

A Study on the Technology and the Case of Virtual Reality Image Contents Creation

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Abstract

Next to 3D, a new filming technology emerged: realistic media VR (Virtual Reality). VR is a concept that encompasses both Hologram, Augmented Reality (AR), and Mixed Reality (MR), but when it comes to filming technology, you can stitch 360-degree directions by stitching images taken by multiple cameras. It may also refer to doing. At present, research and service related to VR filming are being conducted continuously by various operators in each area of CPNT(Contents-Platform-Network-Terminal), including manufacturers, platform operators and content producers, and there is a willingness to grow VR as an axis of next generation media in the market. Therefore, this study examines the meaning of VR as the next generation media towing vehicle by looking at the overview of VR filming technology and the examples provided to real users.

Keyword : VR, AR, VR filming, 360-Degree Camera, Contents Creation

1. Introduction

Virtual reality refers to a situation or technology similar to reality created by computer graphics technology using a lens and an electronic device. This is a technology that provides a spatial and temporal experience similar to reality because it stimulates the five senses of the user. In order to realize virtual reality, it is necessary to accurately calculate the virtual space, to interact with the user, and to use computer graphics [1]. Until now, the development of video content production technology has been centered on picture quality from SD (Standard Definition) to HD (High Definition) and FHD (Full High Definition) to UHD (Ultra High Definition). With UHD, it became harder to distinguish from contents produced with higher resolutions with the naked eye. As a result, video content production is shifting its direction not to image quality but to filming.

According to the policies of major countries, the US has invested in mixed reality technology as 'the 10 key strategic future technologies' since the mid-2000s, and the National Research Council (MSRC) MOVES(Modeling, Virtual, Environments, Simulation) program Through R&D(Research and

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Development) for the application of virtual reality technology to each industry sector [2].

China has set up a VR industry roadmap centering on the Ministry of Industrial and Modernization, encouraging companies to actively invest in creating an environment for the development of the virtual reality industry. In Europe, the EU(European Union) 8th Framework Program has been established to promote core technologies of related media related to realistic media as industry, academia and research projects.

Japan is making extensive investments in the virtual and augmented reality industries to make a leap forward as an ICT(Information and Communications Technologies) technology powerhouse, and is implementing the 'Virtual Reality Techno Japan' policy. In response, Korea is promoting the development of original technologies to support the creation of a hyper-realistic convergent contents industry ecosystem in all industries, centering on the Ministry of Science, ICT and Communication.

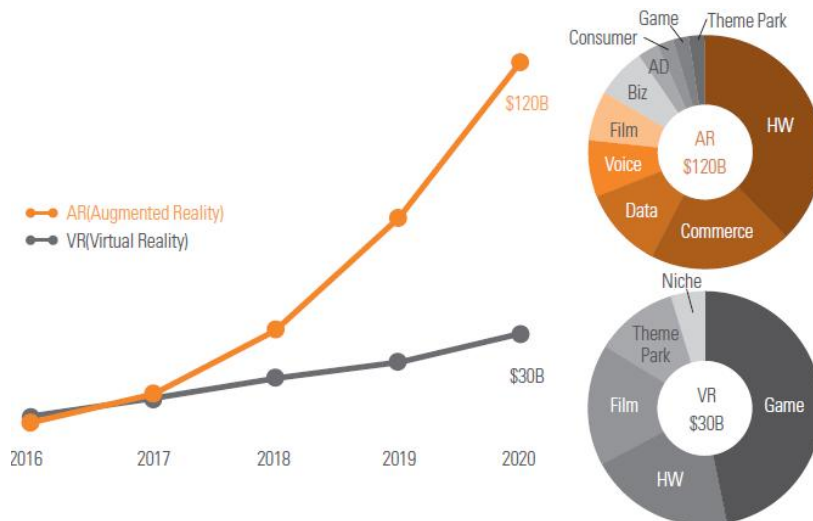
We have released Oculus TV that you can watch through. According to data released in 2017 by market research firm IDC(Internet Data Center), global virtual and augmented reality goods and services revenue grew from \$ 11.4 billion in 2017 to \$ 2,150 in 2021, with a CAGR(Compound annual growth rate) of 113.2%. Is expected. In addition, Digi-capital's 2017 report predicts that the market for virtual augmented reality will grow from \$ 4.4 billion in 2016 to \$ 108 billion in 2021 [3].

