the screen, and 1 corporal action of moving around the Lobo-Guará.

The coding highlights the predominance of touch when interacting with this artifact, which is exemplified with the fact that one of the three children (the boy), even though he only pressed one button (the one in the tail) during the recording, has kept his hands on the physical artifact all the time during the observed video recording. As previously reported by Duarte, Maike and Baranauskas [5], the Lobo-Guará interactive artwork can evoke social interactions, such as group exploration and coordinated actions. In the video we analyzed in this study, we found the recorded social interactions to be more cautious, such as the three kids initially exploring Lobo-Guará together, and the woman approaching the boy to see what he was doing. Therefore, although we have subtle hints at possible social aspects to be investigated, we do not believe that the video recording analyzed is enough to make conclusions about the potential socioenactive qualities of this artifact.

3.2 Memoção

For Memoção, we analyzed a video recording with 59 seconds length in which seven different children and three adults interact with the artwork. The events observed in the video and their coding according to our coding schema can be seen in their entirety in the Appendix B. The first interactions observed in the video recording were more hesitant. Both the adult woman and the girl in pink interacted with Memoção for approximately 10 seconds, and activated two different buttons during this interaction: the two buttons that evoke “cute” and “sad” Internet memes respectively. The adult woman was smiling while interacting with Memoção, and the girl in pink seemed to interrupt her interaction with the artwork to give space for the new group of children and adults that approached the artifact during the video recording.

The group that approached the artifact during the video recording were also apprehensive at first, and the boy in black only put his hand inside Memoção after the tall girl encouraged him to do so by saying “you stick your hand in there”. After that, even though the boy in black was the only one to interact directly with Memoção, the group became more engaged. We recorded the boy in black interacting with Memoção for approximately 30 seconds, and during this interval he pressed buttons six times (one time for the “disgusted” button, two times for the “angry” button, and three times for the “happy” button). It is noticeable how the boy in black did not want to stop interacting with the artifact, and the rest of the group were eager to play too, given their actions, *i.e.* the boy in orange pulled the arm of the boy in black at one moment, and their comments for him to rush, *i.e.* “hurry up”, or pass the turn, *i.e.* “my turn, my turn”. Even though only one person of this group directly interacted with Memoção during the video recording, the way the participants interacted with each other giving instructions, making comments and participating together highlights an underlying social aspect to be found in Memoção.

3.3 Monolito

For Monolito, we analyzed a video recording with 53 seconds length in which five different children and one adult interact with the artwork. The events observed in the video and their coding according to our coding schema can be seen in their entirety in the Appendix C. At first, there were two children and one adult exploring the room in which Monolito was exhibited. During the video recording, the girl in white, the girl in black and the adult woman continued playing with Monolito together for approximately 20 seconds before abandoning the artwork, which was enough to manipulate the artifact and see the effects on the projection.

After the two girls and the woman left, the boy in white approached Monolito and picked it up, which led to the girl in grey and the boy in black to join him. Together, the three of them kept looking at the changes in the projection on the walls and ceiling while the boy in white kept moving Monolito in different ways (shaking, moving horizontally, and making circles). The coding highlights the cryptic nature and subtle feedback of the artifact as the girl in white was apparently not sure about how it worked, and was assisted by the adult woman who conjectured something about proximity by saying “maybe closer”. When the adult woman had apparently made sense about how Monolito worked, she was interested in sharing it with the two children accompanying her by saying: “look, see?”. The second group who appeared in the video recording had more timid social interactions: they did not talk to each other, but they were together while closely watching what happened as the boy in white interacted with Monolito. Even though only one person manipulated Monolito at a time, our observations emerged an underlying social aspect in the artwork related to collectively making hypothesis about how it works and observing the outcomes.

3.4 Evaluation of the Workshop

With regard to the evaluation of the workshop, Figure 10 illustrates the results obtained from the use of the adapted AttrakDiff questionnaire. The results are presented through the Results Portfolio that shows the positioning of the mean values of the Pragmatic Quality, and Hedonic Quality dimensions, and the Diagram Description of word pairs that shows the mean values of word pairs. The left image in Figure 10 shows that the line formed by the blue dots link is located significantly to the right, which indicates a positive experience. The only exception is the word pair "technical - human", situated in the Pragmatic Quality (PQ) group of word pairs, that indicates that most of the participants considered the workshop to be a little bit more technical than human, probably due to their constant contact with technology during the workshop.

