

**THE EXPERIMENT ON TECHNIQUES USED IN
INTERACTIVE ART**

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**Bachelor of Applied Arts with Honours
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This project is submitted in partial fulfilment of
the requirements for the degree of Bachelor of Applied Arts with Honours
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Faculty of Applied and Creative Arts
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2015

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PENGAKUAN

Project bertajuk '*The Experiment On Techniques Used In Interactive Art*' telah disediakan oleh **Lau Leh Na** dan telah diserahkan kepada Fakulti Seni Gunaan dan Kreatif sebagai memenuhi syarat untuk Ijazah Sarjana Muda Seni Gunaan dengan Kepujian (**Seni Halus**).

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PENGESAHAN

Adalah ini diakui bahawa saya, **Lau Leh Na**, disertai penulisan yang bertajuk '*The Experiment On Techniques Used In Interactive Art*' sebagai sebahagian daripada keperluan untuk Ijazah Sarjana Muda Seni Gunaan Dan Kreatif dalam Program **Seni Halus** diterima.

Disahkan oleh:

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ABSTRACT

This research would discuss the experiment on the *techniques* that are used in interactive art. Interactive art involves the audience as a factor that influence the changes of the artwork. The artwork titled 'Self-Confidence' is the result of studies which discuss the techniques used in the interactive art and implies it in the artwork. The visual image encourages the involved audiences to build up their self-confidence by facing themselves. The inspiration comes from experiece of the researcher, who used to be weak in self-confidence but now getting stronger. Experiment on the techniques of frame differencing, background subtraction, and brightness thresholding that can detect the presence of an audience. To conclude the analysis, the researcher compared research of the techniques that is most suitable to apply in the interactive artwork.

ABSTRAK

Kajian ini membicarakan tentang eksperimen pada teknik-teknik yang digunakan dalam seni interaktif. Seni interaktif merupakan karya yang memerlukan penglibatan audien secara langsung di mana mereka merupakan faktor perubahan kepada kesan interaktif tersebut. Karya bertajuk 'Keyakinan Diri' merupakan hasil kajian yang membicarakan eksperimen pada teknik-teknik yang digunakan dalam seni interaktif dan mengimplikasinya dalam karya. Imej visual, yakni bayang audien yang muncul dalam karya ini adalah bertujuan menggalakkan mereka membangunkan keyakinan diri mereka melalui menghadapi mereka sendiri. Inspirasi idea ini diperoleh daripada pengalaman penyelidik, di mana dahulu penyelidik merupakan seorang yang kurang keyakinan diri dan kini, keyakinan diri menjadi semakin meningkat. Teknik-teknik yang akan dieksperimen merangkumi pembezaan bingkai, pengurangan latarbelakang, dan ambang keterangan. Untuk menyimpulkan analisis, penyelidik membandingkan teknik-teknik yang paling sesuai untuk diimplikasikan dalam karya seni interaktif.

1.0 Introduction

Interactive art defined as a type of installation that allows the audience or spectator to interact with the piece in a way that achieves its desired purpose. Burham (1968), explained that interactive component of the installation is designed to be meaningful because the viewers have to cooperate with each other in order to experience the entire work. Their cooperation with the nature imagery, as detected by the interactive system, is the content of the artwork. There are several techniques that are use in interactive art, which including frame differencing, background subtraction, and brightness thresholding.

There are various techniques can be used to develop interactive arts, for instances motion detection, presence detection and so on. According to Levin (2006), the elementary techniques to achieve this are brightness thresholding, which detect the brightness between the people foreground with the environment of their background; frame differencing, which detect the visitors' movements to locate the characteristics; background subtraction, which based on the different of the visitors' background scene to locates their pixels; simple object tracking, which is in every new frame of video to locate the every single pixel of brightest.

According to Dinkla (1994), interactive art allows the audience to interpose the action which is built on participation art forms of traditions way. Interaction is not an art that against the conventional of art. However, it can fulfill the media educated public's need. Interactive art implication is so much reflects the position of computer technology (Huhtamo, 1993). In 1969, an American, Myron Krueger, had developed the interactive art in computer-controlled. He began to visualize spaces while the effect starts out by the action of a visitor.