In this study, we examines the meaning of VR(as the next generation media towing vehicle by looking at the overview of VR filming technology and the examples provided to real users.

2. Related research

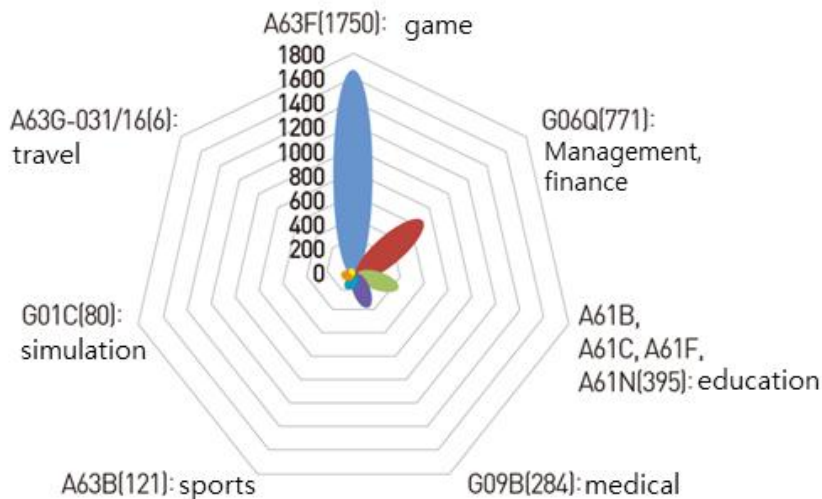
Virtual reality-related industries have emerged as one of the hot spots since social network service company Facebook announced the acquisition of Oculus VR in March 2014. Recently, with the spread of smartphones and the development of high-performance devices, the company has entered the commercialization phase and a mobile environment where many large companies such as Oculus, Facebook, Google, Sony, HTC, Samsung, and LG experience virtual reality using smartphones. To provide. As a result of analyzing patents related to virtual and augmented reality over the past 10 years, it is shown in [Fig. 1] and [Fig. 2] [4][5].

In [Fig. 1], each axis in the radiation direction represents seven fields based on the International Patent Classification (IPC), and the end of each axis represents the number of patents filed in each field. By application field, game, management / finance, medical, education, sports, simulation, travel, etc. take the largest share.



[Fig. 1] Virtual Reality Market Outlook

In addition, [Fig. 2] shows the current status of patent registration by application field. It can be seen that it started with the game until 2008 and is spreading with all industries.



[Fig. 2] Patent Registration Status by Virtual and Augmented Reality Applications

In addition, in the results of the online discussion conducted in 2017, focusing on the virtual and augmented reality fields at the ICT Promotion Center, there were many discussions on the application of the education field due to the nature of domestic demand that is interested in education. Active discussions about keywords related to simulation, healthcare, travel, finance, and games have shown that

public interest is spreading to various fields. The discussions focused on each field are as follows. In the game field, new types of VR games such as FPS games, adventure games, and horror games are developed, and games that respond to user's words and actions by combining figures, cards, and accessories with games, and artificial intelligence Game development has emerged as a major issue [6].

Lastly, develop and commercialize contents for famous tourist attractions such as cities, ruins, mountains, and normal beaches related to travel, maximize the effect of virtual environment such as outer space, deep sea or past / future space, and experience the user. The demands for service development in areas of high demand have become an issue. As such, it is expected that the needs of users in various applications may be widely used.

In the VR market, various products such as theme parks, walking attractions, room escapes, and party rooms have appeared, but no explosive growth has been made. This may be due to the price of expensive devices, insufficient content, limitations of hardware, lack of consumer awareness, etc., because it does not completely solve the inconvenience of use such as dizziness and motion sickness. In particular, the difficulty in inducing consumers to use repeatedly due to high hardware purchase cost and lack of killer content makes the market ecosystem difficult [7].

If a 5G network is established in the future and a high quality low latency wireless multiplayer environment is developed through hardware technology development, a high quality virtual reality content usage environment will be established and the market will be activated [8].

3. VR concept and principles of VR filming

3.1 VR concept






VR refers to an integrated experience that feels like real life, using all human senses. In other words, all technically distinct things such as hologram, VR and AR are virtually VR. The VR may be classified into a virtual environment, augmented reality (AR), augmented virtuality (AV), substitutional reality (SR), and mixed reality (MR) according to the implementation technology in the market.

