

# The Application of Physical Interactive Game Technology for Media Performance - Focused on the Kinect Sensor-

Hyun Yi Jung<sup>1</sup>, Sungdae Hong<sup>2</sup> and Unzi Kim<sup>3</sup>

*1, First Author* Graduate School of Advanced Imaging Science Multimedia & Film, Chung Ang University

*2, Co-Author* Dept. of Film and Digital Media, Seokyeong University

*3, Corresponding Author* Graduate School of Advanced Imaging Science, Multimedia & Film, Chung Ang University

[hyunning1202@gmail.com](mailto:hyunning1202@gmail.com), [sungdaehong@gmail.com](mailto:sungdaehong@gmail.com), [unzi@cau.ac.kr](mailto:unzi@cau.ac.kr)

**Abstract.** Recently, as digital technology develops, interactive media performance is giving greater absorption to the game and visual experience to the audiences using Kinect sensor used in physical interactive game. This research will study the similarities of body interface appearing in the physical game and interactive media performance works from the interactive perspective and suggest possibilities of applying physical video game technology in the creation of interactive media performance contents.

**Keywords:** Physical Interactive Game, Kinect, Media Performance, Physical Interface

## 1 Introduction

Continuous developments of computer interface and human interaction method gave innovative paradigm changes in various fields, and per applied areas, it developed by exchanging and applying technologies through combined researches. Especially the field of games is a field where interface technology development, from joy stick game to movement based indirect interface technology, is commercially utilized well. As technologies and hardware with the application of movement recognition based interaction is developed, in the field of performing arts where the piece is completed by the performer, new form of performance, where interactivity is emphasized and new performance form is created from applying the form or technology of the game in different ways. Especially after 2010, as Kinect from Microsoft based on movement recognition got commercialized in the game market, the performing art field made interaction of stage space following the movements of the performers using a Kinect with portability and convenience. Expression effect done without separate controller by tracking the movement of human and interacting with a video applied physical gaming factor to the performing art to give absorption and fun similar to the game experience environment and help artistic expression. In the

gaming field, to support convenient and intuitive interaction between the game contents and the users, research on user interface based on movement recognition using the user's movement is being actively conducted. Research like this will play a positive role in creating dance performing art which exists with physical body as a basic surface medium and research on the linkage possibility of these two fields will be essential.

## 2 Use of Kinect Sensor

Kinect of Microsoft is a machine installed with camera module and infrared sensor, so it recognizes the body frame and movement of the user using motion capture, and recognizes voice with mic module. It brought new sensation by suggesting a new method of experiencing entertainment and games using the user's body without controller. After that, Kinect for Windows was opened to the public, and as various software developments using Kinect became possible for everyone, different fields of industries outside gaming industry started using it [1][2]. Microsoft Kinect for Windows includes RGB camera that captures three basic color components and thus enables its human recognition ability. A depth sensor, an infrared projector combined with monochrome CMOS sensor enables three-dimensional space recording in any light conditions. It also contains a multi-directional microphone that is able to identify voices according to sounds and to distinguish noise from the surroundings. Furthermore, the Kinect device includes a 3 axis motor that can tilt Kinect accordingly [3].



Fig. 1. Microsoft Kinect

### 2.1 Kinect in Games

Among the physical interactive game hardware, the Kinect which is the most famous is the most famous indirect movement recognition technology that materialized the interaction with virtual space through person's movement and is used a lot in gaming contents where games and entertainment is combined like exercising games and

educational games for kids. Anyone can easily and quickly enjoy the game using their body if they have the minimum space for the camera built in Kinect to recognize the body without any other particular equipment.



