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COMPARING TECHNICAL - AESTHETICAL DIFFERENCES BETWEEN 360 VIDEO AND REGULAR VIDEO: CREATING AN EXAMPLE VIRTUAL REALITY PROJECT

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ABSTRACT

COMPARING TECHNICAL - AESTHETICAL DIFFERENCES BETWEEN 360 VIDEO AND REGULAR VIDEO: CREATING AN EXAMPLE VIRTUAL REALITY PROJECT

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MA, Art and Design

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In this study, the technical and aesthetic differences of regular video which is using traditional narration methods, and 360 videos are discussed and compared. The effects on human perception and viewing experience are analyzed with two documentary projects produced in different formats. Comprehensive results are aimed to be reached from start to end of the project making process until it meets with the audience. The technical and aesthetic structures of the formats were compared, the scenario shooting setup of the same short documentary story was carried out in two different formats, the same sample was made to watch the documentary in two different formats and a survey was conducted, the questionnaires were evaluated and the impact measurement of 360 videos was made according to the traditional documentary work. As a result, the main inferences from the project realized with virtual reality technology in the data obtained are: Inferences were made on the main titles of virtual reality in terms of human-space relationship, virtual reality in terms of sustainability, virtual reality in terms of re-watching and interaction, and virtual reality in terms of sensory and emotional effect.

Keywords: 360 Video, Regular Video, Virtual Reality, VR Scenario, VR Filmmaking, VR Editing, Storytelling

ÖZ

360 VİDEO VE GELENEKSEL VİDEONUN TEKNİK VE ESTETİK YÖNLERDEN KARŞILAŞTIRILMASI VE ÖRNEK BİR SANAL GERÇEKLİK PROJESİNİN ÜRETİLMESİ

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Mayıs 2022

Sinemada geleneksel anlatım yöntemleri ile 360 videonun teknik ve estetik farklılıklarının ele alındığı bu çalışmada, ayrıca farklı formatlarda üretilmiş iki belgesel proje ile insan algısı üzerinde yarattığı etkiler değerlendirilip ölçümlenmiş senaryo aşamasından izleyiciyle buluştuğu noktaya kadar karşılaştırmalı ve kapsamlı sonuçlara ulaşılmaya çalışılmıştır. Formatların teknik ve estetik yapıları karşılaştırılmış aynı kısa belgesel öyküsünün iki farklı formatta senaryo, çekim, kurgusu gerçekleştirilmiş aynı örnekleme iki ayrı formatta belgesel izlettirilmiş ve anket çalışması yapılmış, anketler değerlendirilmiş ve 360 videonun geleneksel belgesel çalışmasına göre etki değerlendirilmesine gidilmiştir.

Sonuç olarak elde edilen verilerde sanal gerçeklik teknolojisiyle gerçekleştirilen proje üzerinden çıkarımların belli başlıları :

İnsan mekan ilişkisi açısından sanal gerçeklik, Sürdürülebilirlik açısından sanal gerçeklik, Yeniden izleme isteği ve etkileşim açısından sanal gerçeklik, Duyusal ve Duygusal Etki açısından sanal gerçeklik, temel başlıkları üzerinden çıkarımlara gidilmiştir.

Anahtar Kelimeler: 360 Video, Geleneksel Video, Sanal Gerçeklik, VR Senaryo, VR Çekim, VR Kurgu, Hikaye Anlatıcılığı

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Ömer Kartelli

İzmir, 2022

TEXT OF OATH

I declare and honestly confirm that my study, titled “COMPARING TECHNICAL - AESTHETICAL DIFFERENCES BETWEEN 360 VIDEO AND REGULAR VIDEO: CREATING AN EXAMPLE VIRTUAL REALITY PROJECT” and presented as a Master’s Thesis, has been written without applying to any assistance inconsistent with scientific ethics and traditions. I declare, to the best of my knowledge and belief, that all content and ideas drawn directly or indirectly from external sources are indicated in the text and listed in the list of references.

Ömer Kartelli

01/03/2021

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SYMBOLS AND ABBREVIATIONS

ABBREVIATIONS

VR	Virtual Reality
AR	Augmented Reality
MR	Mixed Reality
CAVE	Computer Assisted Virtual Environment
HMD	Head Mounted Display
AI	Artificial Intelligence
UX	User Experience
HDMI	High Definition Multimedia Interface
FPS	Frame Per Second
IOS	iPhone OS
LED	Light Emitting Diode
RGB	Red Green Blue
GHZ	Gigahertz
GPU	Graphics Processing Unit
HUD	Head-Up Display
LCD	Liquid Crystal Display
3DOF	Three Degrees of Freedom
6DOF	Six Degrees of Freedom

SYMBOLS

°	Degree Symbol

1. INTRODUCTION

1.1 OVERVIEW

In today's world, regular (traditional) video became a widely used medium for communication. After using traditional video and storytelling for decades, human beings started to look for new ways to tell stories both technically and aesthetically. Then virtual reality came as a new concept to life which was carrying 360 videos in it. 360 Video is a new way to tell stories, show events, and document moments. It has the capacity to be the next innovation in the media industry.

This thesis will focus and research the potentials of 360 video compared to linear video in both technical and artistic terms. The main purpose of this study is to create an example project in both 360 video content and traditional video content and compare them aesthetically and technically.

Chapter 1 will explain why 360 video in the form of virtual reality headset content is important. Chapter 2 will focus on the History, Definitions, Comparisons, and Literature review. Chapter 3 is where the project production and analysis take place. Chapter 4 is about Evaluation Form which is applied to different student groups. Chapter 5 is about conclusions and predictions on the future of 360 video and virtual reality.

1.2 THEORETICAL FRAMEWORK

Many different studies have been made in the area of both 360 video and virtual reality. Having more immersive vision and feeling is the primary specification that virtual reality has. Different studies demonstrate how impactful it could become in the next couple of years.

Recently Cannes film festival has started accepting applications from 360 video and virtual reality areas. It also shows the potential that it has as an alternative storytelling medium both aesthetically and technically.

One of the great technical aspects that 360 video has is 3D Surround Sound. By enabling 3D surround sound, the viewer could hear the sounds whichever way that he or she turns to head to. It is recorded by using special microphones and edited by industry professional sound software.

Moreover, 360 video cameras are using the latest gen technologies which enable directors to shoot from all angles. It also enables viewers to have the freedom to choose what they see. That results in such an immersive experience for the next generation audience.

To conclude, 360 videos have the potential to change how we create and watch stories. It is a new medium for human beings that utilizes the latest technology and enables viewers to have a more immersive experience. This study will compare the technical, aesthetical sides of 360 video and linear video by creating both linear video and virtual reality video content.

1.3 STATEMENT OF THE PROBLEM

In the modern age, human beings got used to traditional narration techniques since it is widely used for many years. But as time goes by, there may be a need to discover new ways to tell stories. Exploring new ways of storytelling also means creating different ways to communicate. When humanity connects while using new methods of communication, it can cause a greater understanding of each other which also means better sympathy.

Virtual reality started emerging in the last couple of years in the global area and 360 video is a big part of it. With the help of 360 video, the human species could face new ways to tell and discover stories.

When peoples change how they get stories, it could be the start of a new era. The main difference occurs between regular video and 360 video. 360 video enables human beings to watch content in 360 degree vision with the help of virtual reality glasses.

1.4 RESEARCH QUESTION

Will new ways to tell stories also mean new ways to communicate for the human species? 360 video could have the capacity to change all that we see and tell. While using virtual reality googles, the human species might become more open to external stimuli since it is a much more immersive experience compared to regular video.

Human beings always looked for new ways to tell stories. Finally, it may be time to change how we tell stories. With the help of technology, everything changed in human life, and now it might be time to change how we create narratives. Compared to regular video, 360 videos might enable us to tell stories in many different ways in terms of aesthetics and technics.

1.5 PROJECT OBJECTIVE

The main purpose of this thesis is to compare 360 video and regular video in terms of technics and aesthetics. 360 video is a new technique that is widely used among virtual reality and virtual worlds. It enables humans to see in a wider view by utilizing virtual reality googles and 3D Surround Sound. The objective of the research is to define the technical and aesthetical differences between 360 video with regular video and answer whether it is superior compared to traditional storytelling methods.

The main difference between 360 video and regular video occurs in the areas of narration, storytelling, shooting, and editing. The main purpose of this research is to understand the main distinctions between 360 video and regular video in terms of techniques and aesthetics and create a virtual reality project accordingly.

1.6 PAST WORK AND STUDIES IN THE FIELD

When the recent scientific outputs of the studies in this field are examined, basically the definition of 360 video techniques, the relationship between Virtual Reality and 360 video, Social media and 360 video, new media studies and different aesthetic structures, use of 360 video in education, VR as a treatment tool, 360 video in storytelling and games attract attention.

Many different studies and thesis works have been made in the field of VR and 360 Video, they mainly focus on the usage areas such as education, military, science, gaming, and entertainment. On the contrary this study is focused on comparing the differences between traditional(Regular) and modern(360 Video).

In this study, theoretical and practical analyzes and evaluations were made on the 360 video technique and aesthetics, a short documentary section was shot in two different techniques, the experience was made with VR glasses, and instant evaluations were taken from the audience. With its comparative structure, the differences of 360 video with traditional narration and the new dimension it brings are discussed.

1.7 SIGNIFICANCE OF THE STUDY

There will be 2 main creations in this work. One will be the regular video story and the other will be 360 video. Both videos will be based on the same story. But different narration techniques will be used and that will give the chance to compare and analyze the differences between the two different mediums.

While creating a virtual reality 360 degree video project, steps will be analyzed. Those steps include which camera is used and how it works to shoot 360 degree content. Which lighting equipments are used under which conditions. How is the editing process of 360 content, what are the tools and programs used while creating 360 content.

Furthermore, the aesthetical differences will be compared within video works by reviewing 2 videos side by side and analyzing both technical and aesthetical sides.

2. LITERATURE REVIEW, DEFINITIONS, HISTORY AND COMPARISONS

2.1 OVERVIEW

In the second part of this study, 360 video, which creates a different aesthetic with a new technique in today's storytelling, evaluates the technological developments in the process, aesthetic searches, and different usage areas of 360 video in the context of virtual reality, while discussing the possible position of 360 video in the future and its relationship with new media.

2.2. 360 VIDEO

2.2.1. Definition of 360 Video

Virtual reality refers to the observation of a virtual environment using a system that displays things and permits interaction, resulting in virtual presence.

The content of a virtual environment determines its environment (objects and characters). This material is presented in a variety of ways (visual, auditory, and haptic), and the user experiences it through vision, hearing, and touch.

Items in a virtual environment, like objects in the real world, have qualities such as form, weight, color, texture, density, and temperature. Different senses can be used to observe these qualities. For example, an object's color can only be recognized in the visual domain, yet its texture may be sensed in both the visual and haptic domains. (Mihelj et al., 2013, p. 2)

Essentially, 360-degree images or movies are graphics that capture and portray the view from every angle at the same time. Although this may appear to be a recent development, humans have been attempting to capture and duplicate immersive 360-degree experiences for ages. (Cameron et al., 2020, p. 5)

Virtual reality had been a fantasy of the human mind for decades before the first deployments. Feelies—movies that include touch in addition to sight and sound—were first introduced in Aldous Huxley's novel Brave New World in 1931. In his book Pygmalion’s spectacles: A Study in Virtual Reality, published in 1935, Stanley

Weinbaum went even further and gave a thorough notion of virtual reality. (Mihelj et al., 2013, p. 5)

2.2.2. History of 360 Video

In the development process of art, human beings have been affected by the magic of the image and sound surrounding them, and they have been the audience and listener of painting, photography, graphic mapping, and sound applications.

