Interactive Digital Art based on user’s Physical Effort with Sensor Technology

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Abstract

Interactive Digital Art is a popular art form that collaborates with science and technology. In this paper we search for Interactive Digital Art which is one of the most popular art genres in these days. It takes a digital technology with modern art and sensor technology helps audiences’ active participation on art works. The participations naturally move their part of body or the whole body to create some image and sound that programmed by digital artists. To create the image or sound sensor technology is also take a very important part in Interactive Digital Art. Interactive Digital Art takes visual and sound through new technologies. Audience participation type of Interactive works need sensing process requisitely. Therefore, we search for some digital art installations about body experience through participation’s movement using sensor technology that create visualizations and sounds. Various sensors are used for Interactive Media Art works; however, Kinect from Microsoft Company is easy and useful for artist. The Kinect is a contactless controller to make an audience to be free from exist contact controller. Sensor that on-board in Kinect recognizes the audience movement who is free from controller and offers visual or auditory response to the audience in a real time. Therefore the audience becomes a user in an Interactive Digital Art. The goal for this paper is to survey and analyze about the Interactive art works that includes based on cutting edge trend sensor technology and the audience’s physical affordance and effort.

Keywords: Interactive Media Art, Sensor, Digital Game

1. Introduction

Modern art started from Fluxus in the mid-twentieth century and it developed to a free form deviate from tradition art expression. The appearance of portable video camera ‘porta-pack’ from SONY was the opportunity to uptake a video as an art. Video artist Nam June Paik who applies media actively into art made a sensation with experimental, avant-garde performance and exhibition that break the mould of the traditional art. [2] This artistic expression of art is according to the development of computer and internet in the late 20th century and the new media century has come. The types of new media such as television and video applies for experimental art brought the most visible result, and the present that the computer has developed digital video camera is the important media for art works. At that time artists, curators and critics named ‘New Media Art’ which use digital technology such as interactive multi-media installation, virtual reality and network in an art. Because of the character of New Media Art that continuously develop and factional, it is not easy to classify a super ordinate concept and a subordinate concept or unified the name. [7]

Even artist create an art, in modern art, incomplete art works can be completed with audiences participation place in a physical or in a virtual space. These arts using present digital technology make psychological and physical interaction with users or audiences.
Therefore, the goal of this paper is to survey and analyze about interactive art works based on sensor technology. For this study, In Chapter 2 researched a related works and In Chapter 3 survey and analyzed about sensor technology in Interactive Digital Arts. The In Chapter 4, concludes the paper.

2. Related Works

In this chapter we are going to looking for the concept of Interactive Digital Art and Art works which need the user’s physical effort that can be extended as a physical exertion with sensors.

2.1. The Concept of Interactive Digital Art

Interactive Digital Art is a digital interaction art. This kind of art performance in many art fields such as sculpture, painting and installation art through digital media. After technology development, artists use various and easy program to create Digital Art. The baggiest feature of Interactive Digital Art is ‘participation’, ‘interaction’ which is to make the art works audiences participate to the art works. Interactive is a recycle art that output a new transformed product according to the indicating factors and deliver it to the audience. As the Figure 1 below, the feature of media technology cannot be operated without user. This feature applies on Interactive Digital Art as well to participate the audience to the art works as necessary requisite to complete the digital art works [8].

![Figure 1. Reconstitution from Communication Process between User and Digital Art (The journal of the Korea Institute of Maritime Information & Communication Sciences . V. 13)](image)

Interface in interactive Digital Art is the space to meet the art works and the audience, therefore, its importance is emphasized. Interface using in Interactive Digital Art, the audience gives effects on the stream of the art work, change the structure, interresponse on environment or through network so make them to transform and production performance actively participated. [5]

The interface of Digital Art accept the audience’s five senses mainly sight, hearing and also receive psychological thinking and sensitivity stimulate elements. A new creation is coming up through the artist’s thoughts and process according to these indicating factors of the audience. After that the audiences experience perceptually from messages of the art work and the communication between the art work and the audience can be completed. [8]

From the existed typical contact controller Wii from Nintendo to offer a contactless interface Kinect from Microsoft make the user to be free from controller. These game devices are also take a great role in Digital Art and it is a medium for interactive work. [7]
2.2. Interactive Digital Art Works with Physical Effort

Interface and body in interactive art

Body function methods that how reflect on art works in Interactive Digital Art works can be divided into three types. The first type is project the audience as it is on an art work like ‘Text Rain’ (Figure. 2). ‘Text Rain’ shows the most basic feature of interaction in a new digital environment. The audiences are able to watch themselves directly so they can build up their expanded ego and they manipulate the digital environment through the feature of themselves in a virtual space.

