Participating interface

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Participating Interface

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Abstract

This paper is presents an artwork that is concerned with the interactions among people rather than the interaction between an audience and the artwork. We visualize the physical motion variations from the interactions among different participants using Kinect-based depth estimation and video tracking algorithms. The proposed work can visualize the affective experiences based on the physical distance between participants. We also provide experiences in which a participant becomes a part of the artwork in the form of both shape and interface. The body of a participant plays an important role in communicating and interacting with other participant and the artwork itself.

Keywords: interactive media art, interaction among the audience, participating audience

1 Introduction

In media art, interactions between the audience and an artwork is essential in the promotion of audience participation. Traditional interactive media artwork generally uses one or more objects to communicate with the audience. However, in this paper we are interested in an artwork that focuses on the interactions between different participants. More specifically, we focus on the interaction among the audience participants rather than the interaction between the audience and the artwork. This work allows the audience to become engaged with the artwork, and provides an immersive experience for the participants. The novelty in this artwork is twofold; i) visualization of the physical motion that results from the interactions among different participants, and ii) the responses of these participants to the data that make them become a part of the artwork.

Traditional paintings and sculptures have the specific objective of conveying certain emotions to the viewer such as pleasure, sadness, and sympathy. Beginning in the mid-twentieth century, a new form of art began to appear throughout Europe and the United States that moved away from object-based evaluation to art forms in which the audience is integrated in some way into the artwork itself. In his work entitled *The Void*, for example, Yves Klein removed everything from a gallery except a large cabinet, and painted the gallery walls white [Klein 1958]. Prior to allowing guests to enter the empty gallery, they were served a cocktail mixed with methylene blue (a dye that passes straight through the body). Unknown to the audience at the time, the artist had left his mark as his blue color had become a part of them - the same color that he wanted to paint the world [Lee 2001]. In contrast to traditional works of art, Klein attempted to immaterialize objects of the artwork and used the audience as the contents of the artwork. As another example, in her artwork entitled *The Artist is Present* [Abramovic 2010], Marina Abramovic used the human body as an object by sitting on a chair for eight hours a day over a period of three months with the audience sitting in front of her. In this performing artwork, the artist is 'present' and becomes a part of the artwork with the audience members coexisting with the artist. With these examples in mind, we might ask the question of whether or not the body should have a role in art, and whether or not it would have the same limits as immaterial objects.

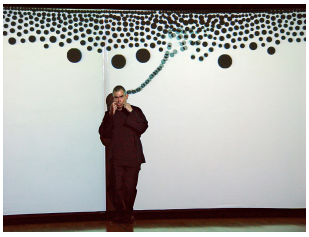

Figure 1: *Messa Di Voce.*

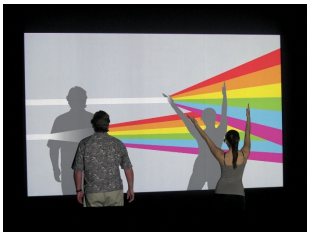

Figure 2: *Social Light.*

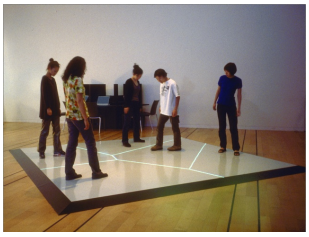

Figure 3: *Boundary Functions.*

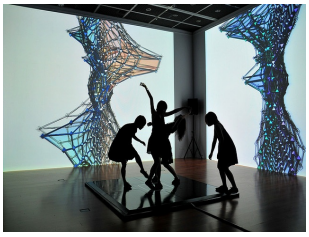

Figure 4: *Si Mi sei Vicino.*

The body is the most fundamental physical basis through which people exist and by which they interact with and recognize and interpret the world they live in. Merleau Ponty [Merleau-Ponty 2002] believed that the body, as opposed to ones consciousness, was the primary means by which a human is able to understand the world, and there have been various non-object artworks using the body as a medium. Such non-object artworks can be classified into two categories. The first are those in which the audience is an object interacting with the artwork as in *Messa Di Voce* by Golan Levin [Levin 2003] and in *Social Light* by Snibbe Interactive [Snibbe 2007]. In these artworks, the bodies of the audience members are used as the medium and interact with the artwork. The second category consists of those artworks in which the audience is the object and the artwork is shaped or completed through the relationships that exist or are formed between people in the audience. An example is the artwork *Boundary Functions* by Scott Snibbe where an interactive floor shows how one's personal space is defined through its relationship to others. As a result, this space is constantly changing and out of their control [Snibbe 1998]. Another example is *Se Mi Sei Vicino* by Sonia Cillari [Cillari 2006] where images and sounds change as audience member touch or come close to the performer. Thus, each of these art pieces focuses on the relationships among the members of the audience. However, in contrast to these works of art, we focus on creating interactions between the members of an audience through their own movements rather than through the use of intermediate objects.