Paintings depicting natural landscapes, court life, towns, or dramatizations of historical or legendary events would cover the interiors of buildings and villas from floor to ceiling throughout the Roman Empire, offering a 360-degree visual experience. The panorama is as old as art itself, consisting of an ultra-wide horizontal perspective that allows you to view as much of the topic as possible. (Cameron et al., 2020, p. 5)

Figure 1 Roman fresco Villa dei Misteri Pompeii

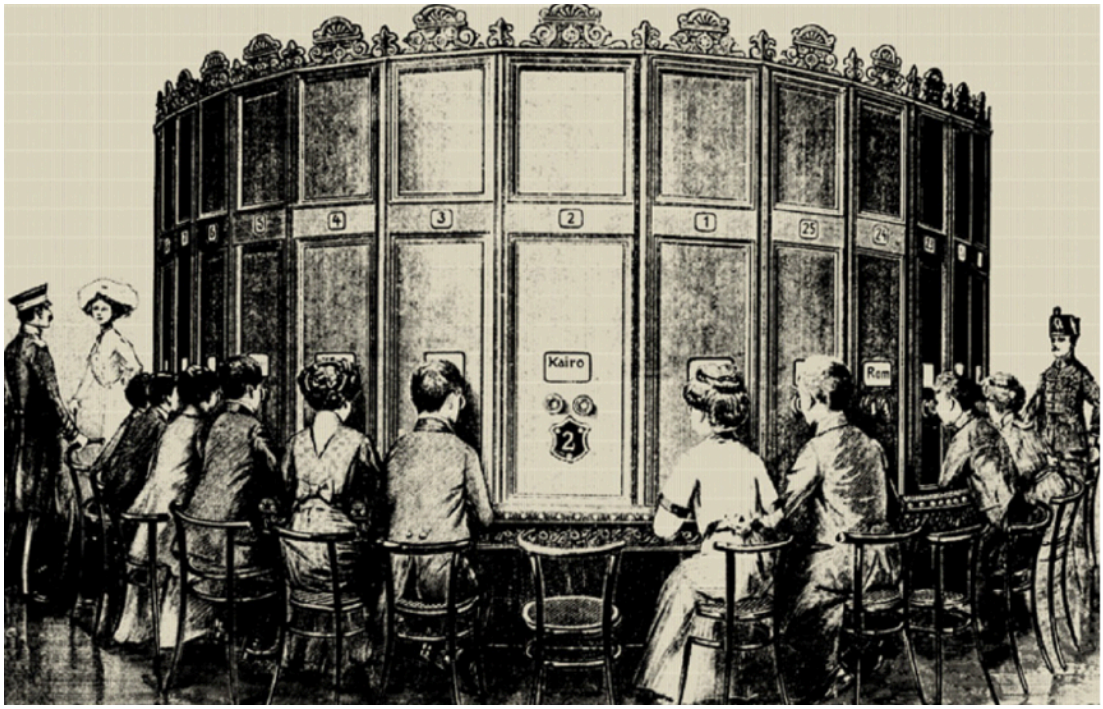
Source: Wikimedia Commons Public License https://commons.wikimedia.org/wiki/File:Roman_fresco_Villa_dei_Misteri_Pompeii_006.jpg **Access Date:** 20.02.2022

The brilliantly called Kaiserpanorama was another popular and distinctive means of exhibiting photos in a more immersive way. This interesting circular mini-theatre was patented in 1890 by physicist August Fuhrman. It consisted of a number of

wooden viewing stations that cycled through a sequence of lit glass slide pictures. (Cameron et al., 2020, p. 8)

Numerous examples of surrounding art experience manifest themselves in different periods in the historical process.

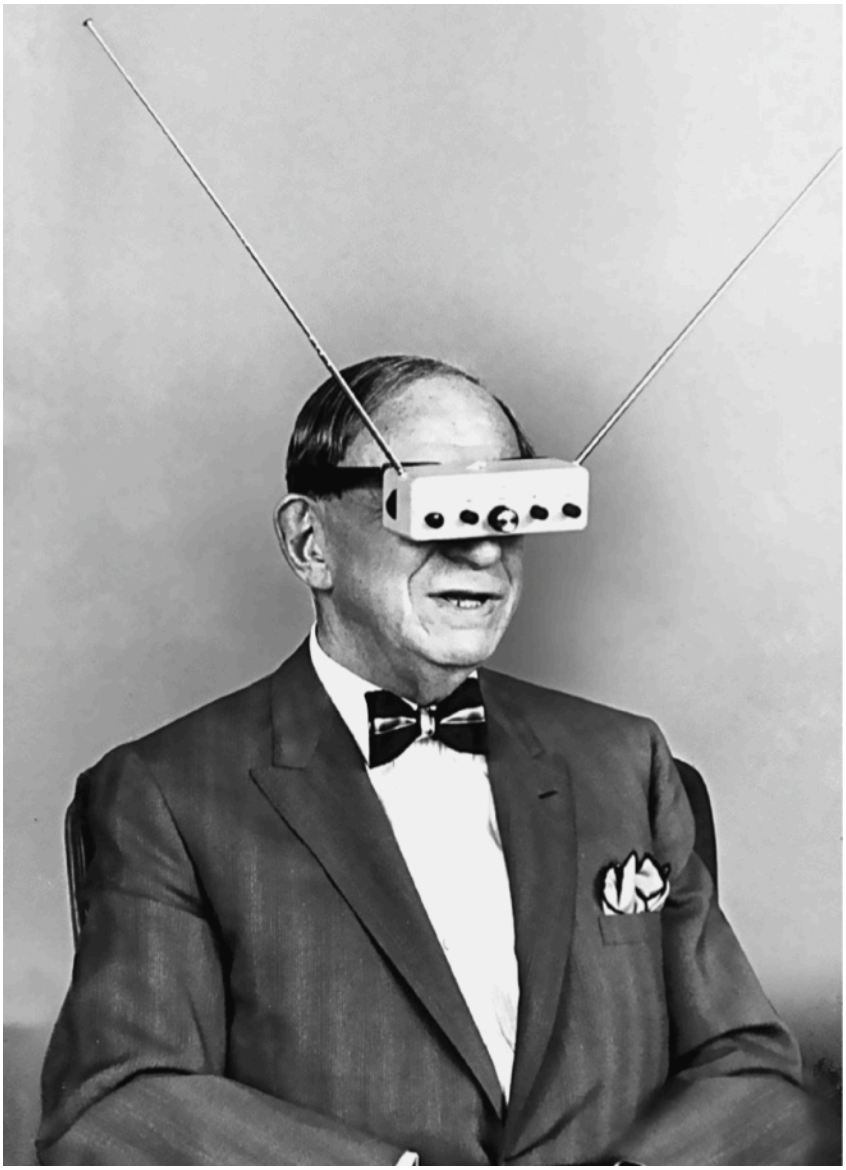
Figure 2 A drawing of the Kaiserpanorama, built with 25 viewing stations.



Source: Wikimedia Public License https://en.wikipedia.org/wiki/Kaiserpanorama
Access Date: 16.01.2022

The stereoscopic effect was used to create these glass slide photos. For the left and right eyes, two photos of the same topic are obtained, but at slightly different angles. When the eyes view the pictures together through the Kaiserpanorama, the brain perceives them as one image with a feeling of depth, at least considerably more so than a regular image, because the images are slightly out of sync with one another. Many of the "3D" experiences you're probably familiar within the present period are based on this stereoscopic method, from 3D comic books to those red toy View-Masters to classic superhero blockbusters. (Cameron et al., 2020, p. 9)

Figure 3 Hugo Gernsback with VR Glasses



Source: Alfred Eisenstaedt/The Life Picture Collection/Getty Images https://spectrum.ieee.org/the-man-who-invented-vr-goggles-50-years-too-soon **Access Date:** 05.03.2022

Hugo Gernsback, a science-fiction writer and inventor (for whom the Hugo Awards for science-fiction literature are named), invented Tele-Eyeglasses in 1936. He depicted the future gadget as a pair of eyeglasses with two small cathode ray tubes (CRTs) in each eye displaying television pictures. His invention was meant to be wired to a television set, which would receive and broadcast the signals to the wearer. Gernsback made mock-ups of his invention but never built a functioning model.(Tricart, 2018, p. 12)

Figure 4 Virtual Reality NASA Research

Source: Tricart (2018) Virtual Reality Filmmaking

Mark Bolas, Ian McDowall, and Eric Lorimer launched Fakespace in 1988 to develop virtual reality hardware and software for government and scientific applications. The Pinch Glove, Fakespace's own version of a data glove, and the BOOM (Binocular Omni-Orientation Display), a VR imaging and tracking device that placed a high-resolution computer monitor within a stereoscope on the end of a boom arm, were among the company's developments. The user would watch stereoscopic real-time computer-generated imagery (CGI) through the wide-angle optics, while the arm sensors tracked the stereoscope's location through six axes of motion.(Tricart, 2018, p. 15)

2.2.3. Usage Areas of 360 Video

360 video and virtual reality are one of the most immersive tools for communication in the modern age and they have many usage areas along the way.

The capacity to create more immersive visual experiences expanded as camera technology advanced, going from pressed plates to flexible film. Rotating cameras, for example, were invented as new advancements. However, for most of the early to mid-twentieth century, 360 photography and video were still prohibitively costly and difficult to produce, and image quality trailed considerably behind that of ordinary cameras. The majority of persons creating 360 visual information at the time were doing it for scientific, military, or documentary purposes. Smaller, more agile, and more cheap panoramic cameras joined the market in the late twentieth century, but because these devices still needed a lot of setup, training, and production know-how, they remained primarily relegated to the professional set. (Cameron et al., 2020, p. 9)

Objects can be transported from the actual world to a virtual environment. In virtual worlds, for example, there are replicas of renowned structures. Without ever visiting the building in person, the user may stroll around a virtual historical building, interact with the artifacts within, and learn historical information. Virtual persons from the building's historical age can be included in the virtual environment, allowing the user to interact with them and gain more facts. (Mihelj et al., 2013, p. 8)

VR/AR technology, which produces content in digital art and many different fields, has strengthened the sense of reality and ensured widespread use with increasing resolution and accessible cost in the development process, which started 360 video in low resolution and very costly.

Once 360 Video technologies became cheaper, they also became widespread because the costs was so effective in terms of making it common and public.

Furthermore, DSLR cameras had the power to motivate public towards creating more content since they were not only easier to use but also much more easy to use and carry.

Nikon and Canon released game-changing digital single-lens reflex (DSLR) cameras, motivating new generations of photographers to take up the hobby. GoPro, based in California, became a global market leader by popularizing inexpensive action cameras that are durable and stable enough to be used for everything from kayaking to skydiving. GoPro's action camera revolutionized the photography industry by combining a tiny, rugged camera with a wide lens. While it gained popularity among extreme sports enthusiasts, it also found a home in 360 photography. Standard cameras have only one lens, which allows you to photograph with a small field of vision, ranging from a few degrees to 180 degrees. To generate a 360 effect, a computer software must be used to organize and overlay the images. (Cameron et al., 2020, p. 10)

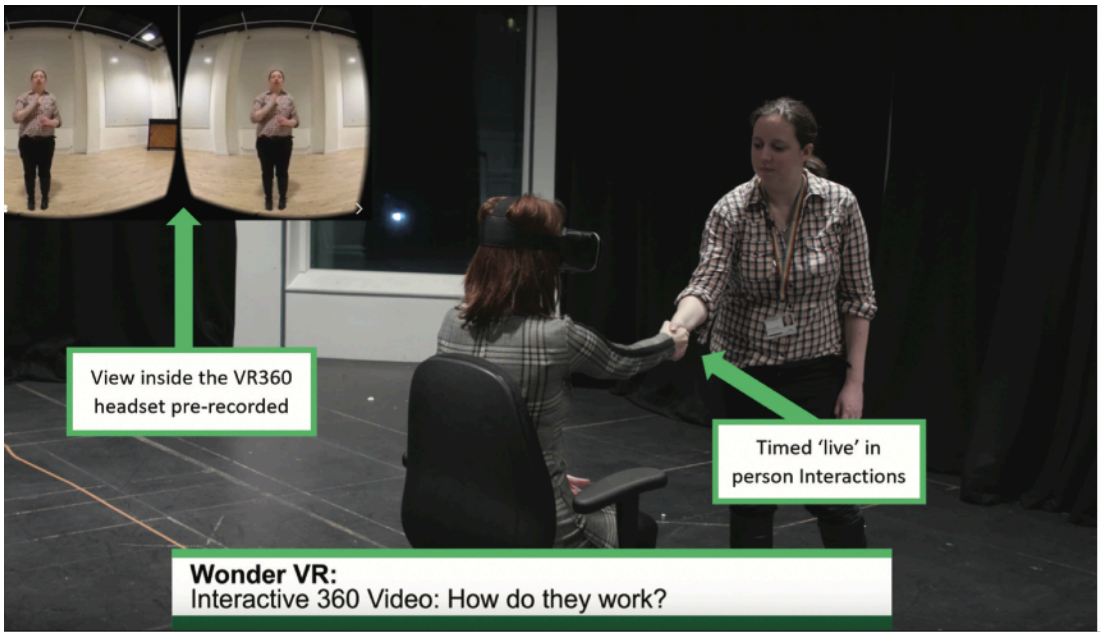
The most powerful medium of this process, which is experienced visually and audibly with surround sound systems, sometimes on walls and surfaces, sometimes on giant screens, is the content watched with VR/AR glasses and the ones realized with 360 videos.

2.2.4.1. Treatment

Virtual reality applications and 360 video that they contain, since the beginnings of 2000’s are used to stop develop further disease and treatments. First therapies started with acrophobia and arachnophobia. Then schizophrenia and neuroscience and smoking addiction.