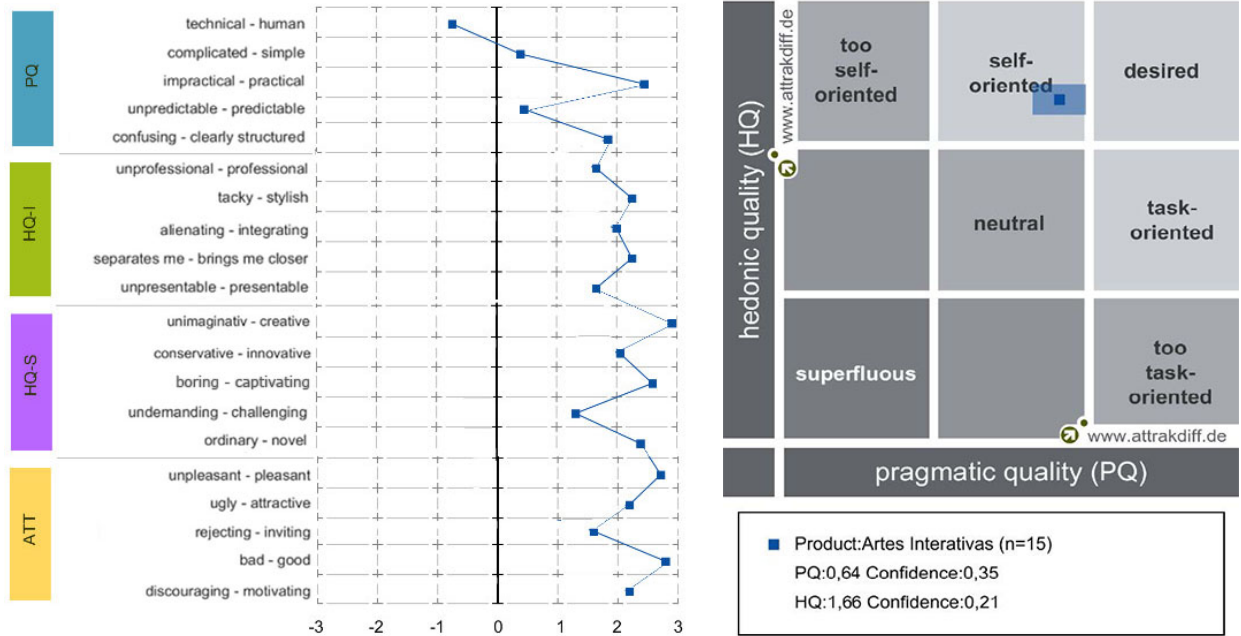
For the Pragmatic Quality (PQ) group of word pairs, most of the participants considered the experience to be technical, simple, practical, predictable (but not too much, as it is almost neutral) and clearly structured. Considering the Hedonic Quality - Identity (HQ-I) group of word pairs, most of the participants considered the experience to be professional, stylish, integrating, to bring them closer, and to be presentable. For the Hedonic Quality - Stimulation (HQ-S) group of word pairs, in turn, most of the participants considered the experience to be creative (100%, which is the maximum score), innovative, captivating, challenging and novel. Lastly, for the Attractiveness (ATT) group of word pairs, most of the participants considered the experience to be pleasant, attractive, inviting, good and motivating.

The right image in Figure 10 shows the Results Portfolio in which the results are interpreted according to the definitions of the quadrants. The smallest and darkest represents the mean value of the study dimensions with respect to the user experience, the larger and lighter represents the confidence interval. These rectangles are used to identify the general location of the responses and the results reflect greater convergence between opinions. The two rectangles are fully located in the self-oriented quadrant, it suggests that the workshop was considered "self-oriented" and could be further improved in terms of pragmatic quality to reach the "desired" quadrant. In terms of pragmatic quality, the experience was evaluated positively (0,35). Regarding hedonic quality, the results show that the users were motivated in relation to the workshop (confidence interval of 0,21).

