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# MITMI Man-In-The-Middle Interaction

The human back in the loop

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## ABSTRACT

"The medium is the message" from McLuhan [13] showed and still shows how the medium influences how the message is perceived. This article proposes a new model for computer-human interaction named MITMI for (hu)man-in-the-middle Interaction in the context of digital art. This approach questions the concept of mediated interaction by placing the human as the driver and as the "translator" of the interaction process from a theoretical point of view. Indeed, mediated interaction is based on the fact that two humans are able to interact through a technological device [5]. We develop the idea of putting human back as an intermediary between the user/spectator and the technology. Our model thus introduces a way of conceptualizing interactive digital artworks, where the artist considered as an operator and creator can also take a central position and is no longer the only producer of the work taking thus entirely part of the artwork. We first explore the need to put the human back in the loop, then we will describe how the principles of mediated interaction help in defining the MITMI model. We will stress this model through several installations and interactive artworks based on the idea of shifting the artist position from the creator, to the mediator between the real world and the virtual world. Beyond the artistic approach, this model proposes to redefine and to explore new modes of co-creation or mediation, where digital media supports human-to-human interaction.

## Keywords

computer-human-interaction, interactive digital art, performance, computer-mediated interaction, mixed reality

## 1 INTRODUCTION

McLuhan [13] showed and still shows how the medium influences the message's perception in his quote "The medium is the message." Crowley et al. [5] also consider media as a form of extensions of man. In the creative process, despite new technologies offers more degrees of freedom regarding immersion and interaction, we identify the need to question back this consideration about technology. Following these reflections, we propose to develop the idea of putting human back as an intermediary between the user/spectator and the technology

theorizing a new model for computer-human-interaction in the context of digital art.

## 2 HUMAN IN THE LOOP IN DIGITAL CREATION

### 2.1 Computer-mediated interaction

The approach of placing human in the loop in digital creation questions the concept of mediated interaction by placing the spectator or user as the driver and, so, as the "translator" of the interaction process from a theoretical point of view. Computer-mediated interaction is based on the fact that two humans are able to interact together through a technological device [9] (Figure 1). In the context of digital theater and performances, several studies explore different models to assess the question of intersubjectivity between real and virtual actors. The open source project *The machine to be another* [3] is a typical use of computer-mediated interaction where through head-mounted displays, a user is able to see a first-person video with the eyes' perspective of a second person (the performer) who follows the user's movements. This experiment investigates the relation of identity or the empathy using embodiment and virtual body extension.

De Loor et al. [7] proposed a model which uses artificial models based on enactive considerations for the digital theater play *Il était Xn fois*. They design ontogenetic mechanisms for complex dynamic systems which were guided by people. The authors report their model addresses the fact that man can "learn from the machines which can learn in return" providing a clear parallel with the concepts of co-evolution and co-constitution of phenomenology.

Batras et al. designed a Virtual Reality model for improvisation in digital theater [2] that connects a real actor activity to a semi-autonomous agent switch from imitation to improvisation behaviors with the real actor. In this specific case, the actor is in a situation of computer-mediated interaction with himself as a deforming mirror for improvisation.



Figure 1: computer-mediated interaction between two humans

## 2.2 The MITMI model

We could see through these interactions an opposite model of the "mediated interaction" paradigm [9] where the computer tool serves as a communication channel between humans (Figure 1). In the cases described above, the exchanges are very different. Indeed, if in the first case the computer tool serves as an intermediary, whereas in our case a person is acting as an intermediary between the user and the machine. We call this interaction model MITMI (Figure 2), for Man-In-The-Middle Interaction, in reference as the Man-In-The-Middle attack (MITM) in computer security where the attacker secretly deforms the communication between two parties who believe they are directly communicating with each other [9]. This type of interaction leads, of course, to the notion of interpretation of the intermediate link also so-called "telephone game" [4] where misunderstandings accumulate in the retellings creating usually an interesting and significant difference between the statement announced by the first player and the one from the last player of the chain.

