'The Machine to Be Another': embodiment performance to promote empathy among individuals

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ABSTRACT

'The Machine to Be Another' is an embodiment system designed to address the relation between identity and empathy. The project merges performances with protocols of neuroscience experiments, in order to offer users an immersive experience of seeing themselves in the body of another person. The paper reports the methods and partial results of the interdisciplinary qualitative investigation that we are making on low budget approach to stimulate empathy through embodied interaction between individuals.

Categories and Subject Descriptors

J.5 [**Arts and Humanities**]: *Performing arts*

K.4.2 [**Social Issues**]:*Assistive technologies for persons with disabilities.*

General Terms

Performance, Experimentation, Human Factors.

Keywords

Interactive Art, Cognition, Conceptual, Culture, Installation, Interaction, New Human Interface.

1. INTRODUCTION

'The Machine to Be Another' is an artistic project addressing the perception and understanding of the *Self* based on the understanding of the *Other*.The project merges low-budget virtual reality technology with real human performances in order to provide users a telepresent experience of another person's point of view.

The investigation reported in this document includes results from collaborations issued from a four month art residency at l'Estruch (March to June 2013 - Sabadell, Spain) and the participation in Madrid-MIT M+Vision Hacking Medicine event (July 2013).

Embodied simulation mechanisms, in particular of actions, emotions and corporeal sensations have been recently proposed as having deep implications in the understanding of empathy and social cognition, perception of one's body, neural plasticity but also in the formation of concepts [3]. They are also an active field of investigation in the arts [2].

In several experiments at the Karolinska Institute, Henrik Ehrsson and his colleagues have been studying how the brain constructs a representation of one's own body through the integration of different sensory modalities. Among remarkable achievements were the possibility to induce in healthy subjects the sensation of owning dummy limbs [6], the illusion of owning a third arm or even the body of a Barbie doll [14]. They have demonstrated that when individuals visually experience that they are located in a different place from their real body they disown this body and no longer perceive it as part of themselves [4]. They have observed that this effect is best induced when the brain has to perform multisensory integration of stimuli [11].

On the other hand, the discovery of mirror neurons and its relation to empathy has also shown a deep root that bonds us to others "in other words, how bizarre it would be to conceive of an I without an us". [12]. This bond goes beyond physical observation and would also be related to social skills [9].

Recent investigations in neuroscience supporting an embodied simulation account of empathy are exploring new theories of identity, reporting a blurriness of the self and other in the neural representation of threat when related to familiar individuals [1]. Other studies suggest the effectiveness of inducing body ownership for reducing implicit racial bias, both in virtual reality [10] and using the *rubber hand illusion* [8].

In "The Machine to Be Another" we're adding a poetic frame to the embodiment experience by creating layers of content that conducts users and performers to a reflexion about the other and themselves.

2. SYSTEM

The system combines elements of telepresence and performance to generate the psychophysical experience of being present in the body of another. The users movements are coupled to those of the performer through head-mounted displays, head tracking, headphones, microphone and servo controlled cameras. The performer follows user's movements in an identical space.They are able to interact with objects,

their own body, as well as the internal narrative of the performer's thoughts and memories. In this manner the system provides a unique way for the exploration of identity and how it relates to embodiment and narrative in a deeply immersive way.

2.1 Using a real human as Avatar

In "The Machine to be Another", dummy or virtual bodies are replaced by the body of the performer, a person whose role is to reproduce as accurately as possible the movements of the user, a person exploring an environment through the body of the performer.

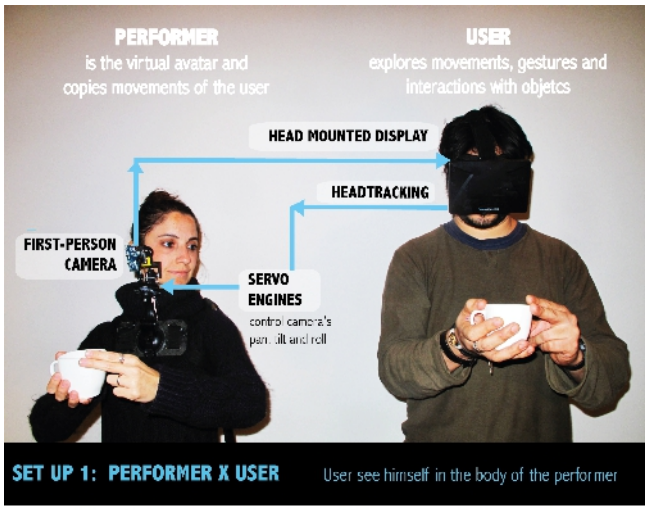

Figure 1. *Basic functional diagram of the system*

To maintain the embodiment sensation, the performer must try to reproduce the user's movements as accurately as possible. User and performer will usually be in different but seemingly identical places. The performer holds a camera capturing his point of view, and the camera orientation is controlled by servos, accordingly to the head orientation data sent by a sensor on the user's head.The goal of this experiment is to stimulate empathy by provoking the sensation of embodiment through the system and add on top of it a narration of the performer, triggered by multisensory cues, involved in objects' manipulation. The performer tells personal experiences evoked by the objects, further enhancing the immersion of the user in the performer's point of view, not only physically but also emotionally.