Furthermore, Figure 11 illustrates the Emoti-SAM [8] emoticons selected by participants during the workshop. Participants only selected the emoticons that represent the highest value in their respective dimensions of pleasure (thumbs up emoticon, selected 2 times), arousal (smiling emoticon full of ideas, selected 10 times), and dominance (emoticon with graduation cap, selected three times). These results suggest that the children had a positive experience, which provoked remarkably positive affective responses in the three dimensions (pleasure, arousal, dominance).

4 Conclusions

To expand on the concept of enaction, towards the original concept of socioenaction, there is a need to bring theory and practice as close together as possible, and this is our goal for conducting workshops at the Exploratory Science Museum of Unicamp. Besides the valuable lessons learned for conducting a first workshop there, such as planning, logistical, and conduction issues, we also obtained valuable insights regarding different aspects and qualities of three distinctive Interactive Art artifacts. Furthermore, another important step taken in this workshop was the involvement of participants not only for exploring exhibited interactive artworks, but to actually create a technological artifact from scratch, in the playful form of a "magic potion" and "magic wand".



(a) Word Pair Results.

(b) Pragmatic vs. Hedonic quality.

Figure 10: Result obtained from the adapted Attrakdiff [7] instrument.




Emoticon	Quantity
	2
	10
	3

Figure 11: Emoti-SAM [8] emoticons selected by participants.

4.1 Next Steps

In the following year we intend to publish our main findings from a further analysis of the experience and the results obtained from this first workshop we reported in this technical report. It is our understanding that these results (both the artifacts themselves and their analysis) and publications will support the Socioenactive Systems project, advancing the original concept of socioenaction and providing working prototypes to exemplify and evaluate this concept.

Furthermore, on January 12, 2019 we conducted a second workshop at the Exploratory Science Museum of Unicamp. The workshop was titled “Uma Experiência no Tempo Profundo” (“An Experience in Deep Time”, in English). We exhibited three new artifacts associated with the concept of deep time: (1) TangiTime (an interactive and tangible tabletop installation to explore the passage of time in the world by manipulating objects from different geological ages), (2) Cronobit (an interactive installation in musical instrument format to experience the passage of time in the different contexts of the geological process of erosion and the evolution of a species at different speeds), and (3) Temporário (an interactive installation associated with an educational video played on a display, as more people come closer and watch the video together, the video’s speed increases). Therefore, in the following year we also intend to analyze the results of this second workshop, including a qualitative analysis of the video recordings of interactions with the three new artifacts, and publish our main findings.

Acknowledgements

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
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






Appendices








In these appendices we present the coding of the recorded interactions with each of the three interactive artifacts explored during the workshop. While there is no abandonment of the work or other action, it is understood that a person continues to perform the last action analyzed. We used the following coding schema with colors and icons:








-  Interactive Artwork
 -  Lobo-Guará
 - *  Show information about the maned wolf
 - *  Do nothing
 -  Memoção
 - *  Show an Internet meme with sound
 - *  Do nothing
 -  Monolito
 - *  Change the projection speed and color
 - *  Do nothing
-  Person
 -  Emotion expression
 -  Individual action
 - *  Look at something
 - *  Interact with the artwork
 - *  Abandon the artwork
 -  Social action








A Coding of the Recorded Interactions with Lobo-Guará

00:00 The video starts with    the screen showing information about the paws of the maned wolf

00:00  Girl in white,  Girl in pink, and  Boy are  beside  Lobo-Guará while   touching and   looking at it together

00:00  Girl in white   touches  Lobo-Guará on the body and head,    nothing happens

00:00  Girl in pink   touches  Lobo-Guará in the body,    nothing happens

00:00  Boy   touches  Lobo-Guará on the body and head,    nothing happens

00:03 🧑 Boy 👁 looks at the screen and then 👁 looks back at the 🗨 Lobo-Guará

00:04 🧑 Girl in pink 🗑 abandons the artwork

00:06 🧑 Girl in white 🗑 abandons the artwork

00:10 🧑 Boy 👉 touches 🗨 Lobo-Guará in the tail , 🗨 🐾 nothing happens

00:12 🧑 Boy 👉 touches 🗨 Lobo-Guará in the tail , 🗨 🔄 the screen shows information about the tail of the maned wolf
then the 🧑 Boy 👁 looks at the screen