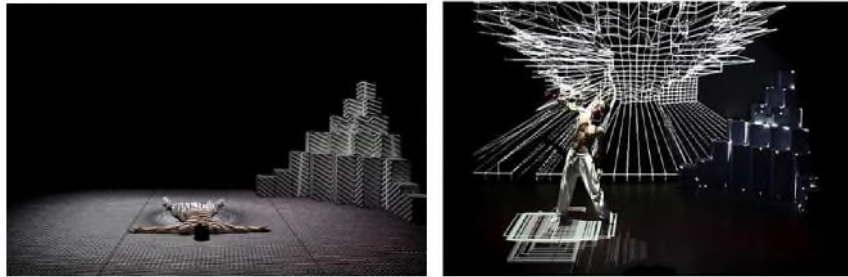
**Fig. 2.** Games that utilized Kinect

Chanjira notes that in interactive games, motion can be captured and used to drive game characters to give the game player a new experience of participation, such as the Kinect for Xbox 360. motion capture is very useful in physical training as it makes the traditional training based only on experience enter into the digital era. The Microsoft Kinect brought these capabilities to a new level, eliminating the need of a hand-held controller and allowing a precise position detection of the user in 3D space [4].

## 2.2 Kinect in Media Performances

If you Motion capture technology that inputs by sensing the movements of a person is also a technology that was used for dance performances back in 1990's where it was used for expressing the movements visually with sensors attached to the "body" of a performer. This technology, as the most used technology in interactive performances, recognizes the sensor which is attached to the performer or the artist, and a marker or analyzes the screen input to the camera to capture particular movements. A movement of the body like this is output through the monitor by combining with prepared animation.

Choreographer Bill T. Jones with many developers and Merce Cunningham in Ghostcatching (1999), programmed it separately to show only the movements that react to the sensors and not the bones and muscles when a person moves with a sensor, an equipment that reflects the extracted point, lines, curves, and pillars to the motion capture, by attaching sensors on his body [5].



**Fig. 3.** Interactions Between the Performer and Stage of Midas Space

However, as Kinect got commercialized, the expensive equipment and motion capture equipment that only professionals could use promoted convenience and efficiency that easy and simple artistic expression of pieces became possible in game market and dance performance area. The Midas space of MIDAS projects in fig. 3 makes 3 dimensional space of the stage through a projector in real time by capturing extemporaneous movements of the dancers using Kinect. According to director of the team Derek, “the Kinect was set up at the front of the stage to track the performer using skeleton tracking and then interface with Synapse. This controlled the particle visuals in Quartz Composer during the performance. Elsewhere, the Kinect was used as depth sensor to effects other visuals aspects of the performance [6]. The video of dimensional pattern changes according to the body movements and immediate visual effect being shown brings absorption environment as if one is playing a game and expansion of senses for the audiences as if the movements of a dancer and space is temporarily linked. Through relatively simple installment of hardware such as computer, Kinect, and projector and software program for image work, it creates an environment that can create performance of computer technology base. Interaction of a dancer and space newly reconstruct the physical stage area and creatively express it just with the movements of the dancer; it plays a big role in newly reconstructing the physical stage space and creatively utilizing it. In other words, because virtual space and performer that are impossible in traditional stage set interacts and space can be expressed easily and quickly in real time, utilization of Kinect is being effectively applied in dance works

**Table 1.** The Technical Spaces for Midas Space

Software	Hardware
openFrameworks	4 iMacs (3 for visuals, one for audio)
Syphon	3 Projectors (1 x 8000 Lumen Sanyo, 1 x 3500 Lumen NEC and 1 x 5000 Lumen NEC)
Madmapper	Microsoft Kinect
Quartz Composer	Playstation 3 Eye (modified to an IR camera)
VDMX	RME Fireface 800
Ableton Live	Network Switch
Synapse	Stage Lights
After Effects	
Google Sketup	

The performance of Slipping out of Consciousness by Hyun Yi Jung (fig. 4) also uses the Kinect to change its image and sound to the dancer's movements. When a dancer stand up without movement, it projects picture images which overlap her body giving an effect that expresses her souls going out of her body. When the dancer begins to move her body intensely to get her soul back, the sound turns on and the lighting becomes brighter. Just like fig. 5, simple installation of the Kinect with body action recognition and use of the computer programming can effectively express the consciousness (reality) and sub-consciousness (virtual world). As the existing GUI (Graphic User Interface) is extended to NUI (Natural User Interface), application of the NUI concepts of the Kinect to the performing art becomes available.