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This paper is organized as follows. In Section 2, we discuss the contribution of the proposed interactive media artwork. Then, in Section 3 we present the basic concepts of the proposed artwork and the relationships between people that are captured and displayed through the artwork, and in Section 4 we illustrate the meaning of the design and content of the configuration of the visualization. Finally, in Section 5 we present the installation environment of the art, and in Section 6 we conclude the paper.

2 Using Kinect for Interactive Artwork

As described in the previous section, many artworks have been created that involve the use of the human body, and some of them use digital technologies to track the bodies as they move around within the artwork. With the introduction of the Kinect sensor in 2012, many of the tracking and depth estimation tasks required in these earlier artworks became much easier and more flexibility, which opens up new possibilities in the design of the artwork.

Figure 5: *Multiple sensors in the Kinect camera*

Kinect is a motion sensing device produced by Microsoft for the Xbox 360 video game console and Windows PCs. Kinect contains an infra-red (IR) projector, an RGB camera, and an IR camera. The Kinect's IR projector generates a grid of invisible infrared dots over the entire viewing area, and the embedded IR camera acquires the IR pattern on the object's surface for the estimation of depth. The spatial resolution of these depth estimates is 640 pixels wide and 480 pixels high, and the depth sensor range is from 800mm to 4000mm [Borenstein 2012]. As a result, a number of interactive media artworks have been designed around Kinect. A nice example is the work entitled *Intervention* by Bryan Leister [Leister 2011] that controls the contents of a gadget using the gestures of the audience as shown in Figure 6. Another is the work *Play* by Nicolas Bellet, et al. [Bellet] where the pitch of sound is controlled by movement of the performer as illustrated in Figure 7. In *Step In* by Mai Nguyen, et al. [Nguyen] and *Pirouette en re Menor* by Bacum [Bacum] the motion of a performer is detected and used to change the graphics on a display as shown in Figure 8 and Figure 9, respectively. The *Kinect Interactive Art Installation* by Microsoft [Microsoft 2010] projects the shape of the audience onto the iconic Stachus Gate in Central Munich, where the audience can interactively control the image. As a final example, the interactive work *Entre* by Barbara Castro [Castro 2012] is one that displays the body as two half images, with one being data that is captured by Kinect and displayed as a virtual body, and the other being the body itself, and both halves alternate on a display according to the orientation of the body.

In the artworks described above, the Kinect is used to capture motion and depth information of a person and displays some form of visual experience to the audience from this captured data, In this paper, we also use the Kinect to capture motion and depth information, but use it to focus on the relationships between the members of an audience. This is done through an artwork entitled *Between* that is described in the following section.

Figure 6: *Leister, Intervention.*

Figure 7: *Bellet, et al., Play.*

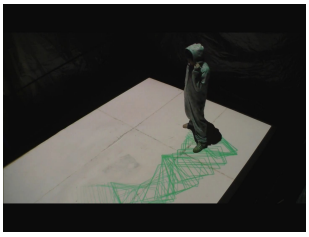

Figure 8: *Nguyen, et al., Step In.*

Figure 9: *Pirouette en re Menor.*

Figure 10: *Kinect Interactive.*

Figure 11: *Castro, Entre.*

3 Concept

Although the perception of reality is product of our vision, what we see is not always what exists in reality. For example, individuals from different backgrounds may interpret a specific object in many different ways. Their perception may be shaped by their culture, experience, and environment in which they are raised. This raises two interesting questions about the perception of reality. First, "Can we trust our vision to provide us with an absolute perception of reality?" and secondly, "Does our perception of reality encompass the entirety of our vision or is our vision only a partial indication of the reality?" The art piece that is presented here attempts to address these philosophical questions. We distinguish and identify an individual as a unique entity by the standards of nationality, appearance, familial relationships, and one's social and ethical values. In such a case, what is the physical and psychological distances between "You" and "I"?

Although we, as humans, may fall into a state of loneliness and despair, we understand that we co-exist with a multitude of others. Such different perceptions are therefore, established by the motivation. When we feel as if we are alone, it seems like the people around us have suddenly disappeared and we are left detached and isolated. Even if we desire to mingle with others, we find ourselves standing alone. At some unexpected moment, however, we may sense a person near us, not so far away. All the while, it was us who could not see or sense the existence of the other because we had made the subconscious choice not to recognize the other. In reality we were never alone. When we approach others more closely, we begin to "see" the others. The active displacement of ourselves enables us to "see" the others who once seemed non-existent and

invisible.