VE is a technology commonly used in the term VR, and refers to the experience of wearing a virtual reality filmed with a VR camera or a computer graphic (CG) by wearing a head mounted display (HMD). [Table 1] is a table about Technical classification of VR.

AR is the experience of adding virtual information to the real world using a dedicated glass or smartphone, such as Google Glass and Pokemon Go. AV provides an experience in which the actions taken in the real world, such as a screen golf course, affect the virtual space. SR and MR are

technologies that combine the advantages of VE and AR. SR adds a virtual image specific to a real person or object, and wearing an HMD makes the person or object feel as if they exist in the virtual world.

[Table 1] Technical classification of VR

<p>Virtual Environment</p>	<p>☐ Providing a virtual world with city, city, and sensory information - Leverage HMD (Head Mounted Display) and gesture recognition devices ex) Oculus Rift, Samsung Gear VR</p>	
<p>Augmented Reality</p>	<p>☐ Combine virtual information over reality - A technology that overlays virtual objects in the real world that the user sees ex) MS Hololens, Google Glasses</p>	
<p>Augmented Virtuality</p>	<p>☐ Combine reality information on top of virtual - Technology that projects the user's movement on the monitor ex) Nintendo Wii, Golfzon</p>	
<p>Substitutional Reality</p>	<p>☐ Combining VR Immersion with AR Interaction - Enhance Interaction for virtual reality experience by adding virtual image to real people or people ex) Magic Leap</p>	
<p>Mixed Reality</p>	<p>☐ Combine the immersion of VR with the information delivery power of AR - Multiple people experience the same situation at the same time, Place Image in the desired location ex) Magic Leap</p>	

Finally, MR is a technology that allows people to experience virtual reality in the real world without having to wear certain equipment such as HMD.

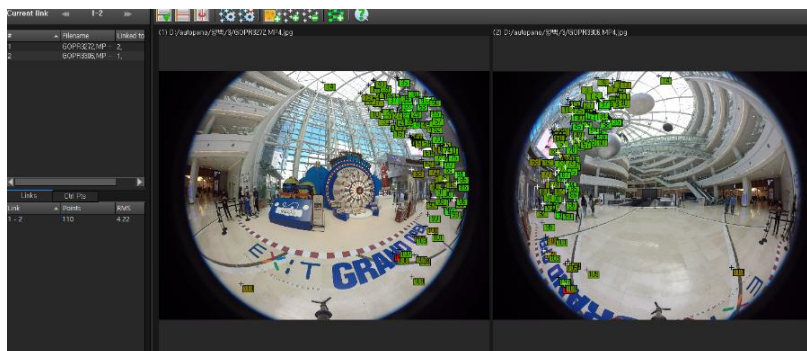
3.2 Principles of VR filming

In general, 2D video undergoes a process of converting an image signal photographed by one camera

into a digital signal and delivering the same to a viewer. VR video filming also goes through the same process in large frames, but the difference is that VR uses five to six cameras because it must contain 360 ° forward-orientation video. In order to shoot VR video, the composition of VR filming equipment must be preceded. VR filming equipment consists of a VR camera and a stitching server.

First of all, VR cameras use finished products made exclusively for VR, but it is common to use existing cameras in combination. Depending on the filming purpose, the camera uses a variety of types, ranging from lightweight such as GoPro to high-end digital single lens reflex (DSLR) cameras. In this case, a device that combines multiple cameras to capture all 360 ° images is required. This is called a rig.

[Fig. 3] is a picture of Vahana and Otopanolar. The stitching server is a device that combines and converts the images taken by the camera into a single 360 ° image. Since VR video is 4K resolution, it is large-capacity, and a high-end PC is required to convert it to VR video by stitching it in real time. Performing actual stitching is a separate solution that runs on the PC, and Videostitch's Vahana and Kolor's Autopanolar are widely used worldwide. In addition, Adobe, which specializes in existing image editing tools, is expected to continue to expand software that supports VR-related functions, such as adding VR content editing function to 'Premier Pro CC'.