00:18 🧑 Boy 👁 looks at the 🗨 Lobo-Guará while he 👉 moves around to the front of 🗨 Lobo-Guará

00:19 🧑 Boy 👉 touches 🗨 Lobo-Guará in the body and head , 🗨 🐾 nothing happens

00:21 🧑 Woman 🐾 approaches 🧑 Boy and 🗨 Lobo-Guará

00:21 🧑 Boy 👁 looks a the screen

00:23 🧑 Woman 🐾 joins 🧑 Boy in 👁 looking at the screen

00:29 🧑 Woman 👁 looks at the 🗨 Lobo-Guará and then looks back at the screen

00:31 🗨 🐾 the screen finishes showing information about the tail of the maned wolf

00:32 End of video

B Coding of the Recorded Interactions with Memoção

00:00 The video starts with 🗨 📺 the screen showing a love Internet meme with sound

00:00 🧑 Woman 👉 puts her hand inside 🗨 Memoção and 👁 looks at the screen

00:04 🧑 Woman 😊 laughs and smile while she 👁 looks at the camera and then looks back at the screen

00:05 🧑 Woman 👉 presses a surface inside 🗨 Memoção , 🗨 🔄 the screen shows a cute Internet meme with sound

00:08 🧑 Woman 👉 presses a surface inside 🗨 Memoção , 🗨 📺 the screen shows a sad Internet meme with sound

00:09 🧑 Girl in pink 🐾 pulls the arm of 🧑 Woman

- 00:11 🧑 Woman 🧑 🖐️ removes her hand from inside 🗨️ Memoção and 🗑️ abandons the artwork
- 00:11 🧑 Girl in pink 🧑 👁️ looks inside , 🖐️ puts her hand inside 🗨️ Memoção , and then 👁️ looks at the screen
- 00:12 🧑 Girl in pink 🧑 🖐️ presses a surface inside 🗨️ Memoção , 🗨️ 🔄 the screen shows a cute Internet meme with sound
- 00:13 🧑 Boy in black and 🧑 Boy in orange 🐾 run towards 🗨️ Memoção together 🧑 👁️ looking at it
- 00:14 🧑 Girl in pink 🧑 👁️ looks inside and 🖐️ presses a surface inside 🗨️ Memoção ,
 🗨️ 🔄 the screen shows a sad Internet meme with sound , and then 🧑 Girl in pink 🧑 👁️ looks back at the screen
- 00:18 🧑 Tall girl , 🧑 Girl with colorful pants , 🧑 Girl with skirt and 🧑 Mother of girl with skirt
 🐾 approach 🗨️ Memoção together 🧑 👁️ looking at it
- 00:19 🧑 Girl in pink 🧑 🖐️ removes her hand from inside 🗨️ Memoção and 🗑️ abandons the artwork
- 00:22 🧑 Girl with colorful pants 🧑 👁️ looks inside 🗨️ Memoção
- 00:24 🧑 Tall girl 😊 smiles while she 🧑 👁️ looks at the screen
- 00:26 🧑 Girl with colorful pants and 🧑 Boy in black 🧑 🖐️ lean in front of 🗨️ Memoção
- 00:28 🧑 Tall girl 🐾 🧑 👁️ looks inside 🗨️ Memoção and say: "you stick your hand in there"
- 00:28 🧑 Boy in black 🧑 👁️ looks at 🧑 Tall girl
- 00:29 🧑 Boy in red and 🧑 Father of boy in red 🐾 approach 🗨️ Memoção together 🧑 👁️ looking at it
- 00:31 🧑 Boy in black 🧑 👁️ looks at and 🖐️ puts his hand inside 🗨️ Memoção , then 👁️ looks at the screen
- 00:33 🧑 Boy in black 🧑 🖐️ presses a surface inside 🗨️ Memoção , 🗨️ 🔄 the screen shows a disgusted Internet meme with sound
- 00:34 🧑 Girl with colorful pants 🧑 👁️ looks at 🗨️ Memoção and then looks back at the screen
- 00:37 🧑 Boy in black 🐾 says: "I put my whole hand"