This has been demonstrated so far in joyful responses to VR360 experiences through excited accounts of past memories, the realization of a virtual experience visiting an aspirational location, and person-centered 'calming' experiences that deliver bespoke, consistent encounters that can be revisited whenever needed. This initiative can transfer patients into a narrative encounter in which they return happier, less irritated, and cognitively stimulated, allowing them to extend their stay in acute hospital settings. (Abraham, 2020, p. 489)

Figure 5 Demo of interaction between facilitator in person and participant in VR360 in *Wonder VR Project Documentation*



Source: *Nicola Abraham*, London 2020

Surgery simulators are virtual environments in which a surgeon may practice surgical operations on a variety of patients using realistic haptic interfaces (which look and feel like actual surgical tools). These virtual patients aren't always fictitious, made-up individuals. Modern medical technology (e.g. computed tomography) may be used to build a three-dimensional model of a patient who is slated for surgery. Surgeons can 'practice' on a virtual patient with remarkably comparable qualities to the real one before the actual surgery. With the development of surgical robots, which allow the whole procedure to be done through haptic interface and screen, surgery simulators have become even more popular. Virtual surgery experience is much more immediately transferable into reality using surgical robots. (Mihelj et al., 2013, p. 8)

2.2.4.2. Education

Especially after world pandemic times the importance of 360 video and virtual reality has increased rapidly. The areas of medicine, engineering, linguistics, art and design are the most noticeable developing fields.

VR technologies enable learners to visualize abstract ideas, show phenomena to improve comprehension of their meanings, visualize the dynamic interactions between variables in systems, and present different views to users, among other educational benefits. (Tacgin, 2020, p. 62)

Figure 6 VR in a classroom

Source: Tacgin (2020) Virtual and Augmented Reality

Virtual reality systems are utilized in a variety of sectors for learning and teaching, including history, geography, biology, medicine, and vehicle driving. They are appropriate for K-12 students, teens, and adults. (Tacgin, 2020, p. 62)

Figure 7 HUD of map and vocabulary system

Source: Chang et al. (2011) Edutainment Technologies. Educational Games and Virtual Reality/Augmented Reality Applications

Immersive media, like any other instrument, is successful for some themes and ineffective for others. That raises the question of when immersive media is beneficial to industry and/or society. The broad strokes are very easy, based on 60 years of VR and other immersive media development. However, as the medium becomes more widely accepted, the intricacies are just now being ironed out. While the basics of technology have not changed, new applications are being developed on a vast scale every day as a result of a significant cost reduction in the previous several years. This will result in a constant advancement of technology as well as occasional breakthroughs. (Liu et al., 2017, p. 49)

Figure 8 Driving simulator driving in a rural area

Source: Teen Driver Source, Children's Hospital of Philadelphia). http://www.teendriversource.org/images/drivingsimulator.jpg **Access Date:** 05.01.2022

Because learners prefer to learn by playing and engaging in multi-player games and competitive interactive activities, the 3D virtual world for language learning is developed to promote English learning by integrating the virtual environment into the curriculum with intriguing scenario-based assignments. Learners can develop their language knowledge and achieve communication skills in a relevant environment by interacting with objects and other users in a virtual world. It becomes feasible to develop more dynamic, immersive, and communicative language

learning activities when 3D rendering and real-time voice communication technologies are combined into the 3D virtual environment for language learning. (Chang et al., 2011, p. 50)

Figure 9 Word card in foreign language

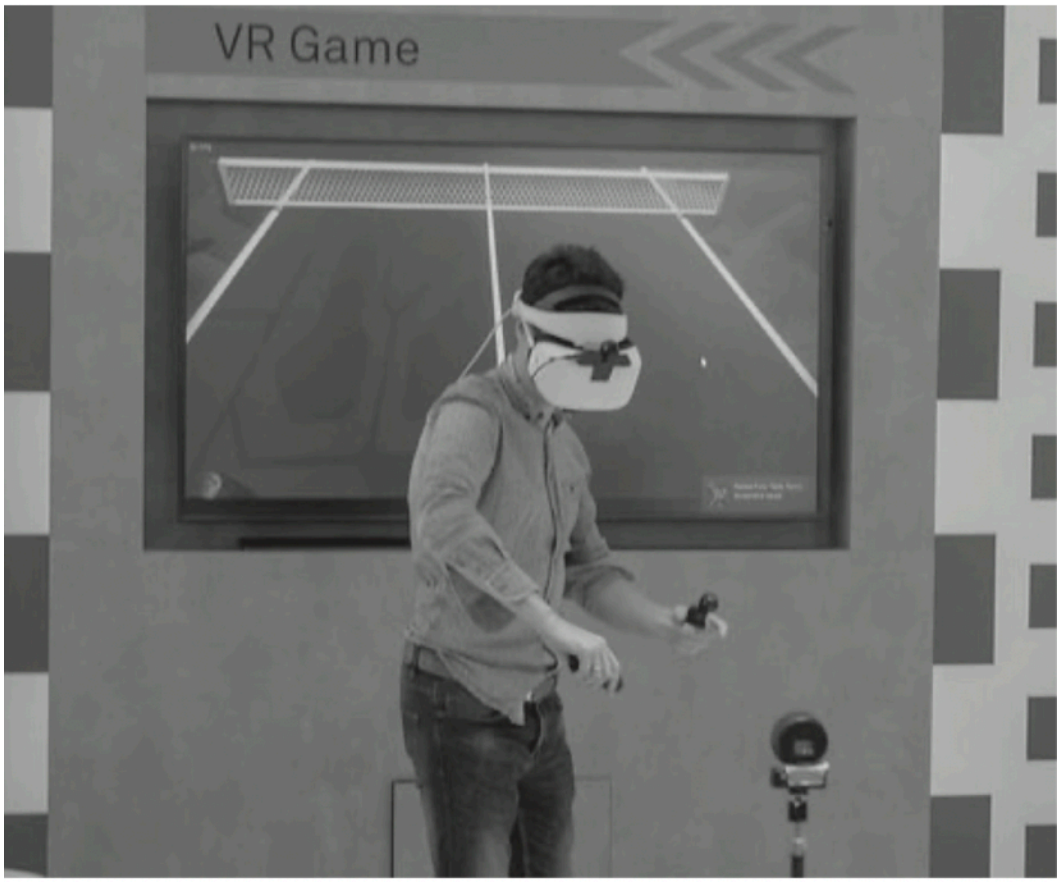
Source: Chang et al. (2011) Edutainment Technologies. Educational Games and Virtual Reality/Augmented Reality Applications

2.2.4.3. Gaming

Gaming world is the first place where young people and virtual reality meets through interactions, 360 videos and virtual worlds. Big gaming and technology companies made strong developments in the virtual reality field and directed their investments to this area. Brands such as Sony, Google, Facebook, Microsoft have the potential to raise new generations with virtual reality technologies.

Most importantly, gaming plays an important role in the modern age for all ages especially young generations and they develop themselves by playing.

Figure 10 Word card in foreign language



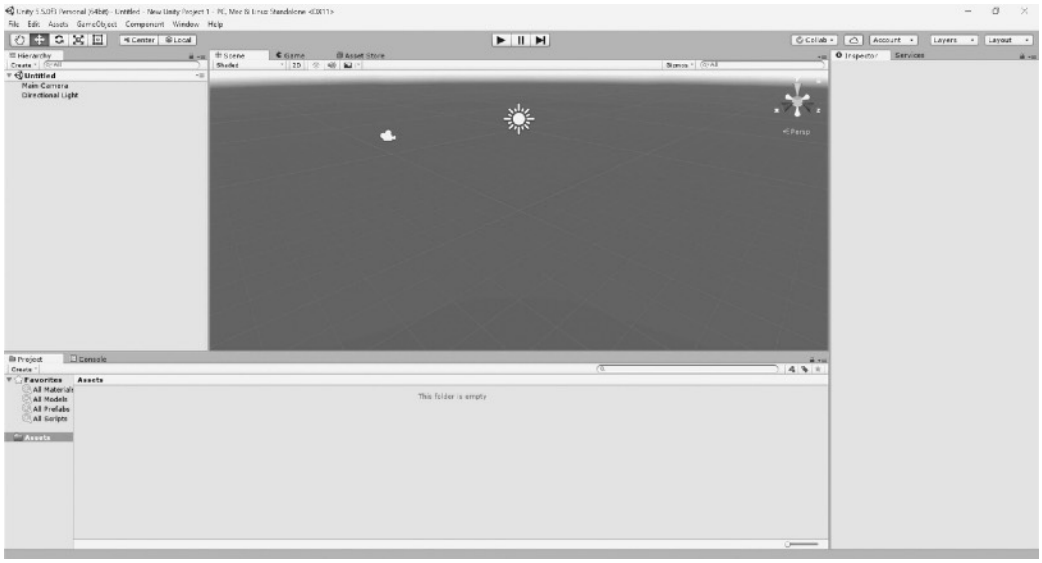
Source: Tacgin (2020) Virtual and Augmented Reality

The gaming industry, in particular, has merged VR technology (headsets, wands, sensors) into devices like the PlayStation, Nintendo, and Xbox to give consumers with immersive 3D game experiences. (Tacgin, 2020, p. 70)

Not just for games, architecture, or education, but also for narrative VR, game engines play an essential part in the VR industry. Because this book is about VR filmmaking, this chapter focuses on how gaming engines may improve a VR experience that includes some form of live action. Whether the project was filmed in 360° and then projected into a gaming engine, or whether sophisticated techniques such as volumetric capture were utilised. (Tricart, 2018, p. 51)

Virtual reality gaming has a great potential especially in the youth market since young people have more potential for adapting earlier and faster in the VR Technologies.

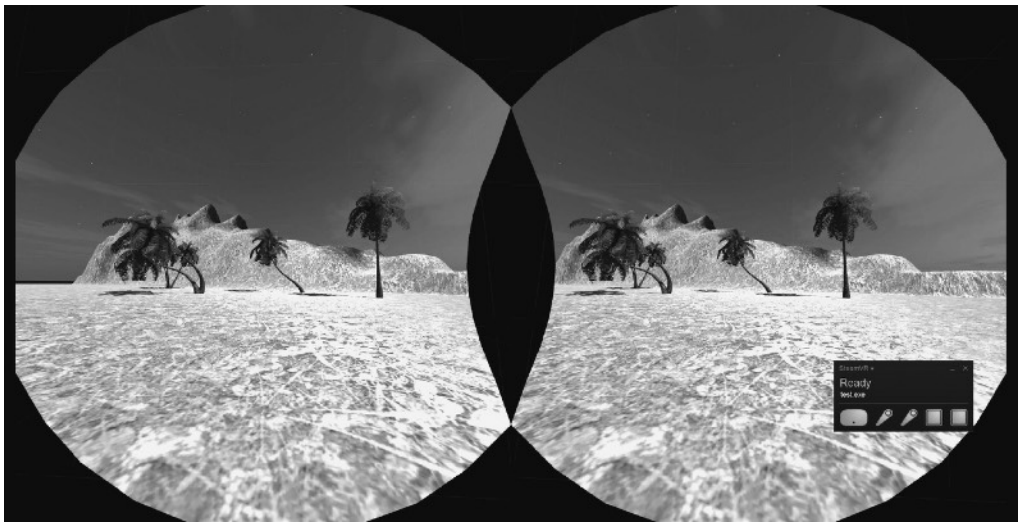
Figure 11 Unity main interface



Source: Tricart (2018) Virtual Reality Filmmaking

A game engine is software that creates a three-dimensional environment in which three-dimensional items and effects may be placed and animated. Scripts are developed in several coding languages, such as C# (pronounced C-sharp), to control how each asset moves, responds, and interacts in response to various inputs. The experience may then be "played" to test the scenes and scripts, then adjusted and retested until it's complete. The completed experience is saved as an executable file called a "build" that may be run on a mobile phone, a PC, or any other gaming device. (Tricart, 2018, p. 51)

Figure 12 Build as seen with an HTC Vive connected to the computer



Source: Tricart (2018) Virtual Reality Filmmaking

The next stage is to find out how to combine the gaming engine with live-action film to create interactive experiences. It's feasible, for example, to utilize a gaming engine to show live-action VR video and use the "gaze-select" interface to activate alternative stories. Indeed, the gaming engines can identify where the players are looking in the screen and adjust the scene accordingly. (Tricart, 2018, p. 57)

If you already have a game design document or plans for how you expect to implement all of the interaction in your virtual environment, there's a strong possibility the final working systems will change significantly from your initial concepts. Testing and iteration will be at the heart of your manufacturing process, and what feels correct will always win out over what looks great on paper. Preplanning may appear to be a challenging challenge in VR design, but we can learn a few lessons from traditional software and game design on how to cope with a project that will almost certainly alter substantially as it develops. This isn't an issue exclusive to virtual reality.(Murray, 2017, p. 42)

2.2.4.4. Storytelling

360 video technology is a strong immersive area that bringed a different visual and auditory perception to the virtual reality aesthetic. Since then the way people tell stories changed eradically. The main reasons are mostly technical. Scripting, shooting, editing, projection and all the other storytelling procedures are different than then the traditional ones.

