Advanced Science and Technology Letters
Vol.46 (Games and Graphics 2014), pp.285-291
http://dx.doi.org/10.14257/astl.2014.46.60

Research on Real-Time Contents for Human Body Experience Edutainment

Sungdae Hong[1] ,Hyun Yi Jung[2] and Unzi Kim[3]

1 Dept. of Film and Digital Media, Seokyeong University
2 Graduate School of Advanced Imaging Science, Multimedia & Film, Chung Ang University
3 Corresponding Author Graduate School of Advanced Imaging Science, Multimedia & Film, Chung Ang University
sungdaehong@gmail.com, hyunning1202@gmail.com, unzi@cau.ac.kr

Abstract. In the past, interface was mostly achieved through visual perception, but due to recent development of digital technology, interface which accommodates the whole human body is appearing. This new interface, by contactless interactive education through recognition of gesture, maximizes learning effect through inducing experiences of audience and is taking place as competitive contents in the market of experience-education contents. This research proposes various interpretations with the standard being the manufacturing educational contents which makes real-time human body experience possible. We developed a gesture interface through applying a Kinect sensor which can recognize the audiences' frame and action. We also calculated the final outcome in terms of educational contents design which suits the gesture interface above by using an authoring tool such as Unity 3D that makes real-time 3D model and animation combination possible. The participating audience can experience and check brain, heart, and more through various gestures, and the manufactured real-time human body experience edutainment design will be able to be applied in various educational institutions.

1 Introduction

Globally, in the field of education, the use of new media technology such as ICT (Information & Communication Technology) and the smart education market are increasing every day. However, in the spot of education, cases which apply the recent ICT are rare and they are just mostly use of simple teaching materials in the form of e-Books. Therefore, as one of the alternatives which fulfill the requests of high-quality education contents, we tried to develop an augmented edutainment contents design which can promote sense of preens and concentration. Especially, there is a need for a manufacturing of augmented edutainment design which maximizes learning effect through factors of experience. Therefore, in this thesis, we develop an augmented real-time interactive human body experience contents which the subject reacts through recognition of the user's actions. In the second chapter, we discuss

ISSN: 2287-1233 ASTL
Copyright © 2014 SERSC

interaction technology regarding virtual reality-based human body learning experience. After that, we research on the study cases of real-time education experience contents and seek the scope of possible application in terms of manufacturing and development of contents. In the third chapter, we give shape to the process of real-time human body edutainment design. Also, we extract realization of frames and image treatment of Kinect sensor interface for real-time recognition of audiences' actions, and materialize a design which applies real-time augmented reality-based 3D contents. Unity 3D is the program used as a way of expressing the final design and lastly, we describe the conclusion and future direction for research for real-time human body experience edutainment design.

2 Education Experience Contents Based on Virtual Reality

Tangible style interaction games such as Xbox 360 and Nintendo Wii, and particular functional games in various fields such as military, management, and medical treatment with educational and entertainment-based functions and virtual reality-based interactive experience contents are leading in the field of digital contents. Recent experience contents based on virtual reality makes the learners directly participate in the virtual reality contents and expands as a learning service which makes the learners experience through mutual interactions.

2.1 Digital Experience Interface Technology

Nintendo, by Japanese company developed the game service Wii which uses game controller Wiimote that embeds a 3D acceleration sensor. (fig. 1) The following technology recognizes the manipulation of the user's controller and provides the interaction function needed for the playing of games, and it shows good performance and recognizes small movements needed for the game environment. However, because of inconvenience on using the equipment and limited service environment, there is a disadvantage of it being unsuitable for educational purposes.

Fig. 1. Nintendo "Wii'

Fig. 2. Microsoft "KINEECT'

 Copyright © 2014 SERSC

Kinect is a motion sensing input device which was released by Microsoft in October 2010 for the game console XBOX 360. An edutainment content for kids which was launched by Microsoft in 2012 has a characteristic of reinforcing voice recognition on Kinect technology which recognizes the user's movements by using a 3D camera (fig. 2). However, it has low accuracy on practicing interaction to use it in the field of education or media, and there is a disadvantage of users having to specially learn to control.

2.2 Cases of Digital Experience Contents

D'strict Company (fig. 3) developed a content which freely controls advertisement menu with infrared light-based electrical gloves. Augmented reality-based advertisement solution which was developed by this company is a technology which people can find advertising films by moving them here and there through gesturing using hands wearing electrical gloves which have infrared light equipment and a marker installed to them.