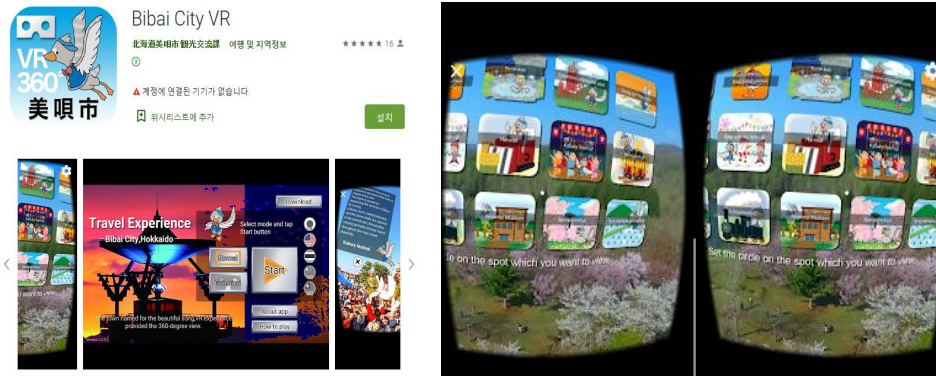
[Fig. 3] Vahana and Otopanolar

4. VR video production case

4.1 Japanese live-action content

This is the first city in Japan to use VR to promote a city, and tourist guides using VR video can be produced at a relatively low cost. The main points of interest are firstly, tourist information can be

easily obtained visually, and secondly, local information that is not easily understood is also discussed. Third, voice narration and multilingual support are provided. The characteristics of the content are as follows. 360-degree video and photos let you experience the scenery as if you were in a tourist destination. It is rich in local scenery and limited moments, so you can enjoy your trip not only in places but also in time and season. Added tourist information guide. You can get information on tourist spots without a tour guide. [Fig. 4] is a picture of Bibai City VR.



[Fig. 4] Bibai City VR

4.1.1 Good value for VR content

DoubleM Entertainment is a VR / AR contents, 3D panorama, and web design business headquartered in Sapporo, Hokkaido. It is a small team with only one VR employee or the ability to create content at such a low cost. The cost of producing 360-degree panoramic content inside the restaurant is low, starting at 3,000 yen a month.

The smartphone app <VR Tourism Experience-Hokkaido Bibai City> became a hot topic because it was the first publicity product to use VR panorama contents in Japan. It can be seen only on a smartphone, so using an HMD such as Google Cardboard will increase immersion. The 360-degree video of Bibai's beautiful tourist spots and the specialty Bibai Yaki-dori was cooked to bring the local atmosphere to life. App production costs are between 1 and 2.5 million yen. The program and verification work were outsourced, planned, photographed and edited by DoubleM Entertainment. The submission was completed two months before the project began and three months after the project was designed, filmed, edited and developed.

4.1.2 Design that can be used online

VR Tourism Experience-Hokkaido Bibai City has a tourist attraction information function. If you

move the cursor to the point installed in the 360 degree image, the commentary of the place is displayed and you can get the guide information.

Since there are many tourist attractions, I put a lot of information to refer to, and it was good to inform tourist attractions. The current version is not only text information, but will be updated in the future by introducing voice commentary and voice input function to improve interactivity. It will also support English, Traditional Chinese, and Thai.

For 360-degree video, a director who knows the characteristics of 360-degree content was in charge of filming on-site, and selected the angle of view to enjoy the direction and height of the camera, the range and distance of the object. Since the field of view that a human can actually see is not 360 degrees, it is difficult to determine how the cameraman looks in the 360-degree video when filming. This can only be done effectively with experience. There was a demand from local governments to make HD resolutions available online. The video part is in the app so it takes a long time to install, so I'm thinking about an app that I can download later.

As it is a tour guide, consideration of the feeling of use that can be seen frequently when traveling will also be an important factor.

4.1.3 Planning power that put local food

Tourist contents are easy to pay attention to tourist attractions. We thought that the promotion effect would be small as a general production method. In VR Tour Experience-Hokkaido Bibai City, as mentioned earlier, the local food called Bibai Yakitori was put into the content. Mita Kenta, president of DoubleM Entertainment, was originally from a popular uploader who posted a lot of content in Nico Nico cartoon. Sincerely immersed in what he enjoys, he has gained over 20 million viewers worldwide. And I naturally learned the marketing effect using the Internet. The result is local food content.

4.2 Domestic production case

Domestic VR video production and distribution was mainly conducted by telecommunication companies and broadcasters. The first example is KT's VR Baseball Live and genie VR. KT launched the world's first service to watch VR baseball games using smartphones and HMD in April 2016. Sony DSLR camera was used to provide higher quality images. The video taken by the VR camera was produced in real time as a VR video from a stitching server located next to the camera, and then transmitted to the viewers' terminals through a CDN (Content Delivery Network) and a wireless network (3G / 4G and Wi-Fi).