The audience wants and needs more time in order to process 360 video informations correctly. Actors have a different connection with the camera which requires a more stable camera angle. The scenes and shooting plans leaves their important place to the new algorithm between actor and the camera.

The sense of distance changes and the power of sound increases in importance. With the help of the sound, the focus of the audience is managed.

Figure 13 VR space vs. cinema frame

Source: Tricart (2018) Virtual Reality Filmmaking

When we link a user with psychological and emotional material, we must also comprehend the environment around us in order to put the virtual universe into perspective and determine how we should engage with it. The lighting, movement, colors, and global scale—the entire stage has a significant influence on how our virtual guests feel and the depth of experience they are likely to have. The virtual visitor will search for more than the most apparent areas to define their virtual experience, much as a stage play could guide the audience through a plot using both visual and nonvisual signals. (Murray, 2017, p. 26)

Stories are captivating in conventional media such as plays, novels, films, and video games because they relate with the audience's experiences. Virtual reality is incredibly immersive, and consumers may become more involved in a tale than with

any other type of media. However, just delivering a tale in virtual reality does not guarantee that the experience will be compelling; it must be done correctly and in a way that the user will understand. It is not necessary to offer all of the information in order to communicate a tale. Users will use their imaginations to fill in the blanks. Even the most basic forms and gestures have meaning for people. (Jerald, 2015, p. 225)

When participants' choices dictate which tale will play from a set of planned alternatives, such as with branching storytelling (when participants' choices determine which storyline will play from a set of predetermined options), the participants are not always acknowledged. When creating a VR experience, it's critical to set the "rules of the game" early on, which involves selecting whether the experience will be participant-driven or storyteller-driven. Going from one to the other might be disconcerting and throw participants off, but it can also be a great narrative technique when well prepared and implemented. (Tricart, 2018, p. 98)

Figure 14 A 360° image from the VR experience *Strangers with Patrick Watson*. (© Strangers with Patrick Watson / F´elix & Paul Studios)

Source: Jerald (2015) The VR Book: Human-Centered Design for Virtual Reality

Throughout the 1990s, virtual reality was a hot topic. The virtual reality scene had been popular for a while, with its visuals appearing in successful Hollywood films and defining a generation, but by the year 2000, the business had almost completely died out. Technology has not been able to deliver what the public expected, namely, experiences that were pleasant enough for ordinary people to want to participate in. Although a few arcade machines remained, most hardware makers had written off virtual reality as a disastrous commercial choice. VR's victorious return to our homes

would require yet another wave of technical innovation in a completely other industry. (Murray, 2017, p. 30)

In the book from Tricart (2018, p. 81) according to the speech of virtual reality film Director Randal Kleiser; “Shooting in 360° is very specific and is best to use when there is a story reason. In the case of my VR series “Defrost,” we want the viewer to feel they are actually experiencing what the character is going through. This means that action can be staged anywhere around the viewer and this needs to be thought out very carefully to be sure that the staging forwards the story. There are thousands of young film students beginning to figure out VR techniques, and I’m sure they will lead the way on the new language. They have energy and time to experiment. Because this is a new, emerging format, I’m very excited by what I’m learning and figuring out. I haven’t been this energized since I was a student at USC studying film. It’s déjà vu all over again.”

In the book from Tricart (2018, p. 84) as stated in the speech of virtual reality film director Jessica Kantor “Virtual reality lends itself beautifully as an extension of our current arts, most specifically theater and dance. As with capturing any art form, simply sticking a camera in the space without adapting for the medium inevitably falls flat. But when you adapt the arts, especially dance for 360° video, something incredible happens. Dance captures humanity in a very pure way. At its most simple, dance is a sequence of movement in space. With VR, the participant is experiencing the same space in which the dance is moving, creating an intimate relationship between the participant and the dancer(s). Each gesture moves through the same space and moves what feels like the same universe the participant is experiencing. The proximity of the dance to the participant can raise their heartbeat, and can propel the participant into movement. In each of these examples the audience/partic- ipant becomes a player. Even if they are passive, acting simply as a voyeur, they have a place in the virtual world. In creating these experiences the designer/director needs to take all the players into account. Using the sound, light, action to guide the partici- pant along the journey. They can be completely emotionally con- nected without having to think about their actions or how to move a story forward. Seamlessly danc-

ing with the dancer, following the actors through the experience as it unfolds around them.”

Figure 15 “Ashes” directed by Jessica Kantor

Source: Jerald (2015) The VR Book: Human-Centered Design for Virtual Reality

2.2.5. Virtual Reality and 360 Video

While the word "virtual reality" is still undefined and subject to interpretation, most academics and content creators believe that one of the most important aspects of VR is the experience of presence, or feeling as if you're physically there in the scene but via the use of technology. When done correctly, virtual reality may fool your mind and body into thinking you're going to swing into a canyon in Utah. (Cameron et al., 2020, p. 19)

The technology which is closest to reality and used commonly is 360 Video. It has an environment based virtual reality understanding which helps audience to get in the scene. The audience feels a strong sense of immersive experience while experiencing 360 video via virtual reality googles. 360 video gives a more realistic feeling compared to other techniques which are used in Virtual reality.

People who use a mouse, trackpad, or move their phone to control the viewing angle can choose where in the photo or video they want to look — this example, when uploaded or embedded on a platform that supports 360 content, would only show you

a small section at a time, and you could drag your cursor left or right to see more. (Cameron et al., 2020, p. 16)

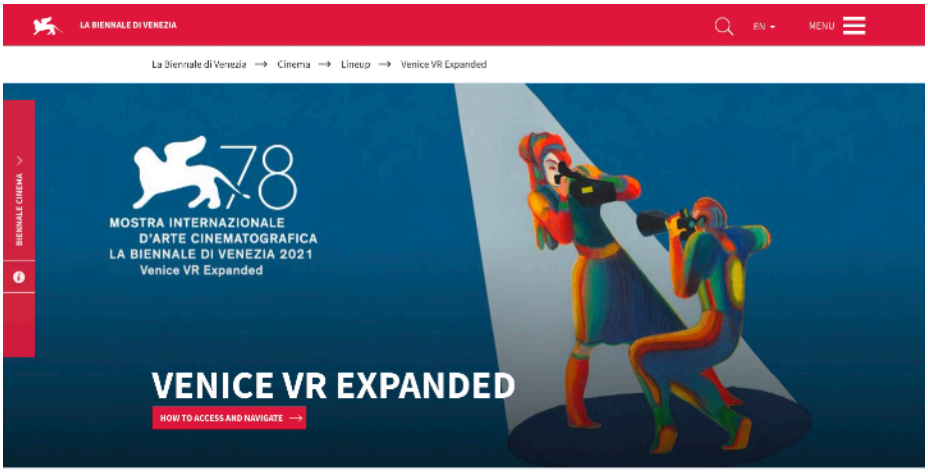
Figure 16 A 360 photo of a farm in Veerhaven, Breskens. Breskens Veerhaven 360 Panorama

Source: Jack Sparrow, Public Domain from PublicDomainPictures.net **Access Date:** 07.01.2022

With this area, 360 video is more persuasive compared to other areas in virtual reality. Not only art but also treatment and therapy industries mainly uses 360 video because of the fact that it is more realistic and persuasive. Being closer to reality means being a better way of persuasion most of the times since reality is what audience is looking for not only in storytelling but also in experiencing. In future, 360 video will be widely used and the indicator of that there are many film festivals showing and marketing it such as Cannes Film Festival and Toronto Film Festival.

By presenting each eye a slightly different version of the same image, stereoscopic methods may generate the sense of depth. Monoscopic video provides the identical image to both eyes, indicating that the brain has no difficulty deciphering the visual, implying that there is no 3D deception. (Cameron et al., 2020, p. 17)

Figure 17 Venice Film Festival VR Content Infotaintment



Source: https://www.labiennale.org/en/cinema/2021/venice-vr-expanded-web-section **Access Date**: 04.02.2022

The shooting and display technology, which has completely differentiated in 360 video, has created its own aesthetics in the process, and 360 film selections have started to take place in major film festivals. (Cannes, Venice, Berlin)

There are two types of virtual reality: cinematic VR and interactive VR. Cinematic VR is more related to filmmaking than gaming, whereas interactive VR is the opposite. Participants in a cinematic VR experience are enclosed in a 360° sphere with just the ability to glance about. Participants in an interactive VR experience can occasionally interact with items and people, pick different scenarios, and move around freely in the area.(Tricart, 2018, p. 2)

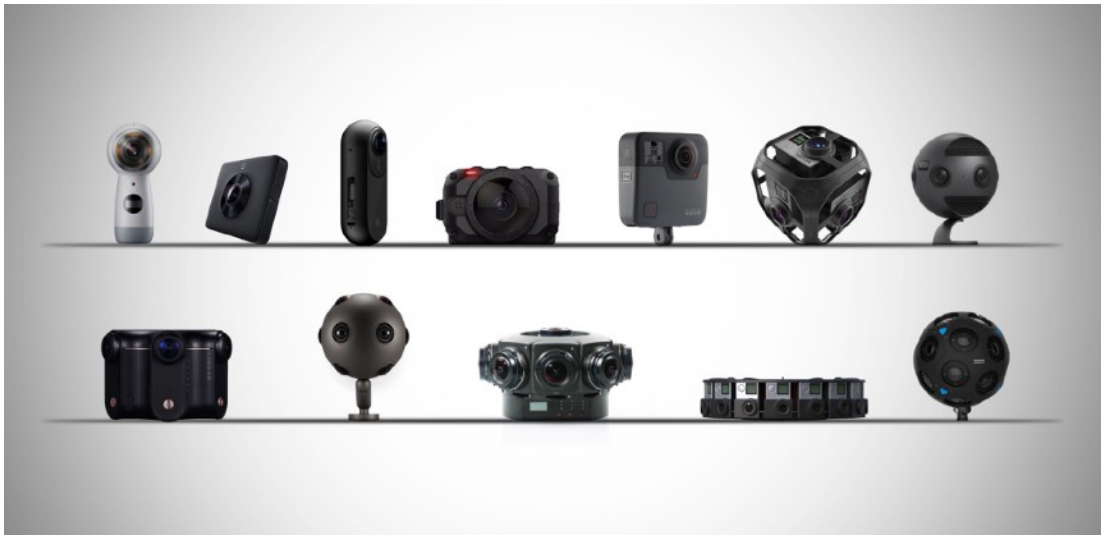
2.2.6. Technical Materials Used in 360 Video

After the 2000's , digital video tecniques and qualities improved dramatically which led to the development of video cameras. Cinema industry mostly turned into a digital production which means using digital cameras rather than 16mm, 35mm or 70mm cameras.

Furthermore, movie theathers leaned more towards digital screening devices such as dcp and Bluray. High speed processors, high capacity hard drives, solid state drives and high performance semiconductors set forward for a high definition image qualaties.

Moreover; 360 video shooting techniques improved after the year 2010 with the investments in virtual reality technology and virtual reality googles. 360 video and virtual reality technology created a new and different perspective for both audience and storytellers.

Figure 18 360 Camera Range in different aspects

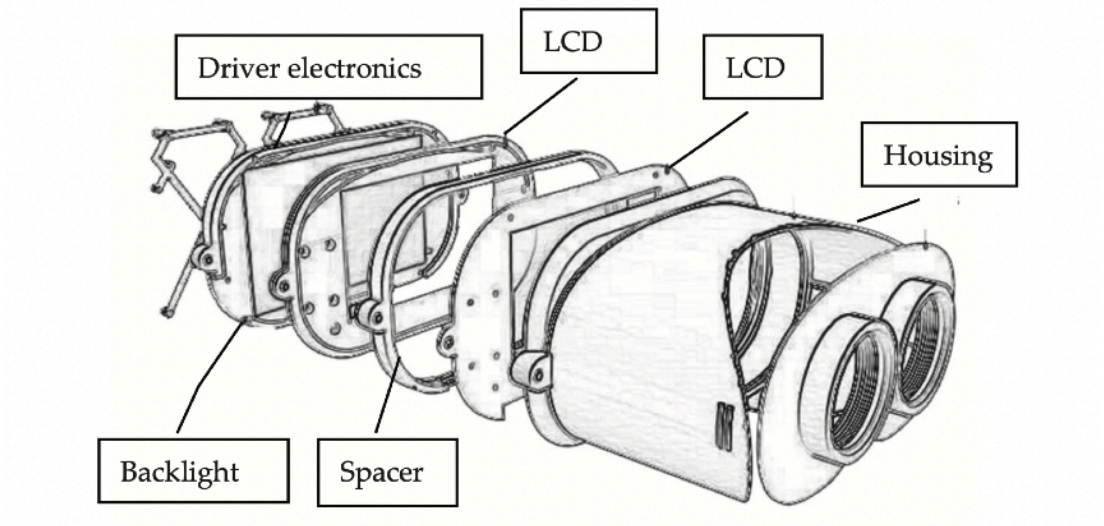


Source: https://www.warpvr.com/blog/the-12-best-360-cameras-for-every-price-range **Access Date:** 08.02.2022

360 Cameras, 360 sound recording devices, virtual reality headsets, 360 video applications and 360 video compatible editing softwares are mainly and widely used in the Virtual Reality 360 Video area.