The system provides a real tactile sensation instead of haptic devices like vibration motors sometimes used in neuroscience increasing the embodiment effect. It also allows detailed gestures (such as fingers movement) that traditional computer vision tracking systems can not achieve easily.

Although performers tend to copy movements of users with a certain delay, the head tracking controls the camera in real time. We've observed that users tend to accept the movements latency and to move slowly in order to achieve a better control of the movements. Interestingly studies relating to embodiment have demonstrated that if there is real-time head tracking in a virtual environment there may not be a requirement for concurrent physical stimuli as it involves motor acts and corresponding perceptual changes comparable to physical reality, such as with head tracking and a head-mounted display [7]. This also ties in with an observation that the strong illusion of being in the place depicted by the virtual reality [13] occurs when sensorimotor contingencies for perception are similar to those of physical reality, that is, when a participant can use their body for perception in much the same way as normally.

3. DESIGN AND QUALITATIVE ANALYSIS PROCESS

The investigation and development was driven to investigate possible uses of "The Machine" as a collaborative artistic and social application. During the art residency

we invited artists and members of the public to participate as performers in order to address an issue of their interest. After sessions of interviews and informal debates, the performers suggested new uses and approaches with the Machine. After each experiment, performers and users shared their conclusions and impressions about the experience with investigators, in order to help understanding how the Machine can contribute for the comprehension of the 'Self' and the 'Other'. The diversity of issues raised by the performers led us to develop a small variety of specific setups, addressing different interaction aspects: from more narrative to more physical.

During the Hacking Medicine event, we had also the opportunity to collaborate with neurologists to devise pre-prototypes pitches dealing with eating disorder and motor neurorehabilitation. This series of pre-prototypes were developed with low budget technology and further investigation is being led on possible uses.

4. EXPERIMENTS AND PERFORMANCES

4.1 Mother-daughter relationship

In this performance called "la noia de les lagrimes vermelles" ("the girl with red tears") Sarah - a 12 year old girl - shares her creative process of drawing the illustration of her own story, while she narrates this story to her mother.

The experiment was suggested by her artist mother - Anna - that wanted to get closer to her daughter. We've simplified the system so that the performer (Sarah) used a camera on her head, while the user (her mother) followed her movements. This approach reduces the level of the user's agency, but allows more freedom of expression to Sarah, relying on little visible technological means (a small camera attached to a hat, and headphones).

Figure 2. *Sarah and her mother Anna performing "La noia de les lagrimes vermelles"*

The performance was also presented to an audience, allowing "The Machine" to work as a tool for artistic expression for Sarah. According to Sarah's mother, the experience helped Sarah to assume a more secure and happy attitude during her everyday life, what we believe is driven by the recognition of her creative talent by her mother and the audience.

4.2 Empathy towards an immigrant

In this performance users could see themselves in the body of Youssoupha, an immigrant from Senegal living in Spain. Youssoupha shared stories about his childhood, his love for dancing and his immigrating, according to the interaction of users with objects in the room.

Figure 3. *Yousoupha letting the user see himself through his Point of View*

This set up uses the embodied interaction with objects, in which users can explore the space and control the movements and stories told by the performer. The performer follows the movements of the user from a different room, using a see through head-mounted display and radio frequency video transmitters.

4.3 Functional diversity exchange

Performance "In Merce's wheels": users with no disabilities could see themselves in the body of a woman in a wheelchair, while listening to the inspiring story of Merce's life, and how people in wheelchairs feel facing everyday challenges. This approach uses the same set up as the experiment on *Empathy towards an immigrant*, adding another level of physical interaction through the wheelchairs. The user operates a similar chair with small wheels and can command the direction by pointing to the desired destination, while the performer uses an electric wheelchair.

Figure 4. *User seeing herself in in wheelchair under the perspective of Merce*

We have observed that both in *Empathy towards an immigrant* and *Functional diversity exchange* the interactive narrative highly increases the level of engagement in users' experience and the reported presence (some users stated that after some time they felt that the voice came out of their own heads). The interaction based on objects have offered a strong sensory experience once it is related to agency (users decide the content of the story they want to hear through their own movements), and the objects have worked as powerful symbols to trigger different stories from a real person. Users tend to demonstrate empathetic feelings towards the performers – claiming that the experience has raised their awareness about the performers' social condition. Besides that, in most of the cases, we've observed that users wanted to hug the performer at the end of the experiment, smiling at them. Although purely qualitative, the statements from users revealed that they got "deep into this other person's life" which contributed to their experience that the story "could be me in their place".