Viewing methods were provided in two ways: monocular mode, which allows users to play videos on a smartphone, rotate 360 ° by flicking, and binocular mode, which enables users to watch more immersedly by attaching a smartphone to the HMD. Due to the regulations that VR cameras on the stadium could not be installed, they had to be installed in the cheering seats, which made it difficult to see the actual players playing close up.

However, it can be said that it provides a feeling of participating directly in the environment cheering and fans support through VR, and that it was the first to broadcast a baseball game in VR for the first time in the world. KT launched genie VR, the first VR professional music service in Korea, in June 2016 after the VR baseball live broadcast service. genie VR is a VR-only tube service located in KT Music's music service genie. [Fig. 5] is a picture of Visitors who visited KT booth at MWC 2019 are enjoying VR baseball games at 5G Playground Zone.



[Fig. 5] Visitors who visited KT booth at MWC 2019 are enjoying VR baseball games at 5G Playground Zone

It is noteworthy that in August 2016, the showcase of Nine Muses A was broadcasted live in VR, bringing VR filming technology to the level of general TV broadcasting by utilizing multiple cameras and introducing broadcasting equipment. Multi-camera application uses a device called 4K Switcher to alternately edit videos taken from multiple VR cameras installed at the filming site and provide them as one channel. In addition, by introducing broadcast professional filming equipment such as Jimmy Jib, the company created an environment where VR filming from various angles was possible.

Beyond simply watching a game, sports will be used as a meeting and training place where you can meet domestic and foreign famous athletes in real-time video or 3D live-action avatars in XR space,

where you can talk, experience sports, and coach. Recently, there are many people who are interested in e-sports and participate, but now v-sports will be activated beyond e-sports. v of v-Sports means VR or Virtual and aims for people to participate in and participate in sports activities by using various equipment in the XR space. [Fig. 6] is a picture of V-sports.



[Fig. 6] V-sports

It may take some time to go to a remote field trip for real estate rental, sale, etc. Therefore, if the technology to experience the field trip 360-degree XR content in order to solve this inconvenience, it can reduce this inconvenience.



[Fig. 7] real estate VR

When building new buildings, such as land or residential land, the building can be simulated and demonstrated with 360-degree XR content. In addition, it will be possible to activate and upgrade the

XR contents for the sample housing experience, and to simulate the interior and exterior of the interior and exterior such as arranging the furniture inside the house, changing the wallpaper and arranging the exterior decoration. [Fig. 7] is a picture of real estate VR.

Online shopping allows customers to shop around the XR store to purchase goods. In connection with such a VR store, the goods that the customer wants to purchase can be placed or attached to the actual location, and the goods displayed in the store can be confirmed by 360 degree XR. CJ ENM O Shopping presented a virtual studio using VR technology on its T-commerce channel, CJ O Shopping Plus. In other words, VR technology is applied to travel broadcasting to show a virtual studio in the background, providing a ambience that is broadcasted in the real field. Photorealistic virtual fittings are also available, which look as if the customer is wearing live-looking items in the face and body mirrors. [Fig. 8] is a picture of Online shopping VR.



[Fig. 8] Online shopping VR

5. Conclusion

The biggest obstacle to enabling VR content creation is the quality of the content. Currently, the quality of VR content is 4K, but it covers all 360 °, so the video that real users watch is less than HD. Dizziness and motion sickness caused by delayed response time also cause content quality deterioration. VR content has the advantage of moving the head up, down, left and right, and freely watching the image at 360 °, but it may be uncomfortable when the actual user moves the head and the image is switched.

Clear solutions to overcome these limitations have not yet emerged, but various attempts are being made. First of all, to improve image quality, it is to reduce the overall content capacity by sending

high-resolution images only to the screen that the user is staring at and reducing the quality of surrounding images relatively. In addition, researches are being actively conducted to develop algorithms for predicting user's head movements in order to minimize delay rate or to shorten content transmission time itself. Although all these problems cannot be solved in the short term, the quality of VR content is expected to gradually improve through various trials and errors.

As we have seen, virtual reality can provide new media experiences, creating opportunities for both companies and users to gain new value. In addition to multiplying the fun in the entertainment area, the integration of virtual reality technology into various areas such as shopping and real estate can improve service convenience and operation efficiency.

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