![Figure 2. Rony Achive & Camile Utterback, ‘Text Rain’, 1999](image)

For the second type of art work is the audiences comes up as abstraction shapes like silhouette or shadow in art works. Audiences in Rafael Lozano Hemmer’s ‘Frequency and Volume’ (Figure. 3) appear as the abstractive shape in the Interactive Digital Art work. It represents the audience extension in a digital environment. The abstracted body of the audiences is able to adapt in a digital environment and recognize and manipulate the artificial existence in the digital environment.

![Figure 3. Rafael Lozano Hemmer, 'Frequency & Volume', 2003-2004](image)

The last type is the audience’s body does not reflect on an art work directly, however, the art work react on the audience’s movement in a real-time to develop a natural feedback process and interaction with the audience and the art work. The last type of Interactive Digital Art work is now more popular than others because of gesture recognition sensor’s development and various interactive visual and audio programs comes up artists who work on Interactive Digital Art. The audiences are able to have some graphic images or sound according to their physical effort. They need to keep move their part of body or the whole body to have any reaction or feedback from the art work [9].

2.3. Interactive Digital Art Works using Sensor Technology (Kinect Sensor)

Many artists using sensor technology for developing their art works. To communicate with the audience and makes real time feedback between the audience and the art work is the key nowadays.
Even though, various types of sensors are exist, however, Kinect from Microsoft is the most useful device for many Interactive Digital Artist.

Therefore we select the Interactive digital art installation using kinect for this chapter. The chosen art work for Interactive Digital Art using Sensor Technology is the ‘Integrarte’. This interactive installation exhibited at Festival Cultura Digital.BR on December, 2nd, 2011 at the Modern Art Museum of Rio de Janerio. The installation was developing using Microsoft Kinect data obtained through SimpleOpenNI wrapper at Processing. The Microsoft Kinect is for the video game Xbox360; however, many artists use the device instead of camera function or sensor function. The Kinect sensor is possible to distinguish the audience movement even can read each skeleton and joint of the body. Integrarte experiments developed four kinds of interactions. Each one controlled by a different body part or by relationships between body parts. The ‘Wave’ experiment is a strip of blue light creates from the audience’s arms of the indicator. The audience can have a body experience moving their arms like a bird [1].

![Figure 4. Integrarte Experiments, Wave, 2011](image)

3. Sensor Technology

3.1. Understanding of Interactive Art Technology

Audience participation type of Interactive works need sensing process requisitely. Sensing grasp the information of user’s location, identity, object distinction, time information, user’s intention and emotion. Sensing technology decides the correct sensor selection and place to the right information and it takes a role for mixture and analysis for the sensor detected. [3] Interactive Digital Art us not only web camera, gyro sensor, touch sensor but also use the most developed technologies to create an art works in a new form. Audiences receive the technology as a participation of the art works. There is an input interface which receives data values through the participation of audiences. Therefore, sensor inside of the interface is also input interface. The place that sensor installed is the place for various technologies are connected. Using various sensors, it is significant to select a correct sensor for the concept of the art work.

3.2. Sensor Technology

A sensor is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. A sensor is a device, which responds to an input quantity by generating a functionally related output usually in the form of an electrical or optical signal. A sensor’s sensitivity indicates how much the sensor's output changes when the measured quantity changes. It widely use for daily lives like smart phones and game devices. Contactless interface user mostly based on visual technology so use one or many number of camera track and recognize the movement of
user. These contactless method based on visual technology is like Figure 5. The flow is follow the steps; initialize, tracks, estimate the pose of user and recognize.

![Figure 5](image_url)

**Figure 5. Contactless Method Process based on Visual Technology**

These sensor technologies are takes a great role not just in a game and an art field but also in medical, retail and commercial field. Recently many artists use Microsoft Kinect device because it contain 2 cameras and infrared light sensor so it can detect fast and accurately in game and Digital Art field.

### 4. Conclusion

In this paper, we analyzed about Interactive Digital Art works and art works production technology and its sensor induces to the audience’s participation. Through the Interactive Digital Art analysis based on sensor technology is able to check the feature and the production technique. Interactive Digital Art is not a completed art; it is kept changes and differentiated according to the media development. The development of technology cannot changes the essence of art but the means and method will continuously changes and develop for its expression. For the future study, based on contents and features of this paper, we will create our own Interactive Digital Art works and analyze how it effect on users different to Media art without sensor technology.

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### References

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