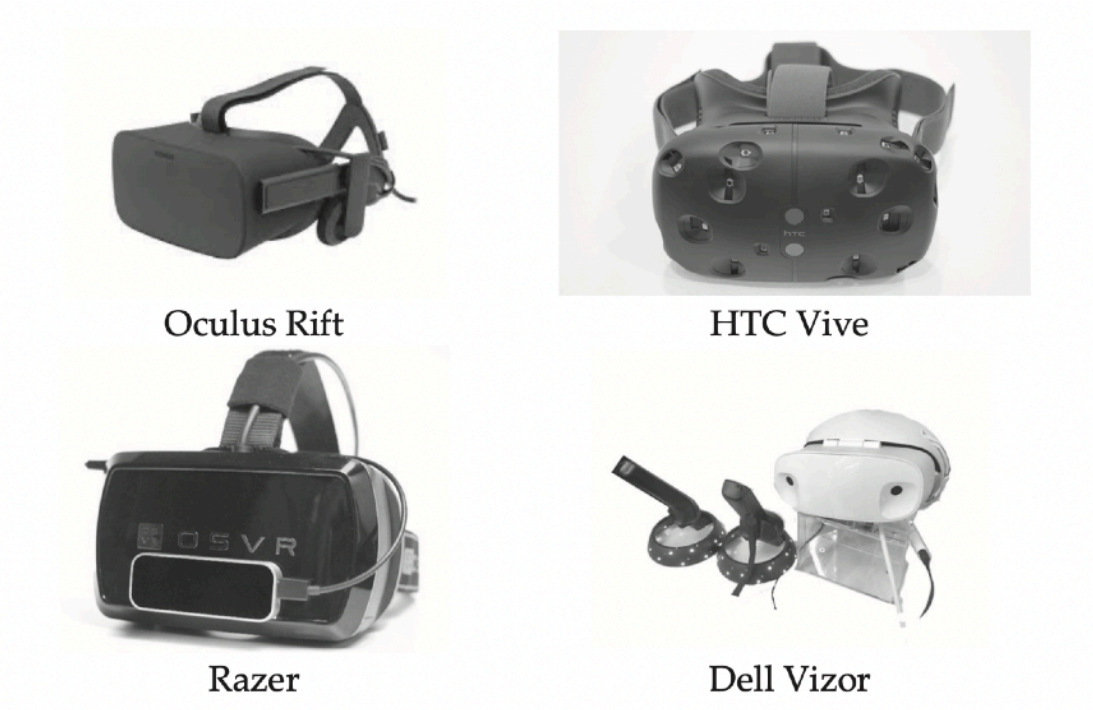
Many brands have taken their place in the market in a very short time with 4K and higher 360 action cameras and high resolution glasses.

Figure 19 Binocular structure of an HMD (2 LCD), adapted from Huang, Luebke, and Wetzstein (2015)



Source: Tacgin (2020) Virtual and Augmented Reality

Figure 20 Different Virtual Reality Goggles in Media Industry which are common

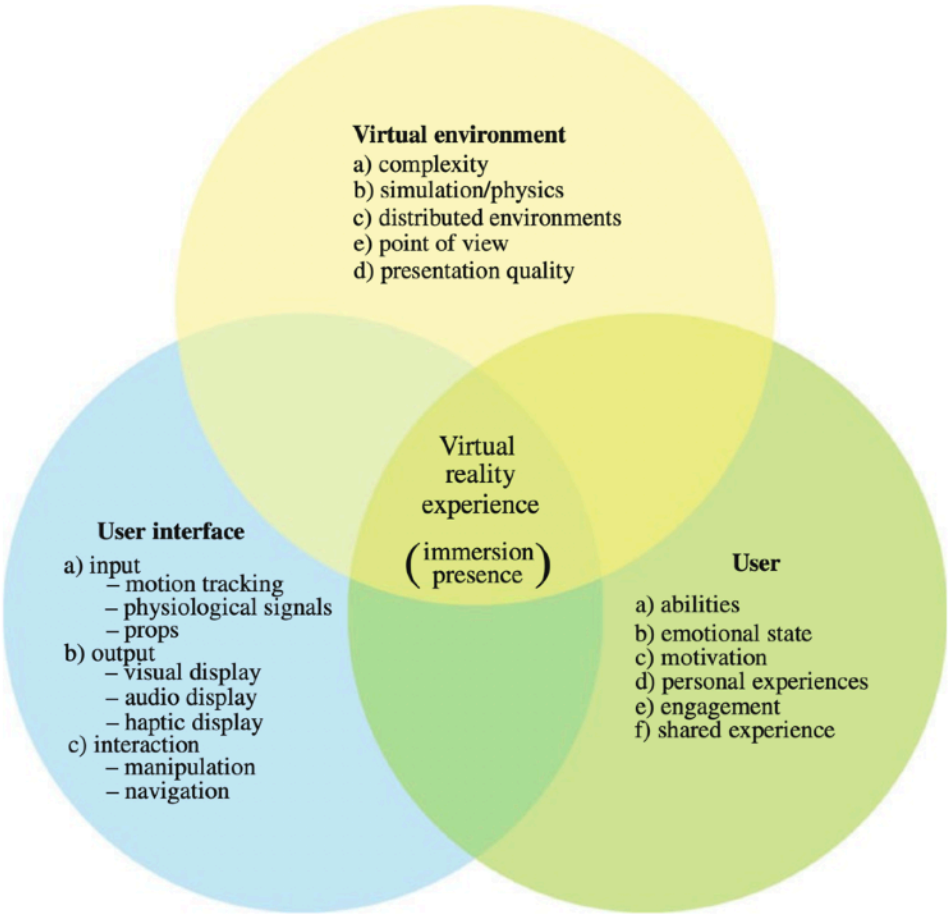


Source: Tacgin (2020) Virtual and Augmented Reality

HMDs have long been regarded as a necessary component of VR technologies' output. Humans' most dominating sense for perceiving their surroundings is sight. HMDs use display technologies to try to surround the user's vision and depict VR content. There are three types of HMDs available today: 1) tethered HMDs, 2) mobile phone integrated HMDs, and 3) stand-alone HMDs are the three types of HMDs available. (Tacgin, 2020, p. 26)

The perception of reality created by 360 video has improved day by day, and audio systems integrated with VR microphones and HD glasses and headphones with spatial sound technology have succeeded in providing an immersive experience.

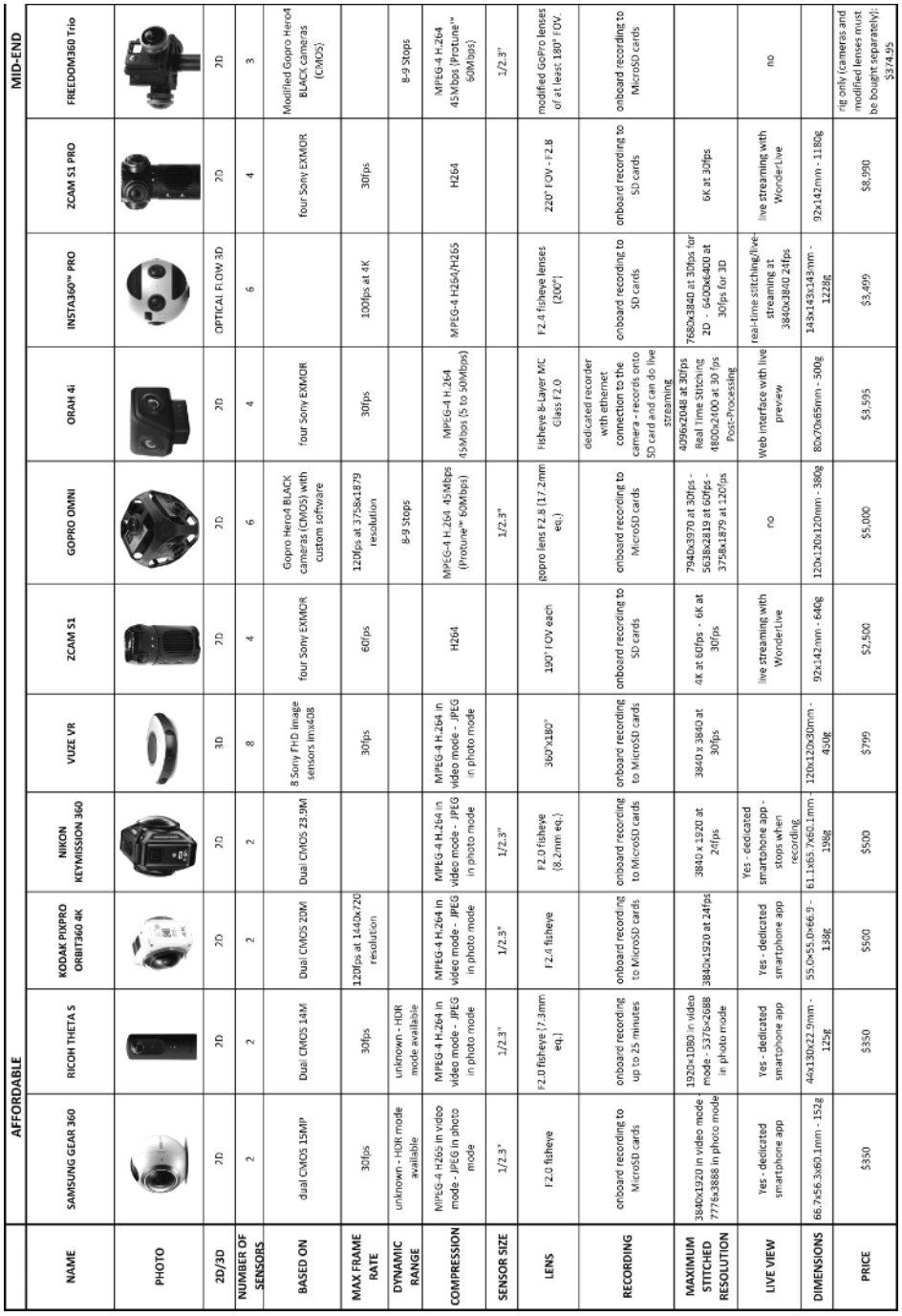
Figure 21 Virtual reality requires the integration of multiple factors—user interface, elements of the virtual world and the user's experiences.



Source: Mihelj et al. (2013) Virtual Reality Technology and Applications (Intelligent Systems, Control and Automation: Science and Engineering)

The specifications of the display systems, optics (lenses), field of vision (FoV), tracking systems (head and eye), motion, latency, frame rate, and other sensors present in the case of the tethered HMD are all connected to the quality of sight perception in the VR world. (Tacgin, p. 27, 2020)