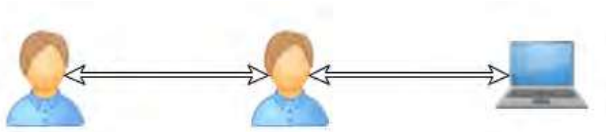


Figure 2: computer-mediated interaction between two humans

The Wizard of Oz technique [6] is part of this model and could be seen as a special case of MITMI. It consists of proposing an experience in which users interact with a computer system they believe it is autonomous, but which is in fact controlled by a human. This technique was used in the design experiments of an improvisation Virtual Reality application [3] dedicated to digital theater to understand how actors start an improvisation and feed it through computer-mediated interaction, the actors were invited to interact with a puppet (i.e. an entity manipulated from the outside) without being aware that the virtual entity is not autonomous. The user was therefore confronted with an entity controlled by a third party.

There is a strong link between mediated interaction and the MITMI model in the way that in both cases the device is at the center of the interaction, the great difference with this model is that the MITMI model takes into account the human interacting as a whole and in "his presence in the real world" and not through an interface that would restrict the perception of the user. Since the computer is no more filtering interaction, this leads to a finer perception and understanding of the "state of mind" of the human

interacting. In the next section, we present several digital art artworks described using the MITMI model. The different types of interaction involved presented here allows to reconsider the link between the artist/performer, the public and the technology.

## 3 MITMI APPLIED TO INTERACTION IN DIGITAL ART

### 3.1 Theater Play

In the theater play *Cassandra-Materiaux* [12] the actress and director C. Chabali er is performing the role of Cassandra from Greek mythology. At the beginning of the play, she is immersed in the world of the predictions of the god Apollo presented as a giant virtual character (Figure 3).

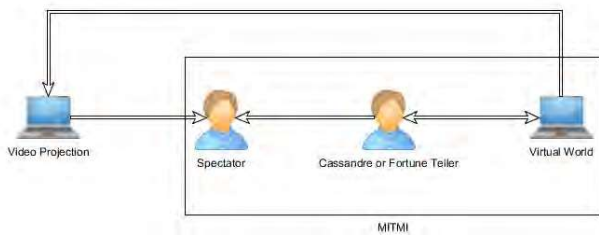


Figure 3: Photography of the Stage in *Cassandra-Materiaux*

The actress is immersed and is interacting in the virtual world on stage using a virtual reality headset and a Kinect camera to detect gestures. The virtual god is also projected on an invisible tulle in order to be made visible to the spectators but not from the other actors on stage. She is therefore isolated in her own world without any vision of the real stage, the other actors and the spectators. In this case, the user-actor is observing a virtual entity which look completely isolated in its world but is still interacting with the actor and is the mediating interaction with the other real actors on stage (Figure 4).

### 3.2 Installation and Performance

In the installation-performance *Between The Lines* [17] presents the digital double of the performer M. Passedouet playing a fortune-teller. This character was projected on a tulle in a closed space which scenography represents the caravan of a fortune-teller. The actress dressed in the same way as her digital double walks silently through the gallery, leads the spectator to the caravan and play with the crystal ball. Her digital double comes to life and makes predictions. Here, the installation requires a mixed reality technology and a performance of the artist (Figure 4).



**Figure 4: The MITMI model applied to the artworks *Cassandre-Materiaux* and *Between the lines***

### 3.3 Artistic Video Game

Our approach also creates perspectives in video games. The *Asile Escape* project (Figure 5) created by T. Fevrier and al. [8] proposes an asymmetrical gameplay using virtual reality technologies to create an escape game, i.e. a puzzle game where the player must escape, played by two people. The plot takes place in real old toilets of a university. One of the players is wearing a straitjacket and equipped with a virtual reality helmet and is only able to observe around him on the replica of the real room, the second player is free to move and can use the VR controllers.



**Figure 5: *Asile Escape* [8], scenography and VR point of view**

The two players' mission is to get out of the cell, despite the fact that they share same the real and the virtual space, they have to find different clues around them. The tied-up character immersed see a distorted and nightmarish vision of reality through his reality helmet and was able to see a certain number of clues, in return he could not interact with his environment and therefore had to give instructions to the unsubmerged player.