As a conclusion, technique to create the interaction between the artwork and the audience, the sensitivity of the motion detector becomes a constraint. This is due to the fact that the sensitivity of the motion detector can influence the quality of the interactivity that can be offered to the audience.

1.1 Problem Statement

This caused the participants to be annoyed with the artwork. Therefore, the sensitivity of the motion detector is the key factor that affects the interaction of the artwork between the participants. When the detector is too sensitive towards the motion, it will be too reactive even to the slight movement such as someone walked past the area where the artwork is located. Meanwhile, if the detector is less sensitive, then it will take a longer time to respond to the participant's motion. According to Cornelissen *et al.* (1995), from the argument presented by Bradley and Bryant, it provides support for the idea that poor motion detection could be causally related to poor reading.

1.2 Objectives

- i. To identify the elementary techniques that are used in the interactive art.
- ii. To analyze the techniques that can be used to detect the involvement of audiences as a main factor to change the artwork.
- iii. To apply the most suitable technique in the artwork.

1.3 Research Questions

- i. What are the elementary techniques that are used in the interactive art.
- ii. How to analysis the techniques that can be used to detect the involvement of audiences as a main factor to change the artwork.
- iii. How to apply the most suitable technique in the artwork.

1.4 Importance of Research

- i. This research discusses the most suitable technique used in the interactive art. Other than that, it also brings the multifarious ways that allow the researcher to have more interaction with the digital media and computers in order to clarify artwork.
- ii. This will change the perception of the visitors who think that the art museum is “nothing to do”, especially for children. While the interactive art can break this traditional concept and audience will be part of the artwork.
- iii. This research is to introduce interactive artwork so that the audiences can be more interactive in the artwork and engage with the artwork in order to produce different visual and feelings while the audiences interact with the artwork through their own experience.

2.0 Literature Review

This research will focus on the definition, categories, and techniques apply in interactive art. The information sources that have been used by the researcher which aim to investigate the full range of relevant materials is from different types of books, journals, websites, and reference artworks.

2.1 Interactive Art

According to Saltz (1997), the meaning of computer artwork to be interactive is an input device or sensing that interpret the behavior of a person into the form of digital that the computer is able to understand. The data of computer output are linked to the input systematically, which mean the input is affecting the output and the data of output interpret back to the real-world phenomena where the people can be perceived.

Interactive art is a form of art that breaks the 'no touching' policy in traditional artwork such as conventional painting. Audiences cantouch the artwork freely and enjoy interacting with the art. In other words, it canbe simply defined as a type of installation that allows the audience or spectator to interact with the piece in a way that achieves its desired purpose.

Paul Garrin's interactive installation artwork entitled "Yuppie Ghetto with Watchdog" (1989-1993), consists of a video projection of an upscale champagne reception surrounded by real barbed wire, in front of which is a video monitor. As the viewer approaches the installation, a German Shepherd appears on the monitor and barks violently at the viewer. The dog aggressively follows the viewer's movements with its eyes and head. The system tracks the viewer's

position by means of a security camera mounted inconspicuously over the viewer. Though the artist's programming determines the behavior of this piece, the piece itself exists not only as a "concept," but also as a sculpture installation with both three-dimensional and two-dimensional elements. It relies on the tangible qualities of its image and sounds to create it is a highly visceral impact (Saltz, 1997).

2.2 Categories of Interaction in Art

According to Linda (2002), by changing the particular context of interactive digital technology and art, imagine that some situations that characterize the relationship between the artwork, artist, viewer, and environment. The major categories suggested by Cornock and Edmonds (1970), namely static, dynamic passive, dynamic interactive and dynamic interactive are applicable to current examples of interactive artworks.

i. Static

Static means the artwork is unchanged and is viewed by a person.

Audiences' physical participation is not required in static interactive. There is no observable interaction between the artwork and the viewer, although the viewer may experience personal psychological or emotional changes (Candy & Edmonds, 2013). This implies that the artwork is just for view desire only. There are no contact or responses with the audience. It depends on audience personal feelings or interpretations, whether they want have the respond towards the artwork or not.