Figure 22 Different Virtual Reality 360 Video Cameras



	AFFORDABLE					MID-END					
NAME	SAMSUNG GEAR 360	RICOH THETA S	KODAK PIXPRO ORBIT360 4K	NIKON KEYMISSION 360	VUZE VR	ZCAM S1	GOPRO OMNI	ORAH 4i	INSTA360™ PRO	ZCAM S1 PRO	FREEDOM360 Trio
PHOTO											
2D/3D	2D	2D	2D	2D	3D	2D	2D	2D	OPTICAL FLOW 3D	2D	2D
NUMBER OF SENSORS	2	2	2	2	8	4	6	4	6	4	3
BASED ON	dual CMOS 15MP	Dual CMOS 14M	Dual CMOS 20M	Dual CMOS 23.9M	8 Sony FHD image sensors imx408	four Sony EXMOR	Gopro Hero4 BLACK cameras (CMOS) with custom software	four Sony EXMOR		four Sony EXMOR	Modified Gopro Hero4 BLACK cameras (CMOS)
MAX FRAME RATE	30fps	30fps	120fps at 1440x720 resolution		30fps	60fps	120fps at 3758x1879 resolution	30fps	100fps at 4K	30fps	
DYNAMIC RANGE	unknown - HDR mode available	unknown - HDR mode available					8-9 Stops				8-9 Stops
COMPRESSION	MPEG-4 H.265 in video mode - JPEG in photo mode	MPEG-4 H.264 in video mode - JPEG in photo mode	MPEG-4 H.264 in video mode - JPEG in photo mode	MPEG-4 H.264 in video mode - JPEG in photo mode	MPEG-4 H.264 in video mode - JPEG in photo mode	H264	MPEG-4 H.264 45Mbps (Protune™ 60Mbps)	MPEG-4 H.264 45Mbps (5 to 50Mbps)	MPEG-4 H264/H265	H264	MPEG-4 H.264 45Mbps (Protune™ 60Mbps)
SENSOR SIZE	1/2.3"	1/2.3"	1/2.3"	1/2.3"			1/2.3"				1/2.3"
LENS	f2.0 fisheye	F2.0 fish-eye (7.3mm eq.)	f2.4 fisheye	F2.0 fisheye (8.2mm eq.)	360°x180°	190° FOV each	gopro lens F2.8 (17.2mm eq.)	Fisheye 8-Layer M/C Glass F2.0	F2.4 fisheye lenses (200°)	220° FOV - F2.8	modified GoPro lenses of at least 180° FOV.
RECORDING	onboard recording to MicroSD cards	onboard recording up to 25 minutes	onboard recording to MicroSD cards	onboard recording to MicroSD cards	onboard recording to MicroSD cards	onboard recording to SD cards	onboard recording to MicroSD cards	dedicated recorder with ethernet connection to the camera - records onto SD card and can do live streaming	onboard recording to SD cards	onboard recording to SD cards	onboard recording to MicroSD cards
MAXIMUM STITCHED RESOLUTION	3840x1920 in video mode - 7776x3888 in photo mode	1920×1080 in video mode - 5376×2688 in photo mode	3840x1920 at 24fps	3840 x 1920 at 24fps	3840 x 3840 at 30fps	4K at 60fps - 6K at 30fps	7940x3970 at 30fps - 5638x2819 at 60fps - 3758x1879 at 120fps	4096x2048 at 30fps Real Time Stitching 4800x2400 at 30 fps Post-Processing	7680x3840 at 30fps for 2D - 6400x6400 at 30fps for 3D	6K at 30fps	
LIVE VIEW	Yes - dedicated smartphone app	Yes - dedicated smartphone app	Yes - dedicated smartphone app	Yes - dedicated smartphone app - stops when recording		live streaming with WonderLive	no	Web interface with live preview	real-time stitching/live-streaming at 3840x3840 24fps	live streaming with WonderLive	no
DIMENSIONS	66.7x56.3x60.1mm - 152g	44x130x22.9mm - 125g	55.0x55.0x66.9 - 136g	61.1x65.7x60.1mm - 198g	120x120x30mm - 450g	92x142mm - 640g	120x120x120mm - 380g	80x70x65mm - 500g	143x143x143mm - 1228g	92x142mm - 1180g	
PRICE	$350	$350	$500	$500	$799	$2,500	$5,000	$3,595	$3,499	$8,990	rig only (cameras and modified lenses must be bought separately): $374.95

Source: Tricart (2018) Virtual Reality Filmmaking

Although 360 Video cameras are produced with very different techniques and features according to their usage areas and places of use, they are all designed to capture 360 degree moving images in the area where they are located. The number of cameras on them, their resolution, wired sound, ability to transfer images and being suitable for live broadcasts cause them to be in very different price ranges.

Figure 23 Different Virtual Reality 360 Video Cameras in Various Range

	PROFESSIONAL										
	FREEDOM360 Classic	360DESIGNS Mini EYE™ 4	360RIZE Pro10HD v2	360RIZE 3DPRO	360RIZE 360Orb	FACEBOOK SURROUND 360	GOOGLE ODYSSEY	NOKIA OZO	YI HALO	JAUNT ONE	Underwater: 360RIZE 360SeaDak (up to 130 meters underwater)	Underwater: KOLOR ABYSS (up to 150 meters underwater)
Number of Cameras	2D	2D	2D	3D	3D	OPTICAL FLOW 3D	OPTICAL FLOW 3D	PARTIAL 3D	OPTICAL FLOW 3D	OPTICAL FLOW 3D	2D	2D
Number of Microphones	6	4	10	14	24	17	16	8	17	24	2	6
Camera Sensor	Gopro Hero4 BLACK cameras (CMOS)	Blackmagic Micro Cameras	Gopro Hero4 BLACK cameras (CMOS)	Gopro Hero4 BLACK cameras (CMOS)	Gopro Hero4 BLACK cameras (CMOS)	Point Grey GS3-U3-41C6C-C (CMOSIS CMV4000-3E5 CMOS)	Gopro cameras with custom software	2kx2K CMOS	17 SONY IMX377, 12 megapixels CMOS image sensor with Exmor R ability		two KODAK PIXPRO SP360 4K cameras (12MP 1/2.33" BSI CMOS Sensors)	Gopro Hero4 BLACK cameras (CMOS)
Frame Rate	100fps	60fps	120fps	120fps		30fps	30fps	30fps	60fps	120fps	60fps	100fps
Dynamic Range	8-9 Stops	11 stops	8-9 Stops	8-9 Stops	8-9 Stops		8-9 Stops	8 stops		10 stops		8-9 Stops
Video Format	MPEG-4 H.264 45Mbps (Protune™ 60Mbps)	RAW SDI output	MPEG-4 H.264 45Mbps (Protune™ 60Mbps)	MPEG-4 H.264 45Mbps (Protune™ 60Mbps)	MPEG-4 H.264 45Mbps (Protune™ 60Mbps)	RAW 8bits	MPEG-4 H.264	MOV wrapped OZO files - Wavelet-based raw	MPEG-4 H.264	MPEG-4 H.264	MPEG-4 H.264	MPEG-4 H.264 45Mbps (Protune™ 60Mbps)
Sensor Size	1/2.3"	13.056mm x 7.344mm	1/2.3"	1/2.3"	1/2.3"	1"	1/2.3"		1/2.3"	1/1.2"	1/2.33"	1/2.3"
Lens	gopro lens F2.8 (17.2mm eq.)	custom lens package	gopro lens F2.8 (17.2mm eq.)	gopro lens F2.8 (17.2mm eq.)	gopro lens F2.8 (17.2mm eq.)	Sunex DSL3188-650 F2.4 (7mm eq.)	gopro lens F2.8 (17.2mm eq.)	F4 fisheye lens	F2.8 aperture / 155° wide-angle lens, 7G, f=2.66±5%mm	130° lenses F2.9	kodak lens F2.8 (8.2mm eq.)	gopro lens F2.8 (17.2mm eq.)
Storage	onboard recording to MicroSD cards	RAW SDI output to external recorder	onboard recording to MicroSD cards	onboard recording to MicroSD cards	onboard recording to MicroSD cards	records on a separate device	onboard recording to MicroSD cards	onboard recording to OZO Media Module (500GB SSD)	onboard recording to MicroSD cards	onboard recording to SD cards	onboard recording to MicroSD cards	onboard recording to MicroSD cards
Video Resolution	5600x2800 at 24, 25, 30 and 48 fps - 3600x1800p at 48 and 100 fps	3K or 6k stitched output (Micro Cinema Camera or Micro Studio Camera)	12000 x 6000 at 24fps - 3840 x 3840 at 1200fps	8000x4000 at 30fps (2D) - 3600x1800 at 120fps (2D)	up to up to 32000 x 16000 (2D)	up to 8Kx8K	up to 8192 x 8192	up to 4096x2048	up to8K at 60fps, 5K at 60fps	up to 8Kx8K	4000 x 2000	7500 x 3750
Weight	no	no	no	no	no	Yes - live view of 4 cameras - not available while recording	no	Yes, in low resolution	Yes - live view of 4 cameras in Android app - not available while recording	no	no	no
Dimensions	100x100x100mm - rig only: 85g	300x300x100mm - 3175g with cameras	rig only: 265g	rig only: 267g			294.6x65.8mm - 650g	264x170x160mm - 4200g	192x287x287mm - 3500g	10666g		250x250x250mm - 3700g
Price	rig only (cameras must be bought separately): $499.95	rig+micro cinema cameras: $14,599 - rig+micro studio cameras: $15,799	rig only (cameras must be bought separately): $560	rig only (cameras must be bought separately): $999.95	rig only (cameras must be bought separately): $1,770.00	open source design available on Github - cost approx $30,000 to build	for rent only	$45,000	for rent only	for rent only	rig only (cameras must be bought separately): $1,495.00	rig only (cameras must be bought separately): $5,449.00

Source: Tricart (2018) Virtual Reality Filmmaking

Since the increase in the number of cameras on them prolongs the assembly processes in post-production, the two cameras and waterproof features come to the fore, especially in the models that are also used as action cameras. Improving the lightness and long-lasting charging capabilities of 360 cameras is also among the permanent goals of 360 camera manufacturers.

Figure 24 Different Virtual Reality 360 Video Cameras for Special Uses

SPECIAL USES				
Underwater: 360RIZE 360Abyss™ v4 (up to 1000 meters underwater)	**Underwater: VRTUL1 (up to 100 meters underwater)**	**Low Light: DARK CORNER RIG**	**POV: AXA POV**	**Waterproof: FREEDOM360 EXPLORER**
2D	3D	2D	2D	2D
6	9	4	7	6
Gopro Hero4 BLACK cameras (CMOS)	Blackmagic Micro Studio 4k	4 Sony A7S MKII (35 mm full frame Exmor® CMOS sensor)	compatible with Sony UMC-S3C, Blackmagic Micro, ZCAM E1 & C1, Gopro Hero4, etc.	Gopro Hero4 BLACK cameras (CMOS)
100fps	29.97fps	60fps	depends on camera	100fps
8-9 Stops	11 stops	12 stops	depends on camera	8-9 Stops
MPEG-4 H.264 45Mbps (Protune™ 60Mbps)	10 bit ProRes 422 (HQ)	MPEG-4 AVC/H.264 (100Mb)	depends on camera	MPEG-4 H.264 45Mbps (Protune™ 60Mbps)
1/2.3"		35 mm full frame (1.40 x 0.94 in)	depends on camera	1/2.3"
gopro lens F2.8 (17.2mm eq.)	F1.8 2.7mm circular fisheye	fisheye lenses (Canon 8-15mm or rokinon 8mm for example)	depends on camera	gopro lens F2.8 (17.2mm eq.)
onboard recording to MicroSD cards	4x Convergent Design Apollo and 1x Odyssey 7Q+ for a total of 9 UHD recordings	onboard recording to SD cards	depends on camera	onboard recording to MicroSD cards
8000 x 4000	5.4K		depends on camera	
no	yes	no	no	no
250x250x250mm - 2629g	807x440x440mm - 45kg		rig only: 1800g	110x110x110mm - 270g
rig only (cameras must be bought separately): $5,985.00	$25-30k - rental available	for rent only	for rent only	rig only (cameras must be bought separately): $674.95

Source: Tricart (2018) Virtual Reality Filmmaking

In addition, 360 video cameras are produced for special purposes such as underwater research, security, mapping and astronomy, apart from content such as art, design, education and treatment.The usage patterns of all these cameras bring along a very different training and familiarization process for traditional video content producers.

2.2.7. The Possible Future of 360 Video

The investments which are made in the 360 Video and Virtual Reality industry defines the opportunities in the area. Main investors are high valued companies such as Facebook, HTC, Sony, Samsung and Google. Newly developed compatible devices are able to enter into the metaverse. Metaverse is a new form of platform in which humans create avatars and lives virtually.

Human beings are capable of doing many activities which they want to do in that universe. Kids utilize devices such as Playstation VR and it’s applications and they adapt early on. Adults utilize virtual reality projection devices such as Oculus VR in order to enter into metaverse which contains many different applications and games. In near future, 360 video will be one of the most powerful storytelling devices with the help of constantly improving high quality, user friendly headsets and ultra high definition cameras.

We can now effortlessly watch 360 video material on our desktop computers or smartphones. However, we may utilize a headset or head-mounted device for a far more immersive experience (HMD). These wearable eyewear can help filter out ambient distractions, enabling the user to fully immerse themselves in the 360 material and feel the sensation of presence. (Cameron et al., 2020, p. 15)

Because of the fact that the whole area becomes the image during shooting in 360 video cameras, there is no part called behind the camera since it sees everywhere. The use of virtual reality headsets instead of the screen in the viewing experience, and the head movements take on a different function in scanning that area corresponds the viewing angle of the headsets takes the place of framing in the composition.

Headsets, on the other hand, are required for enjoying the next level of immersive video, 360-3D and virtual reality. Whether or not you've used a 360 camera before, possibly you've seen some 360 video or virtual reality material, possibly on YouTube or Facebook. It's critical to recognize that 360 video, 3D video, and virtual reality (VR) are all unique formats. (Cameron et al., 2020, p. 16)

2.3. TECHNICAL AND AESTHETIC COMPARISON OF 360 VIDEO AND TRADITIONAL VIDEO

Differences in technical and aesthetic aspects in 360 video and regular video are evident in all processes from script writing to post production and watching experience.