Each player was locked in his own plausibility bubble, holding information inaccessible to the other, and they have to dialogue to describe their respective bubble. Several immersed players report they really felt like they were locked in their bubble despite the presence of the second player with whom they were able to talk. This extreme isolation can refer to a modern Pythia whose visions are subjected to interpretation when confronted with reality.

### 3.4 Interactive Sculpture

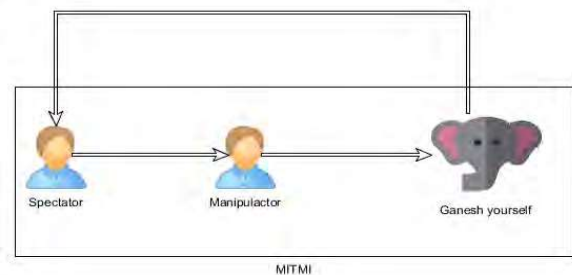
Thus, we can see in the two previous examples of *Cassandre-Materiaux* and *Between The Lines* how this man-in-the-middle (in

these cases a woman) serves as a connector between the "real world of humans" and the "virtual world" (Figure 4). In more anthropological approach, we propose to apply this model to the artistic installation *Ganesh Yourself* [11] from E. Grimaud, Z. Paré and A. Dubos.



**Figure 6: Robot of *Ganesh Yourself* [11]**

This installation allows to control a robotic puppet where the face of the user or the spectator interacting is rear-projected on a Ganesh robot (Figure 6). Anyone can thus interpret the role of the Hindu god Ganesh which is a hybrid entity between a man and an elephant. It is interesting to note how different participants, both those who dialogue with the robot, and the robot operators or manipulators get caught up in playing the game of interaction as if the robot was really Ganesh.



**Figure 7: MITMI Model applied to *Ganesh Yourself***

This installation follows the previous works of the artist Z. Paré conducting performance with the robot replica of the researcher Hiroshi Ishiguro in his company Intelligent Robotics Laboratory. There, the robot was controlled by an external manipulator, which makes it "basically as a big puppet with sensors" [10]. According to the Ishiguro regarding a female robot he has created, "more importantly, we found that people forget that she is an Android while interacting with her. Consciously, it is easy to see that she is an android, but unconsciously, we react to the android as if she were a woman" [18]. In this case, the figure of the Man-In-The-Middle disappears in favor of putting the emphasis on the manipulated robot. We refer here to the term "manipulator" (Figure 7) as the puppeteer who controls the device.

## 4 DISCUSSION & PERSPECTIVES

### 4.1 Toward a co-creative process

From these examples, we now explore how the MITMI model proposed for digital art application but it could be applied in CHI prototyping. It could be for instance used as a new cultural mediation system, by creating for example an exchange process where each interlocutor equipped with more or less immersive and interactive mixed reality technologies from AR to VR [14] can confront their point of view in a co-creative approach. In the field of movie production, new processes called *previz-on-set* allows to previsualize the filename result of a movie (post production) from the beginning of the production pipeline with the actors on set [15]. Usually, communication during the pre-production project does not take place in the virtual environment. The *OutilNum project* [16] proposes a collaborative approach (Multi-users and distributed VR/AR/MR) where each of the interlocutors becomes the man-in-the-middle of the others, thus offering a co-creation space based on interaction both on a real and virtual level. The MITMI model thus allows us to acquire from each participant point of view new elements of analysis.

### 4.2 Perspective for sharing

Beyond the artistic and collaborative axis, we could develop the MITMI model as a mediation tool for sharing the use of new technologies for specific audiences who could for instance not able to use computer tools for sensorimotor or cognitive, cultural or aging reasons. To do so, we could imagine enriching the model with qualitative study or interviews refining the transformations that take place between the user, the man-in-the-middle and the computer tool. Our model thus enables both the ability to understand the other as an empathy process sharing the point of view and the ability to disappear behind the technology. This could allow a progressive access to technology and understand its potential but also the limits of its communication channels. It can increase interaction as well as alter it, which in any case helps in feeding improvisation and sharing creativity.

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