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Investigative Analysis of Virtual Reality Technology through Case Study

Jung Yoon Kim[1]

Abstract

Virtual reality is a technology field that provides a new paradigm that may be used for interaction and communication between human and computer. Virtual reality technology has been researched for a long time but it has faced with difficulty in its commercialization due to high cost and usability. However, recently, as diversified equipment and products have emerged and the cost becomes cheaper, it has gradually popularized. In this study, characteristics of technology will be explored through case study of this virtual reality technology.

Keyword : Virtual Reality (VR), Immersive HMD, Real-Time, Simulation

1. Introduction

Virtual reality is to build an interface that enables interaction between 2D or 3D virtual space generated by computer and its users. Users could be immersed while interacting with virtual environment in realtime by using 5 senses (visual, auditory, tactile, gustative, olfactory senses) and it could make users improve and enhance understanding and cognitive power for the real world. This virtual reality technology is used in diversified fields including medical service, national defense, education and game, and recently, it has been practically commercialized in some required field[1].

Augmented reality was derived from virtual reality and it synthesizes virtual information space generated by computer in a real system as real space, being actually watched and felt by users. Users recognize not only actual environment in which users are positioned, but also information expressed on its real image. This process requires registration stage of real image and virtual image that are not required in virtual reality, and one of major research goal is to enhance exact coincidence of two spaces[2].

Recently, in several manufacturers, diversified products have been commercialized at a relatively

1 Dept. of Computer Game, Chungkang College of Cultural Industries.
e-mail: kjyoon79@gmail.com

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cheaper price by using technology of virtual reality and augmented technology and deviating from large and heavy system in the past, system and products with convenient portability such as handled augmented reality, wearable augmented reality and HMD (Head mounted display) have been developed. Therefore, it is expected that in the near future, virtual reality together with smart terminal would be developed and in this study, current trend of virtual reality technology is intended to be observed through case study.

2. Development of Virtual Reality Technology

2.1 Concept of Virtual Reality

Virtual reality means a certain specific environment, situation or technology itself being made based on artificial technology that is similar to reality but not a reality. Virtual reality characterized by 3D spatiality, real time interaction, immersion provides users with information that does not exist in reality through display and rendering equipment.

Concept of virtual reality and terminal utilizing relevant technology have already been emerged since 1960s[3] and attracted attention, as Ivan Edward Sutherland, a US computer scientist, disclosed HMD (Head mounted display) terminal mounted with display in a form of helmet in 1968.

[Fig.1] First HMD Device

Afterwards in 1982, a term of virtual reality has been extensively popularized by Jaron Lanier who

announced computer interface combined with glasses and gloves.

2.2 Development Background of Virtual Reality

Virtual reality devices in the past had its limitation in providing users with 3D effect or immersion due to inconveniently heavy weight, slow reaction speed, low resolution and expensive price. However, recently, owing to graphic engine technology, technical foundation including HD display and 3D sound upon which various input/output systems are able to maximize user's immersion has been secured. In addition, owing to emergence of microprocessor of which processing speed is improved and miniaturization of massive storage system, high portability could be implemented, and a research on enhancing user's immersion by applying these technologies to game has been progressed actively[4].

And as market launch of commercial HMD terminal by large enterprises has been visualized, concern is focused on virtual reality display. In particular, Oculus VR attracted investment of US$2.4 million through cloud funding service Kickstarter in 2012 and launched Oculus Rift in the market at US$300 per piece. Oculus Rift was selected as the best terminal in CES 2013. On March, 2014, Mark Zuckerberg of Facebook took over Oculus VR at US$2 Billion asserting that it has a potential of being applied to diversified fields including game, medical service and education[5].

According to an announcement of KZERO, a market surveyor, current worldwide sales volume of virtual reality system recorded 200,000 sets and it was expected that in 2018, it would be rapidly increase up to 23.8 million sets[6]. Along with this trend, it is expected that market scale of hardware relevant to virtual reality also would reach around US$2.3 billion and that of virtual reality software would be expanded from current US$30 million to US$2.8 billion in 2018.

3. Trend of Virtual Reality Technology

3.1 HMD Technology

HMD(Head Mounted Display) means a type of monitor being used by mounting it on the head or wearing like glasses, and it is also called as FMD (Face mounted display). Recently, HMD has been gradually miniaturized in a form of glasses from helmet form at its early stage and its price gets

cheaper.