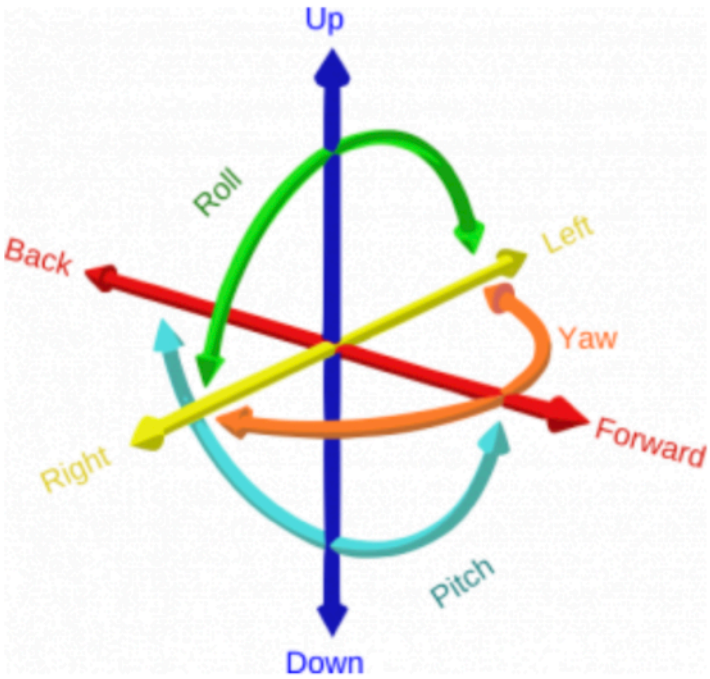
When comparing traditional filmmaking approaches to the possibilities of virtual reality filmmaking, the limits of VR are still apparent. Similarly, there are a slew of new options and ways for telling stories in virtual reality. From an artistic standpoint, it appears that we do not need to discover a successor for every traditional filmic approach. Instead, VR filmmakers should aim to come up with an entirely new approach to VR narrative. In the end, the true difficulty is to create an unforgettable experience for the spectator that allows him to immerse himself in a tale and its virtual environment, not to invent a new manner of editing, framing, or other traditional filmic tools. (Gödde et al., 2018, p. 20)

How they connect with what they're viewing or how they engage with the information is referred to as degrees of freedom (DoF). There are six degrees of freedom because there are six main ways a solid object may move through three-dimensional space.

Pitch, yaw, and roll are three degrees of freedom that correspond to rotational motions around the x, y, and z axes. In other words, you can gaze forwards and backwards, side to side, and shoulder to shoulder if you use a VR headset with 3DoF (three degrees of freedom). (Cameron et al., 2020, p. 19)

Moving freely in the Virtueal Reality headsets suchs as Oculus Rift S, creates this unique feeling of Degrees of Freedom which is also experienced in real life. When 6 Degrees of freedom used within the headsets which are only possible in advanced devices, the sensation of reality increases.

Figure 25 The movements one can experience using a virtual reality headset.



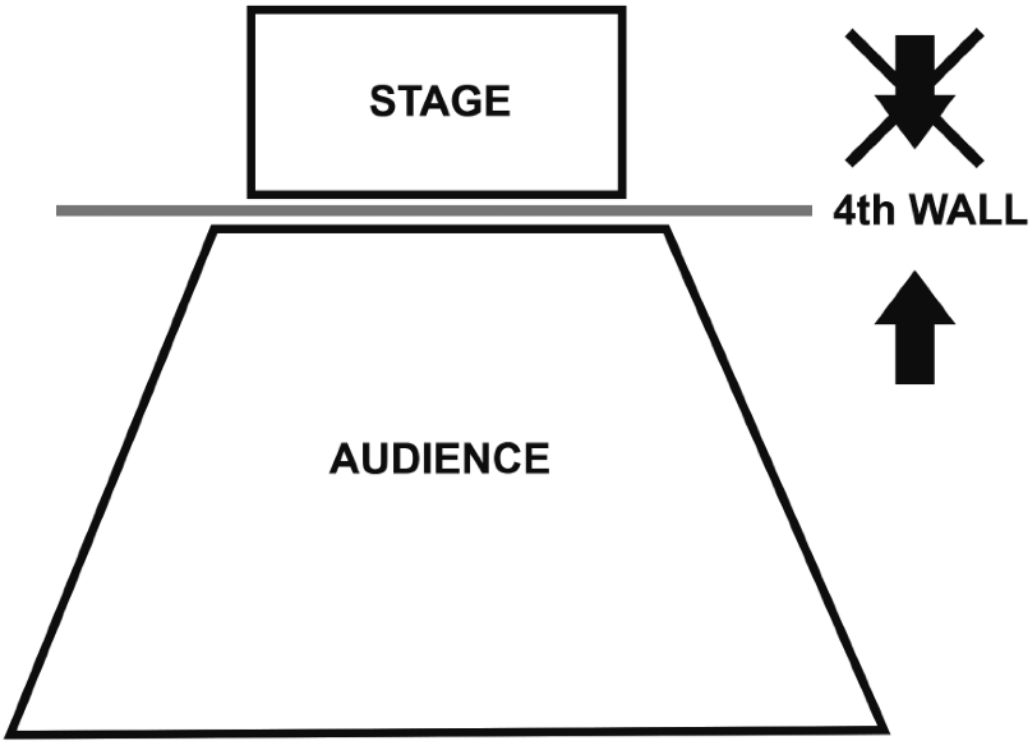
Source: Gregor DS licensed under a CC BY-SA 4.0 license via Wikimedia Commons

2.3.1. Pre Production Stage of 360 Video vs Traditional Video

The traditional scene and shot plan structure method, which is included in the regular video script writing technique in the pre-production stage, is not present in the 360 video. Instead, a structure based on the placement preferences of the camera and actors in accordance with the 360-degree imaging technology is present.

The space plays important role in the 360 video scenario. During the shooting space research, this structure emerges as one of the main differences of 360 video and becomes the most important element in place preferences.

Figure 26 The 4th wall



Source: Tricart (2018) Virtual Reality Filmmaking

It's crucial to pick the camera's location (and hence the participants' position) carefully when generating a sense of presence. When shy participants, for example, find themselves on stage in front of an audience, they are likely to feel uneasy and anxious. If you wish to avoid this, make sure your audience members are aware of the story's context and the reason for their attendance. When setting up a scene, the director might look at a few rehearsals and examine where he or she would naturally place himself to get the desired impact to discover the optimal camera position. The camera may then be placed exactly where it needs to be.(Tricart, 2018, p. 96)

The distance of the actor from the camera plays an imporant role in establishing the human-space relationship. The viewer's preference to be in the space, to witness and to look wherever he/she wants, has different effect compared to power of close-up shots in traditional narration. In storytelling and conveying emotion both 360 video and regular video plays different roles in terms of how they do it.

Figure 27 In VR, there is no 4th wall

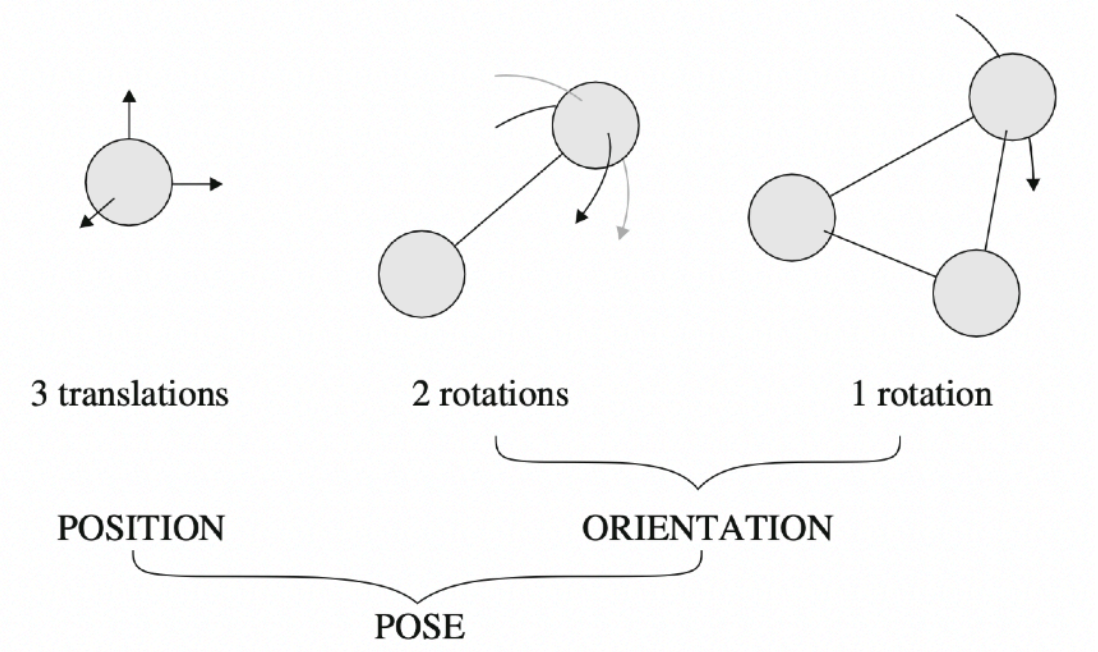
Source: Tricart (2018) Virtual Reality Filmmaking

Things are really different in virtual reality. The players occupy a major role in the plot, which unfolds around them. Because there is no such thing as a "fourth wall," participants normally expect to be acknowledged. This is why the "first-person" approach is so popular in virtual reality. Within the "first-person" domain, there are many levels of agency. When the participant takes an active and essential position in the tale, it becomes more powerful. This is true for the majority of VR games. Then there's "audience-aware" storytelling, in which the audience is acknowledged but not allowed to engage. In Randal Kleiser's "Defrost," for example, all of the characters stare the player in the eyes, and the tale unfolds in the same way no matter what the person does.(Tricart, 2018, p. 98)

2.3.2. Production Stage of 360 Video vs Traditional Video

A concept defined as "Behind the Scenes" in Traditional Production and consisting of employees such as the Cinematographer, the Director, the Directors team, the sound team, and the set staff, are positioned in completely different places in 360 video. Everything in this area is part of the game, as the camera views its entire surroundings. Furthermore; the duration of the plans in this vast area should be considered much longer. The audience needs more time to be able to perceive the decor and objects of the actors and convey the emotion. The light design is also planned with a completely different system, since the light systems cannot be hidden behind the camera, and mostly the times when the natural light of the place is suitable are preferred.

Figure 28 Degrees of freedom of a rigid body



Source: Mihelj et al. (2013) Virtual Reality Technology and Applications (Intelligent Systems, Control and Automation: Science and Engineering)

Two circles resembling meridians and latitudes on a globe define its location on the sphere. Rotation is the displacement along a circular line (R). The third mass particle is introduced in such a way that the distances between the first two particles are maintained constant. In this approach, the third particle might travel around the axis

set by the first two particles in a circle, similar to an equator. As a result, a rigid body has six degrees of freedom: three translations and three rotations.(Mihelj et al., 2013, p. 12)

The glasses technology used in this immersive experience, where the perception of reality is very high, usually completely isolates the viewer from the real world. It takes a long time for the sense organs to adapt to the medium, during which the centers related to hearing and balancing, especially our sense of sight, prepare themselves according to this experience. Motion sickness, mild dizziness, nausea and acceleration in heart rhythm, which are seen at first, return to normal in a short time. In a sense, the body learns to live this experience in a very short time and becomes ready.

Because VR encompasses the entire scene in 360 degrees, traditional cinematic framing is no longer viable. The FOV and the viewing direction define the framing. With the viewer's head movement, the latter changes constantly. The human field of vision normally limits the human FOV, although contemporary HMDs restrict the FOV to roughly 110 degrees. This approximates the binocular area of view in which stereopsis allows us to experience depth.(Gödde et al., 2018, p. 9)

According to the interview with VR content developer and Dokuz Eylul Universty academic staff Markus Berger “cinematography is an important subject. Of course you don't have a specific frame as you have in regular video. The person viewing is finding the frame at the time of viewing. I guess you need to find different ways to direct the attention of the viewer. Because you can't say, look at this. You have to find a way to tell the person to look right since something important is coming from there. Also connected to cinematography is camera movement. Tilt and pan are basically done by rotating the head. Moving the camera can be pretty tricky, because in handheld camera whoever has watched 360 video know the experience. Handheld moving 360 video can in handheld position could be quite challenging sometimes. That is called motion sickness, simulation sickness. You need be careful about how you move the camera.”(M.Berger, personal communication, February 2, 2022).