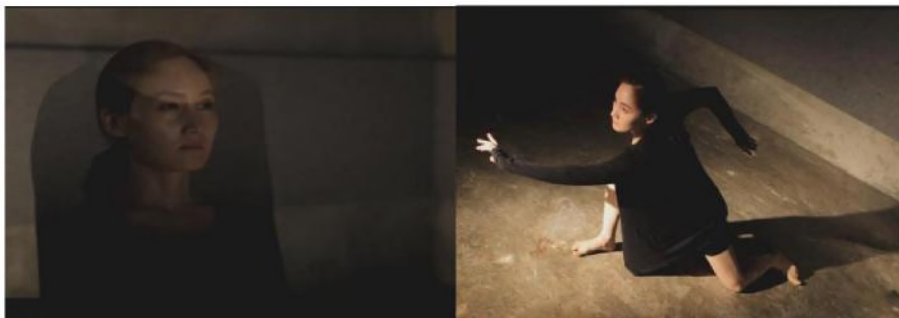


Fig. 4. Slipping out of Consciousness

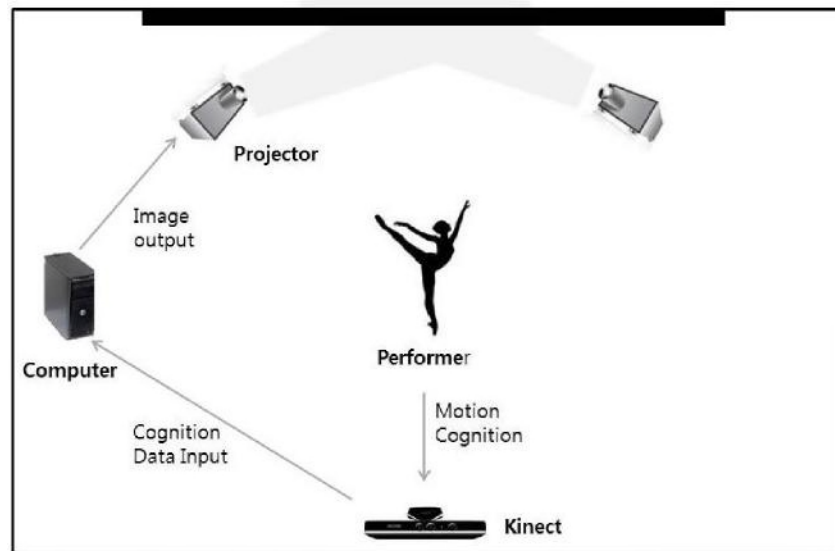


Fig. 5. Technical Setup by Using Kinect Hardware

Sun-Myung Hwang proposed a NUI by voice and motion recognition. Instead of keyboard and mouse, our method provides an easy controlling user interface. The tedious manual works are sure replaced by the method. While keyboard and mouse occupied the space so the flat surface should be installed that is the point. Also, as a large screen that cannot be seen as a whole from the short distance would be inconvenient. But at a relatively long rang distance if motion and voice can be operated, it will have more diverse and improve of the user interface of the existing user-friendly interface [7].

### 3 Body as an Interface

Generally, interface can be defined as a boundary between two different worlds in chemistry and beyond that, as an access point where machine and human users exchange information with each other. As a device that enables communication of two independent entities between computers and users, the boundary of art creation and acceptance process of interactive artistic actions as an interface as a medium will loosen and tend to combine. Work that designed interaction itself to be the kinetic art work can be esthetically experienced while creating new art world where interaction between performers and space is possible [5].