00:40	👤 Tall girl	🐶 smiles	and say: "he is disgusted"
00:44	👤 Boy in black	👤 presses a surface inside	🗨️ Memoção
	and	👤 Boy in black	👤 screams alongside
			🗨️ Memoção
00:45	👤 Boy in orange	🐶 pulls the arm of	👤 Boy in black
00:46	👤 Boy in black	👤 presses a surface inside	🗨️ Memoção
			🗨️ the screen shows a happy Internet meme with sound
00:48	👤 Boy in orange	🐶 says to	👤 Boy in black : "my turn, my turn"
00:48	👤 Boy in black	👤 presses a surface inside	🗨️ Memoção
			🗨️ the screen shows a happy Internet meme with sound
00:49	👤 Girl with colorful pants	🐶 says to	👤 Boy in black : "hurry up"
00:50	👤 Boy in black	👤 presses a surface inside	🗨️ Memoção
			🗨️ the screen shows an anger Internet meme with sound
00:56	👤 Boy in black	👤 presses a surface inside	🗨️ Memoção
			🗨️ the screen shows a happy Internet meme with sound
00:59	👤 Boy in orange	🐶 says to	👤 Boy in black : "hurry up"
00:59	End of video		

C Coding of the Recorded Interactions with Monolito

00:00	The video starts with	👤 Girl in black	👤 looking at reflective objects displayed on the wall unrelated to Monolito
	👤 Girl in white	👤 holding	🗨️ Monolito
	👤 Adult woman	🐶 is accompanying	👤 Girl in white
	and there is	🗨️	🗨️ a projection with a predominantly blue filter on the walls and ceiling
00:01	👤 Girl in white	👤 shakes	🗨️ Monolito
			👤 looking at the projection
	🐶 says something inaudible	🗨️	🗨️ the projection on the walls and ceiling becomes faster and the filter slightly yellow
00:06	👤 Girl in white	🐶 says something inaudible	👤 stops shaking
			🗨️ Monolito
	🐶 comes closer to	👤 Girl in white	and says: "maybe closer"
	🗨️	🗨️	🗨️ the projection on the walls and ceiling slow down and the filter becomes slightly blue/purple

- 00:11 **Y Adult woman** picks up **Monolito** from **Girl in white** and gently waves it in the air with one hand while looking at the projection, apparently nothing happens with the speed and projection filter
- 00:12 **Y Girl in black** join **Y Girl in white** and **Y Adult woman** and is looking at the projection on the walls and ceiling, **Y Adult woman** starts shaking **Monolito** more intensely, the projection becomes faster, brighter and the filter slightly yellow/red, **Y Girl in black** turns her head up to look at the ceiling
- 00:16 **Y Girl in black** turns her back to **Monolito**, **Y Girl in white** also turns her back to **Monolito** and takes a look at the reflective objects displayed on the wall unrelated to **Monolito**, **Y Adult woman** says to **Y Girl in white**: "look, see?" while the projection is faster, brighter and the filter slightly yellow/red but only **Y Girl in black** looks back at **Y Adult woman**
- 00:20 **Y Adult woman** puts **Monolito** down and abandons the artwork alongside **Y Girl in white** and **Y Girl in black**, the projection slow down and becomes darker and the filter slightly blue/purple
- 00:18 A group of people outside the video say some indiscernible phrases apparently unrelated to **Monolito**
- 00:25 Someone outside the video says "you shake it"
- 00:33 **Y Boy in white** approaches **Monolito**, picks it up, and starts shaking it with one hand while looking at the ceiling, the projection becomes faster and the filter slightly red
- 00:40 **Y Girl in grey** and **Y Boy in black** join **Y Boy in white** and approach **Monolito** together, **Y Boy in white** looks back at them while still shaking **Monolito**, the projection continues at the same speed and with the same slightly red filter
- 00:43 **Y Boy in white** looks back at the ceiling and starts shaking **Monolito** in a horizontal fashion, and then in a circular fashion, the projection continues at the same speed and with the same slightly red filter
- 00:48 **Y Boy in white**, **Y Girl in grey** and **Y Boy in black** are looking at the ceiling while **Y Boy in white** is still shaking **Monolito**, the projection continues at the same speed and with the same slightly red filter
- 00:53 End of video