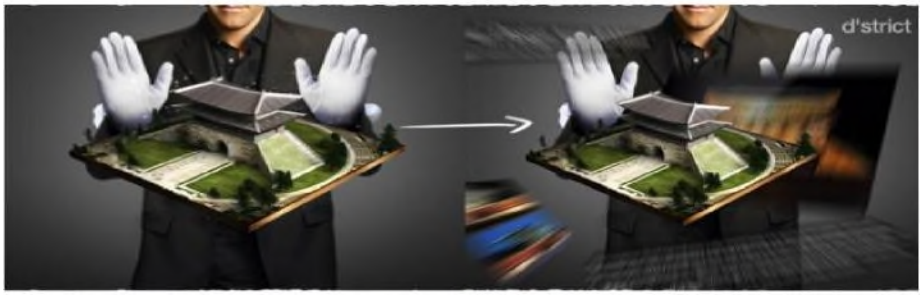


Fig. 3. D'strict 'Hyper Presentation'

GestureTek Company (fig. 4) also developed a full body 3D avatar control technology through extracting users. This technology practices virtual reality navigation by extracting skeleton from the user's videos. However, there is an advantage of not being able to provide an augmented reality experience which mixes a bit of the user's videos and a bit of virtual-reality videos

Fig. 4. GestureTek '3D Avatar

Fig. 5. D'strct '4D technology showcase'

The D'strict Company (fig. 5) presented a system which earns transformation of views in an imaginary space through recognizing the user's posture and gesture by utilizing a Kinect sensor. Specifically, it recognizes movements such as standstill and reaching out of hands and supports space movements and rotations based on these recognitions.

3 Real-Time Human body Experience Edutainment Design

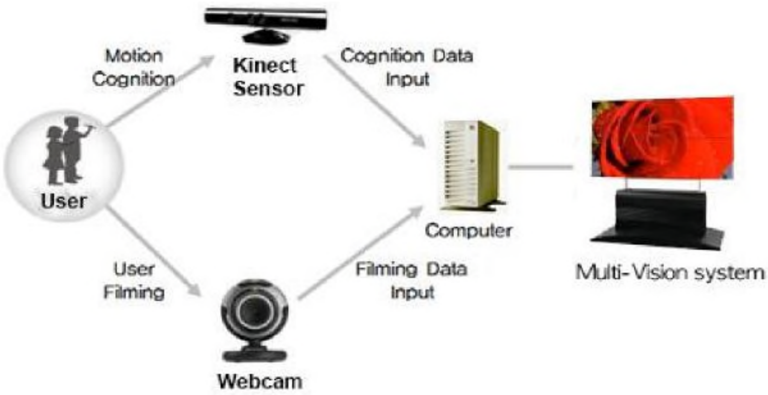
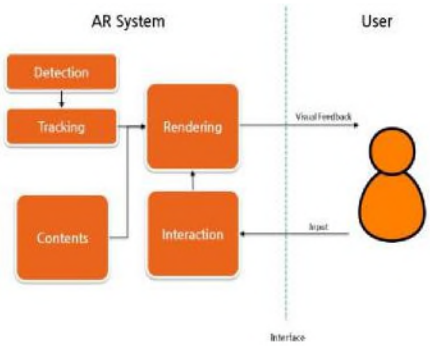


Fig. 6. Real-time human body experience hardware system

The Kinect, which is used as a main device for materialization of this thesis's system, has a ‟3D Depth Sensors' attached to it so it recognizes data with depth of 1.2m to 3.5m. If the participating audience enters the camera range, it dissolves from a 2D camera to a 3D camera and goes to a region of 3D imaginary space by materialization through Unity 3D.



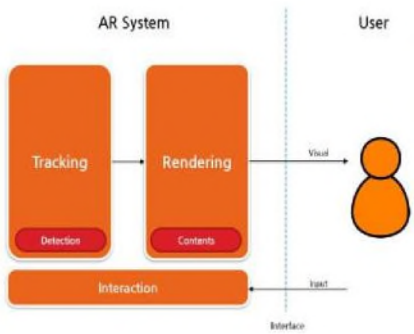


Fig. 7. AR based Workflow **Fig. 8.** AR based Workflow simplify

 Copyright © 2014 SERSC

Motion Detection Algorithm (fig. 7) and Tracking technology (fig. 8), which is applied in the augmented-reality bases, was materialized to real-time recognize the audiences‟ movements and also to exactly match the videos expressed on the multi-screen and 3D characters.