In case of the most famous physical interactive game hardware, Kinect is played by moving one's body. In case of Kinect, Jae-Young Kim, as the most famous controller of movement recognition sensor, plays a role as a performer in physical interactive game and this interface develops strong gaming experience for it acts as a direct medium in actions and movements of a user [8]. Therefore, utilization of Kinect that can express artistic work of experience the game using the body of the user without a controller, is showing the most fundamental aspect of interaction that is possible in the new digital environment while the body being projected on the work or actively leading the game environment.



**Fig. 6.** Seventh Sense by Anarchy Dance Theater



**Fig. 7.** Soccer Game

In Seventh Sense (Fig. 6), a media performance work, many lines arranged in a pattern on the stage space reacts to the location that dancers pass and changes dimensionally in real time and the audiences can feel the joy as if they are experiencing the computer game graphic on the stage [9]. In soccer game of fig. 7, the player exist in the virtual world as virtual body of an avatar and when the players do

an activity of kicking a ball, the Kinect recognizes it and then makes their avatars in the virtual world do the same activity. The players enjoy the game by controlling their own body movement in the virtual world and experience themselves in the virtual world. For the media performance, competition as one of the game elements is not included but the type; engrossment and visual effects of the experiences in the virtual world are similar to those of other games.

In other words, the body manipulates the digital environment as the dancer's movements are reflected as it is in the performance and it can also interact with digitalized stage. Manipulating what happens in the game directly and experiencing the virtual world through expressions of various images of real time image graphics on the stage could mean that strengths of games are included in interactive media performance. Therefore, the similarities of game and interactive performance can be found in their provision of greater absorption and entertainment through the performer's body becoming the interface.

#### **4 Conclusion**

In the field of game that is quickly developing with focus on the physical interactive game industry, user interface field of easy and direct movement recognition base will develop more, and this will result in active commercialization of movement recognition technology, and increase the opportunities to adopt and apply game technology for various expression method using movements even in the dance performance art area where performer's body itself becomes the expressing medium. Utilization of Kinect has its limitation such as the interference of the lighting or distance limit of recognition, and because it is greatly convenience, portability, and efficiency compared to previous motion capture devices, many media performance works that utilized the strengths of Kinect is being made and opportunities to express various ideas will increase by engrafting Kinect and other physical game technologies to the performances.

If interactive media performance works that needs to think of a new expression method by applying movements' expression digital technology in performance art field uses physical interactive gaming technology and engraft it, the combination of two fields with positive effects can play a role in providing future visions of each field.

#### **References**

1. Yoon H.-C., Park J.-S.: Avatar Animation Using Skeleton Tracking With Kinect Sensor. *International Journal of Advancements in Computing Technology (IJACT)*, vol. 5, no. 12, (2013).
2. Meng L., Huang Xinyuan, G.: The Research and Experiment about Interactivity and Immersion of Virtual Reality. *International Journal of Digital Content Technology and its Applications (JDCTA)*, vol. 7, no. 13, (2013).
3. Horejsi P., Gorner T.: Using Kinect Technology Equipment for Ergonomics. *MM Science Journal*, pp. 388- 340, (2013).

4. Sinthanayothin C., Wongwaen N., Bholsithi W.: Skeleton Tracking using Kinect Sensor & Displaying in 3D Virtual Scene. International Journal of Advancements in Computing Technology (IJACT), vol. 4, no. 11, pp. 221, (2012).
5. Jung H. Y.: Characteristics of Interactive Performance Focused on Body Medium. Chung Ang University, (2013).
6. Midas Space by The Midas Project, <http://www.projectionfreak.com/the-midas-project>.
7. Hwang S.-M., Yeom H.-G.: Computer Interface Construction for Recognition of Motion and Voice using KINECT. International Journal of Advancements in Computing Technology (IJACT), vol. 5, no. 12, pp. 235, (2013).
8. J.-Y. Kim, J.-H. Sung, "The Formation of New Game Generation in Game-Extended Space: Focused on the Experience Game", Korea Game Society, vol. 10, no. 5, pp. 1-11, (2010).
9. Seventh Sense by Anarchy Dance Theater, <http://anarchydancetheatre.org>.