There is variety static types of art presented in Jack Ox's artwork entitled, the 21st Century Color Organ (2002). She produced works that are closely associated with music and images. The main goal is to create an intimate correspondence between visual and musical languages. She depicts what she has done as a type of 'translation' of music into sets of visual languages. Once a work that comprise a transformation from music to a virtual world has been produced, the viewer can move through the space according to their will and touch elements of the sculpture and they can hear the sound which originally produced it. However, the involved of the viewer does not change the object of the artwork (Linda, 2002).

ii. Dynamic Passive

The artwork with an interior mechanism that enables to influence the artwork by an environmental component, for example, light, sound, and temperature. The interior mechanism is defined by the artist and the artist can predict any changes that might take place. According to the sculptures of Rickey (1979), any kinetic art objects that move according to interior mechanisms and also in response to the changes in the environmental components count as dynamic passive. Such artwork can be interactive by its own without audience participation. The audience is just an inactive observer in viewing the activity performed by the artwork in response to surrounding environment.

An example of the dynamic passive artwork is Esther Rolinson's work. This artwork can be influenced by environment, but not by involving the audiences. She applied natural components and architectural constructions to

produce installations in the physical world. In this artwork, it reacts with the environmental factor and the movement is according to its internal mechanism (Linda, 2002).

iii. Dynamic Interactive

Dynamic interactive is not only interacted by the environment component, but also the audience participation, which mean the audience can influence the changing of the art object in an active role. This is because this category of artwork need the audience to participate with the artwork so that the artwork can give responds to the audience interaction. For example, the viewers walk and pass by a cushion that contains sound and motion sensors to attach the operating of light in changeable sequences, they become a participant to influence the work's process. The techniques of capturing the sound and motion of the audience can be used to present the sounds and visual images in the artwork.

In interactive art, the artwork can be present differently according to the audience does or says. There can be more than one audience who participate and more than one art object. According to Sidney (1997), the artwork, 'Iamascope', is one of the examples in this category. In this artwork, there is a camera which is used to capture the viewers and connect it to a computer. When the movement of the viewer is capturing by the camera, the artwork will have reaction in changing a kaleidoscope, which is by display images and play music at the same time as a respond to the movement of the viewer.

According to Quantrill (2002), the artwork, 'The Sensor Grid' by Mike Quantrill, is also an artwork which belongs to the dynamic interactive category. When there is a movement made by the audience in front of the image that projected, the visual of the artwork will give reaction according to the movement.

iv. Dynamic-Interactive (Varying)

The influence of environmental component and audience participation, dynamic interactive varying is more advanced with the addition of a modifying agent which could be a human or a software that changes the original specification of the art object. Somehow we cannot predict the movement or changes. From time to time, the artist updates the artwork or the agent that they learned from their experiences during interaction with the artwork. Through this, they can modify the specification in interactive art.

According to Edmonds (2007), the 'learning interactive video construct' is an art system that evolves in response to the interpretation of participant interaction with the work by an agent. From the beginning, Edmonds created computer programme such as the video constructs, abstract computer animations that provide the underlying structure to generate the work. The effect is to produce a sequence of images. The shapes and the colors of the image will change from time to time. The changes are not random, and some order can be sensed although the actual rules that generate the sequence are not normally fully clear to the viewer.

Edmond then developed the time-based video constructs into interactive video constructs. According to Fels (1998), the artwork can be constructed so that it can react to events detected by sensor systems which done in the artwork, 'Iamascope'. A real-time image analysis system is incorporated into the generative program. The performance of the artwork is reflecting what the participants are doing.

2.3 Technique used in interactive art

Many low-level computer vision algorithms are geared to the task of distinguishing which pixels if any, belong to people or other objects of interest in the scene. The elementary techniques for accomplishing the mention above are frame differencing that attempts to locate features by detecting their movements; background subtraction that locates visitor pixels according to their difference from a known background scene; and brightness thresholding that uses hoped for differences in luminosity between foreground people and their background environment. These algorithms, described above, are extremely simple to implement and help to constitute a base of detection schemes from which sophisticated interactive systems may be built (Levin, 2006).

i. Motion Detection

According to Schrater (2000), the movements of people or other objects within the video frame can be detected and quantified using a straightforward method known as frame differencing. In this technique, each pixel in a video frame is compared with corresponding pixel in the subsequent video frame.