This work is a story about establishing the relationships that exist among people. Through self-driven active movements, the object "I" attempts to create a new relationship or acquaintance with the "Other"; the graphical representation of this process then delineates the physical distance between "I" and the "other" into a psychological relationship. Movements in the virtual space represents an abrogation of the boundaries between people and the standards that set us apart. It also depicts the shortening of distances between us and them. Through this art piece, we aim to visually grasp the relationships among people, and perceive our immediate social environment in an unprecedented manner through our own reflection of our volition to approach and to become acquainted with others. Also, we wish to express the process of change from the sensibilities among the others to perceptual experience. In this context, a discussion of the work entitled *Between* is presented in the following section.

4 Between: Content and Design

The components of the artwork *Between* include 'Heart', 'Line' and 'Circle'. The heart is used to indicate the presence of a person, and the line expresses a link that has been established between two members of the audience. The circle, on the other hand, shows the changes that may occur in the physical distances between the audience members, and displays the formation of relationships.

Figure 12: *Heart, Line, and Circle. The basic elements of Between.*

When a member of the audience arrives in front of the Kinect, an image of a heart appears in the center of the artwork. When a second person arrives within the artwork, images of a heart appear in the center of each person, and a curve between the two hearts abstractly and visually connects the two people together. This curve is in the form of a rope that may be loose and folded when two people are close together, or it may become taught when two people who are tied together get further apart. Also, if people move up and down (jump), then the will naturally bounce like a rope. Thus, we display the relationship between people by showing the invisible connection.

Figure 13: *Meet.*

If two people come close to each other and a certain amount of time passes, circles of random scales are made on random positions. These circles go up to the top of the image, and then move around and collide with each other according to the tension value. The speed of a moving circle gradually decreases, and finally all circles stop after a sufficient amount of time. The distance of the connected people is expressed by a color. More specifically, yellow is used to represent long distances while blue is used to represent short distances. The objective of this artwork is not only simple selection of the participating audience, but also the establishment of important relationships between people. In the future we plan to develop an improve the representation of the relationships between more than two people.

Figure 14: *Close.*

Figure 15: *Far.*

5 On Exhibition Space

The proposed artwork, *Between*, was exhibited at the Art & Technology Exhibition in Seoul in October of 2012 [Mok 2012]. As shown in Figure 12, the system was set up inside a cubic space measuring four meters on each side. A Kinect camera was installed on the top of the cube in the front to automatically detect and track those people who are present within the cube, and project their image onto one of the walls. To software that was used to create and implement *Between* was the open source programming language 'Processing' along with the 'Simple-OpenNI' Kinect Libraries. 'Processing' is an open-source programming language and environment to program images, animation, and interactivity [Reas 2007], and the 'Simple-OpenNI' Kinect Libraries is a simple OpenNI and NITE wrapper for processing. [OpenNI].

At the exhibition, two people were selected to enter the cubic space. When one person exits the exhibit, they are replaced with a new person. Since the selection was random, there were no pre-specified constraints or relationships on the participants who were involved in and interacting with the exhibition. Also, immediacy was provided to the participants that was more immersive through circles with

Figure 16: *Exhibition, Seoul 2012.*

different scales and colors.

Snapshots of two people inside the *Between* cube at the Seoul Exhibition are shown in Figure 14. Allowing one to be actively involved in the artwork, *Between* inspired participants to move as it reacted, in real-time, to each of their movements. During this exhibition, audiences were found to become connected with each other, and to interact comfortably with strangers. Relationships that were formed between two people were shown visually by displaying this relationship with a virtual rope. The participants in the artwork were also displayed on the screen in real-time, thereby providing an immersive, phenomenological experience.

6 Conclusion

New forms of artwork have been created recently that focus on the interactions between the artwork and the audience. In some of these, the body is used as the medium. These artworks may be classified into two categories. The first are those in which the bodies of the audience interact with the artwork, and the second are those in which the audience is the object of the artwork. Within this second category, the interactive artworks that use Kinect may be grouped into two types. The first are those in which the audience controls the artwork through gestures while the second are those in which the artwork is affected by the motions and movement of the audience.

The artwork presented in this paper, *Between*, focuses on the interactions between members of the audience rather than on a relationship between the artwork and the audience. The bodies of the participants is the subject and medium of these interactions. The participants are able to create new relationships with others, and these relationships, measured by their physical distance from each other, are portrayed visually in the artwork. Thus, *Between* is an artwork in which the audience becomes active participants in the artwork itself.

Acknowledgements

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