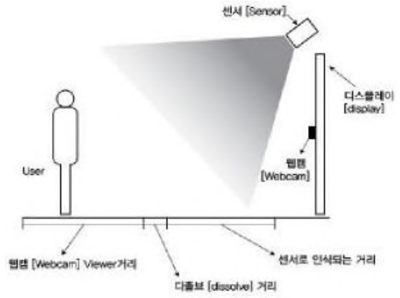


Fig. 9. Blue print of street sensor system

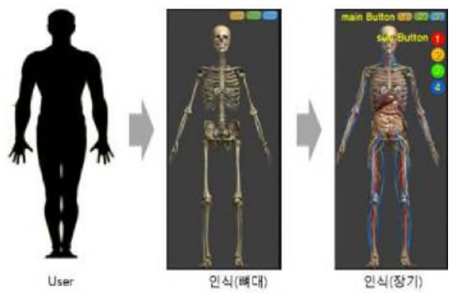


Fig. 10. 3D screen change virtual environment

The participating users are recognized by a 2D camera and are also recognized as frame depending on the distance and they can select the screen they want through gesturing motion. We constructed the screen interface so that the users can see the whole human body divided by the layer [frame and organ], [frame], and [organ] by touching the three icons seen above. In case of [organ], four organ icons (brain), (heart), (lung), and (liver/stomach/intestine) appear on the right. (fig. 11) It was manufactured so that when the users touch each icon, only the selected organ appears and the other organs become translucent. (fig. 12) It is materialized so that the chosen organ is shown bigger and as it rotates, shows each function through text and after 8 to 10 seconds goes back to its place.

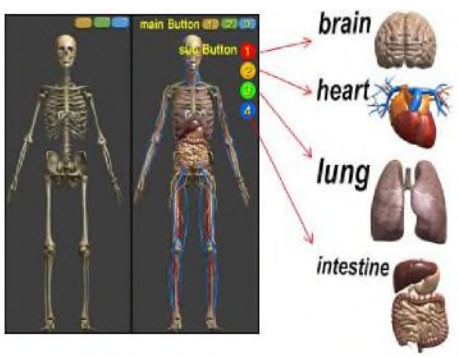


Fig. 11. Organ 3D object

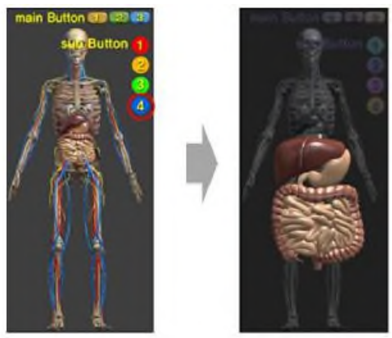


Fig. 12. Human body 3D interactive expression

It was manufactured so that the user which was seen through the webcam is seen dissolved in a 3D state as the user enters the 3D region. The users are recognized by Webcam and are also recognized as a frame depending on the distance. Also, the UI design was considered so that the users can pick the screens they want.

Copyright © 2014 SERSC

Fig. 13. Real-time human body experience edutainment contents design

We expressed the developed real-time interactive human body experience contents on a drawing, and materialized an interactive space possible of real-time interaction through expanding the 3D engine. Concretely, it carries an actual 2D camera and a depth sensor (Z-cam) and it recognizes the depth map achieved by the Z-cam and user‟s motions through skeleton frame. Furthermore, to add reality effect to the participating audiences, it constructs a multi-display network system.

4 Conclusion

This research is a content of proposing new directions which can link to contactless interactive educational learning. Events of experiencing the human body through responding to various real-time motion gestures of audiences were applied, and it was manufactured as a system of human body being a one whole interface. By reproducing the roles and states of actual organs in the form of active simulation, we tried to maximize the experience learning effect. This user-based interactive education contents will propose ways of participation in edutainment design and new ways to educational learning. This will not be just a simple interaction, but play a role of expanding the field of education. In future researches, we are planning to materialize system which can seek learning effect through major participation and not just individual participation, and develop and research these contents.

References

1. 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), Volume7, Number13 (2013).
2. Jung H. Y.: Characteristics of Interactive Performance Focused on Body Medium, Chung Ang University (2013).
3. Lee J. S., Noh J. A., Lim S. H., Lee J. S.: [ETRI],Electronics and Telecommunications Trends, 2012.

Copyright © 2014 SERSC

4. Andersen M. R., Jensen T., Lisouski P., Mortensen A. K., Hansen M. K., Gregersen T., Ahrendt P.: Kinect Depth Sensor Evaluation for Computer Vision Applications. Electrical and Computer Engineering Technical Report ECE-TR-6, (2012).
5. Plagemann C., Ganapathi V., Koller D., Thrun S.: Real-time identification and localization of body parts from depth images. In Proc. ICRA, (2010).

Copyright © 2014 SERSC