The purpose of this comparison is to identify the differences in color or brightness between these two pixels. The comparison is made through the movement in that particular location. A number of differences can be summed across all of the pixels' locations, in order to provide a single measurement of the aggregate movement within the video frame. For some motion detection implementations are different in measuring the difference of the video frames. In this case, the video frame is subdivided into a grid of cells, and the values derived from frame differencing are reported for each of the individual cells. For accuracy, the frame differencing algorithm depends on relatively stable environmental lighting, and on having a stationary camera.

ii. Presence Detection

According to Teixeira (2010), a technique called *background subtraction*, detects the presence of human or any objects in a scene, provided that the human or object did not appear before. In other words, there will be a movement when the image captured currently is different with the first image or background that have been captured and stored. On the contrary, if the image captured has no difference with the previous one, there will be no movement. For every pixel in the frame captured, the absolute difference is computed between its color and that of its corresponding pixel in the stored background image. The areas that have a big difference from the background are caused by the appearance of an object, the object could be a human. Background subtraction works well in heterogeneous environments, but it is very sensitive to change in lighting conditions and depends on objects of interest having sufficient contrast against the background scene.

iii. Detection Through Brightness Thresholding

According to Martin (2004), with the aid of controlled illumination and surface treatments is possible to ensure that objects of interest are considerably darker or lighter than their surroundings. In such cases, the objects targeted can be distinguished based on their brightness alone. In order to accomplish this, the brightness on the object is compared according to the threshold value that fixed.

2.4 Reference Artwork

i. Digital Block

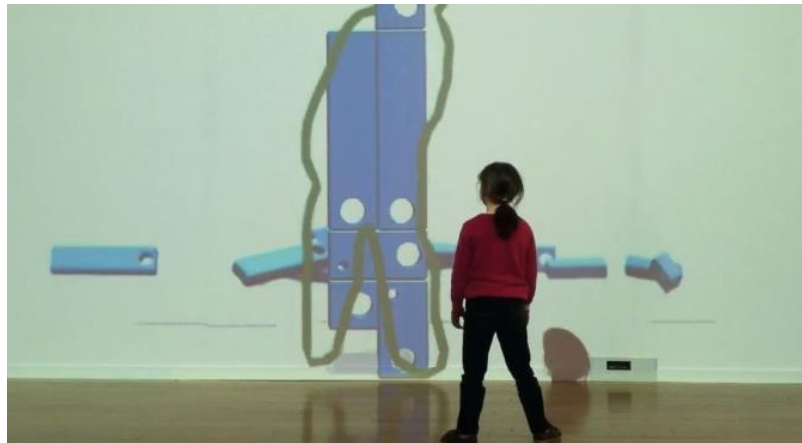


Figure 1
'Digital Block' by LAB

This is an original interactive installation of the virtual block, which is digital blocks, play that has been created by the LAB at Rockwell Group for the National Building Museum. This artwork is purposely created for children. In this artwork, when the children come in front, the digital block will shapes according to the shape of the children. It also shapes the digital blocks according to the distance between the children and the digital block. When

the children move their body, the digital blocks that had form will fall down and disappear (Marom, 2013).

ii. Artificial Reality



Figure 2
Artificial Reality by Myron Krueger

According to Brooklyn (n. d.), Myron Krueger, who developed early interactive work (*Figure 2*). He developed the prototypes for what would eventually be called virtual reality. In this artwork, the audience could interact directly with the video projections of others interacted with a shared environment.

iii. Adaptive Architecture



Figure 3

‘Adaptive Architecture’ by Kaygorodtsev and Andrii Mogylnyi

‘Adaptive Architecture’ by Kaygorodtsev and Andrii Mogylnyi (2012) in *Figure 3*, explored the stone floor, projected forms leap away and encircle the audience like a school of fish disrupted by a shark. When the audience stands on the interactive floor, the geometry line will spread out to the surrounding of the audience.

iv. Video Installation



Figure 4

‘Hallucination’ by Jim Campbell