In 2012, HMD products first widely appealed to the general public and on April, same year, 'Project Glass' [Fig. 1] of Google, was disclosed to the general public, and in August, as Palmer Luckey disclosed Oculus Rift [Fig. 2], a new styled HMD that played a role of motivating game users to show concern over HMD.

[Fig.2] Project glass

[Fig.3] Oculus Rift

In 2014, design side of 'Google Glass' was strengthened as it was converged with glasses and 'Card board' [Fig. 3] that is used in combination with Android smart phone was introduced as well. Sony started to sell HMZ-T3 that is the latest version of HMZ series for home theater and separately introduced Morpheus that is HMD for VR supporting PS4 in GDC2014.

[Fig. 4] Google Cardboard

[Fig. 5] HMZ-T3

[Fig. 6] Sony Morpheus

In case of Oculus Rift that receives the strongest concern from the general public, as DK2

(Development Kit2) was introduced this year, low resolution, reaction speed and after-image problem were solved and by adding head tracking technology, a quality differentiated from DK1 was successfully made.

3.2 Wearable Device Technology Trend

A new wearable device that could be utilized not only in general real world such as Prio, VR and MYO but also in virtual world is emerged in cloud funding one after another by referring successful case of Oculus Rift. Furthermore, interface for VR such as 'Virtuix Omni' [Fig. 6] has completed its development.

[Fig. 7] Virtuix Omni'

MYO is a gesture-based wearable device that recognizes muscular movement and hand motion through sensor. By using 3D accelerated sensor, muscular signal of finger shape and gesture is recognized as signal of diversified forms.

[Fig. 8] MYO

Prio VR is a VR controller that captures motion in real time by attaching sensor to each part of the body and manipulates game characters. Generally, when it comes to controller-recognizing body movement, it is easy to recall a type being recognized by a camera like Kinect. However, as this mode presumes human posture through complicated operation, a problem of wrong recognition by surrounding objects may take place. On the other hand, as Prio VR directly attaches sensor, there is no need to stand in front of a camera without reacting to it surrounding objects. In addition, it shows high accuracy of being able to read even in delicate body movements.

[Fig. 9] Prio VR

[Fig. 10] Oculus Rift + Virtuix Omni + Gun-type Controller

Generally, development direction of wearable devices is designed or manufactured for providing the best experience under the condition of wearing HMD in virtual environment and by providing API and SDK, developers were made to manufacture contents like games. In addition, as most of the devices are designed to enable both input and output, such devices could be used by assembling these devices into

each other as shown on [Fig. 9].

4. Conclusion

The times of having work or enjoying contents by using keyboard, mouse and joystick, sitting in front of a plain monitor, has persisted for more than 30 years. Compared with other rapid development of other IT equipment, progress and development on this field was the slowest. However, a dramatic change has taken place in such environment.

In this study, trend of virtual reality technology was observed through a case study. It is expected that in the future, relevant technology of personal virtual reality system using HMD and wearable device would be utilized and developed in diversified fields including movie, game, medical service, education and military applications.

In the future study, production of tangible contents on utilizing virtual reality technology and its devices and usability assessment of produced system will be performed.

References

[1] http://www.gartner.com/newsroom/id/2575515, Retrieved: **(2013)** August 19.

[2] B. T. Chang, J. W. Kim and D. H. Kim, "Augmented Reality Technology", Information Science Journal, vol. 15, no. 11, **(1997)**.

[3] SBCB, "Basic Understanding of Virtual Reality Fundamentals", **(2005)**.

[4] J. Y. Kim and S. Nam, "A Study of Immersive Game Contents System Design and Modeling for Virtual Reality Technology", International Journal of Control & Automation, vol. 7, no. 10, **(2014)**, pp. 411-418.

[5] http://www.businessinsider.com/facebook-to-buy-oculus-rift-for-2-billion-2014-3, Retrieved: **(2014)** March 25.

[6] http://www.hypergridbusiness.com/2014/05/report-consumer-virtual-reality-market-worth-5-2-billion-by-2018, Retrieved: **(2014)** May 8.