4.4 Body extension

In the performance "Dancing on the Feet" a dancer in wheelchair (Victoria) was able to perform while seeing herself from the point of view of a dancer with no disabilities (Cristina).

The wireless set up used radio frequency transmitters and analog video. To accomplish the performance, we've also developed a gestural vocabulary that allowed Victoria (user) to convert her improvised dance movements into choreographic instructions to Cristina (performer).

This experiment was suggested by physically challenged dancers that have been in wheelchairs for many years and were interested in the possibilities of their artistic self expression. Besides reporting a very strong and unfamiliar feeling that many of them couldn't remember in their lives (being able to stand up or vertigo of being taller) we have been strongly encouraged by them to investigate the use of "The Machine" in neuro-rehabilitation systems.

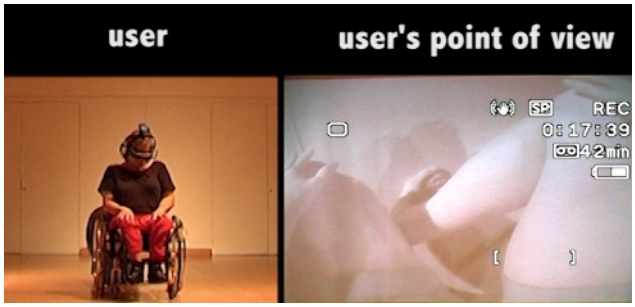

Figure 5. *Body extension*

4.5 Gender Swap

In this experiment we started to investigate mutual respect between different genders.

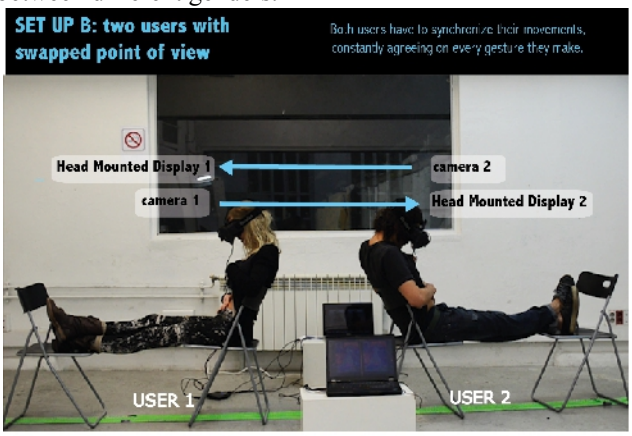

Figure 6. *Gender Swap*

To create this perception, both users have to synchronize their movements. If one does not correspond to the movement of the other, the embodiment experience does not work. They have to constantly agree on every movement they make, which raises the awareness about the other's limit.

The experiment got the attention of international media and meany researchers interested in collaboration. Besides that, it has also showed us potential to address gender identity and queer theory approaches.

5. Hacking Medicine

During Madrid-MIT M+Vision Hacking Medicine we have collaborated with neurologists, engineers and designers to pitch two projects that used "The Machine":

- Quantitative and qualitative embodiment techniques for diagnosis and treatment of eating disorders as school activities: interactive game in which kids can act both as performers and users, switching their image perspective. Built with a camera and Wireless HMD that offers a easy-to-use hardware.

- Mirror Illusion embodiment device solution for neurorehabilitation in neurological diseases with loss of bilaterality: in this system we re-create the experiment of 'mirror illusion' using HMDs, video and performances. The system uses the Oculus Rift immersive HMDs and cameras controlled by head tracking in order to increase agency and to offer new possibilities especially in therapies for inferior members.

6. GENERAL FINDINGS

Based on the statements from users and performers regarding their newfound awareness and interest towards "the other" we have concluded that the system has great potential as a social tool to stimulate empathy among different groups. The hybrid approach of merging performance and technology has also revealed to be very flexible and could be used in a wide variety of embodied applications for performing arts, systemic psychotherapy, neurorehabilitation, and empathy research.

7. FUTURE WORK

We will continue the investigation of 'the Machine' in order to address social issues such as conflict mediation, gender identity and mutual respect. Besides the artistic approach, we are very interested in measuring the efficacy of the system to generate empathy by qualitative questionnaires.

On the other hand, we are also working on the refinement of the prototype of a game for children that can work as a tool for early diagnosis and treatment of body dysmorphia and eating disorders. This development includes a refinement of the hardware and of the procedures that can be applied by educators.

8. REQUIREMENTS FOR DEMO

For the Demo presentation at Laval-Virtual we will need the following requirements:

- **physical space**: area of 3m x 2m, 2 identical chairs, small table for computer.
- **energy:** 4 power sockets
- **visual support:** HDMI monitor display, HDMI SPLIT

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