2.3.3. Post Production Stage of 360 Video vs Traditional Video

The most expensive and difficult component of the VR post-production process is without a doubt the post-production. Depending on the camera system utilized, stitching might be somewhat costly. Because most post software solutions are now compatible with VR, the rest of the post procedure is similar to "conventional" 2D. Keep in mind that VR is a rapidly growing medium, therefore testing your intended post workflow before beginning production is critical. Request sample video from the VR camera you intend to use from your camera rental company and "post-produce" it from beginning to end. You'll learn some important principles that might save you a lot of money in the long run. (Tricart, 2018, p. 32)

Because such experiences do not exist in reality, jumps in space and time shatter the absorption and sense of presence. It is desirable to prevent cuts in a VR video, especially if the impression of presence is important. There are, however, methods for guiding the spectator more instinctively from one scene to the next. Crossfades and black fades are a safer way to change the scene. The spectator will be able to anticipate the shift in this manner. They do, however, have drawbacks in that they slow down the pace and often mark a shift between two scenes. (Gödde et al., 2018, p. 9)

The video from all the cameras (or, in the case of the quadrant approach, the several takes of the same camera) is stitched together to produce a 360° sphere. Depending on the number of cameras to stitch, the kind of deliverable (two-dimensional or three-dimensional), and the closeness of foreground objects/characters, the procedure might get complicated.(Tricart, 2018, p. 32)

The main difference in the post-production stage is that instead of the technique of connecting the plans in the traditional structure, the image is perceived and selected from the screen as deformed by the editor and the director during 360 editing, in a sense, the scenes are mostly added to each other. The exact final results that will reach the audience during the editing process can only be seen after the viewing tests with glasses.

Traditional editing tools such as Avid, Premiere Pro, and Final Cut Pro may be used to cut VR footage. Premiere Pro CC 2017 now has a set of basic virtual reality features, including a VR player. Because the final VR files are frequently too huge to play in real time, it's recommended to modify proxies. It's standard industry procedure to start with a 2K rough stitch, tweak it, and then upload the final high-resolution stitch. Because proper stitching is expensive and should only be done on the final cut, this is a fantastic approach to save time and money.(Tricart, 2018, p. 34)

Because of the ease of content generation, sharing, and accessibility, interactive 360° panoramic video is the most popular VR application form. Unity (Skybox Panorama Shader) and Unreal Engine both feature free 360° video plugins that don't require any scripting. Furthermore, several video editing software offer 360° video creation, and a number of web-based authoring tools have been made available to end-users. (Tacgin, 2020, p. 58)

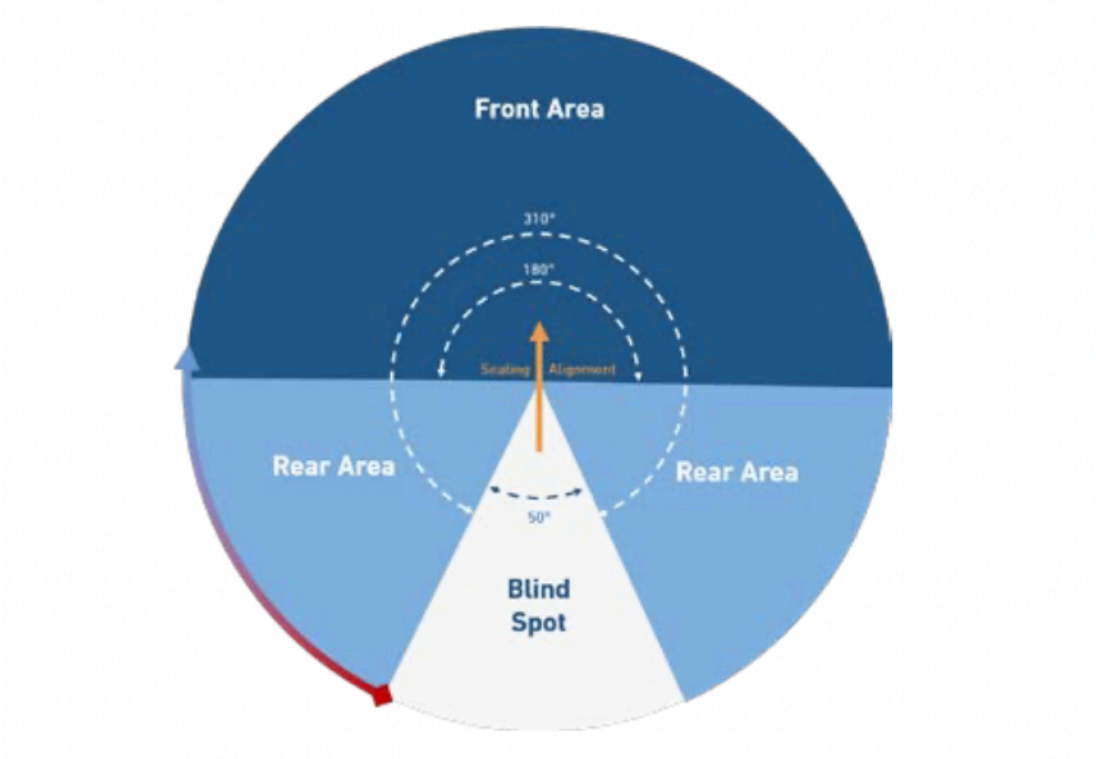
According to the interview with VR content developer and Dokuz Eylul Universty academic staff Markus Berger “when you watch a regular film the camera stays in the same environment jumps from place to place. You wouldn’t do that in 360 probably. You would stay or slowly move from one place to another. Again the viewer is constantly finding the most interesting subjects by themselves in 360 video. In my experience in the editing we did dull editing with long shots. It might be hard to really have like a fast pace editing in 360 video.” (M.Berger, personal communication, February 2, 2022).

To make the process of constructing the final 360° sphere easier, utilize the same cameras, lenses, and settings while recording 360° live action. "Stitching" is the term for this procedure. During stitching, video from all of the cameras (or, in the case of the nodal approach, many captures of the same camera) is combined to generate a complete depiction of the surrounding world. (Tricart, 2018, p. 19)

2.3.4. Viewing Experience in 360 Video vs Traditional Video

The audience, who is accustomed to seeing the area that the director wants to show on the screen, within the time determined by him, finds himself in a place where there are many different angles to look inside the scene in the 360 video experience.

Figure 29 Extended staging for seated VR-viewers

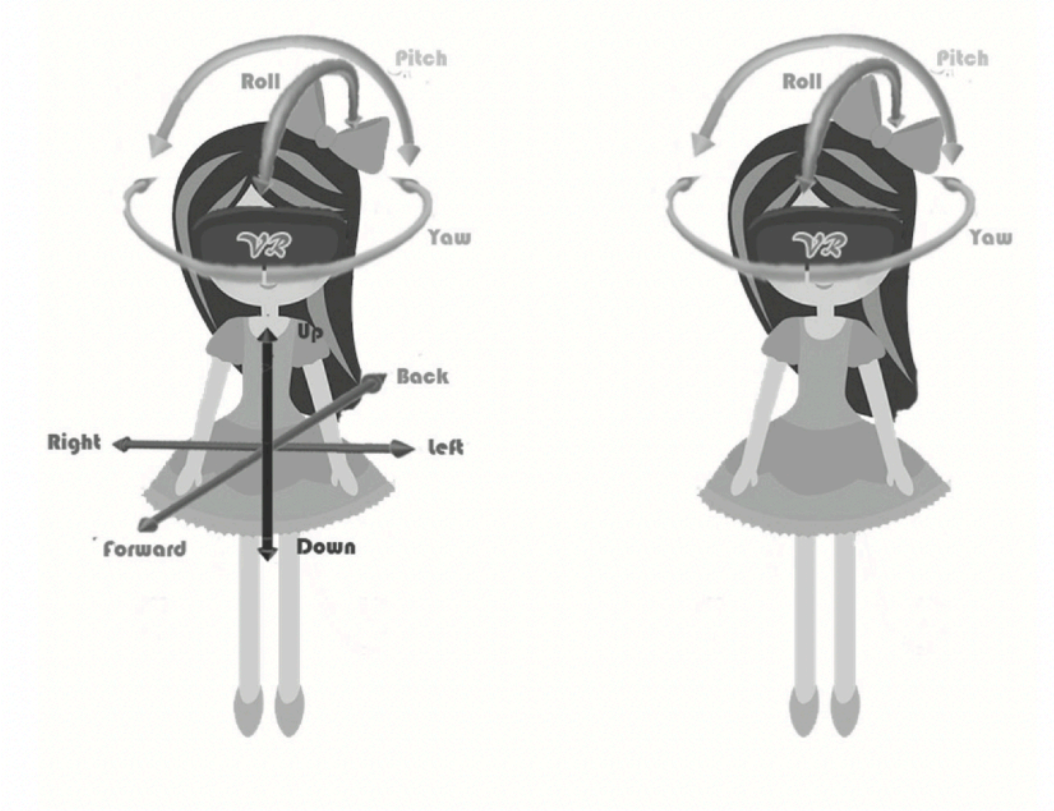


Source: Gödde et al. (2018) Virtual, Augmented and Mixed Reality: Applications in Health, Cultural Heritage, and Industry

Story pieces can be put at any moment in the front 180-degree. The closer the components are to the back (blind spot), the shorter they should stay. As a result, the plot's most important events should take place in the front. Secondary plot components, on the other hand, can and should be scattered throughout the scene. Standing spectators will be able to fully appreciate the possibilities of 360-degree spatial storytelling in VR, while seated viewers will not have to crane their necks to follow the tale.(Gödde et al., 2018, p. 7)

The interaction that can be created in movies creates the opportunity for gamification and personalization in storytelling, while ensuring the uniqueness of the content in every viewing.

Figure 30 6DOF vs 3DOF



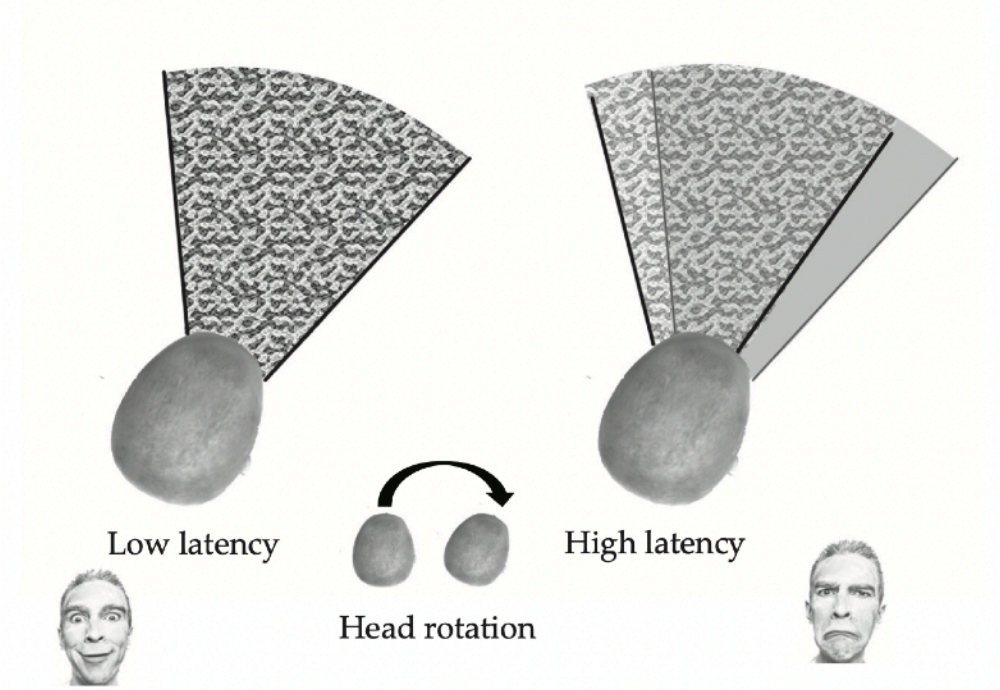
Source: Tacgin (2020) Virtual and Augmented Reality

For a high-quality VR display, latency and frame rates are critical. Low latency speed improves the quality and harmony of the display while also reducing delays in monitoring the user's visual movements.(Tacgin, 2020, p. 28)

According to the interview with VR content developer and Dokuz Eylul Universty academic staff Markus Berger “when 360 video came out everybody tried to shoot everything in 360. Watching something mediocre in 360 doesn't make it less mediocre. For example in one video where we tried to emulate schizophrenic hallucinations we got some big reactions from people. It was the one where we had a plant turning into a snake and coming towards the camera. There was one woman afraid of snakes and it was almost a traumatic experience for her. Also another video we created an ambience where there was a bedroom. All of a sudden everywhere

becomes blood in 360 video and I remember when people watched it, some people had a faster heart rates after and while watching the experience.**”** (M.Berger, personal communication, February 2, 2022).

Figure 31 Latency and other effects on VR



Source: Tacgin (2020) Virtual and Augmented Reality

The most innovative approach 360 video has created in storytelling includes an immersive experience that can be defined by the feeling of letting the audience into the space, right in the middle of the events. Watching this experience in isolation from external influences with a very strong concentration strengthens the transfer of emotion. The most important point that needs to be developed here is that glasses become widespread as a result of increasing and decreasing resolutions and reducing their costs.

2.3.5 Sound Design in 360 Video vs Traditional Video

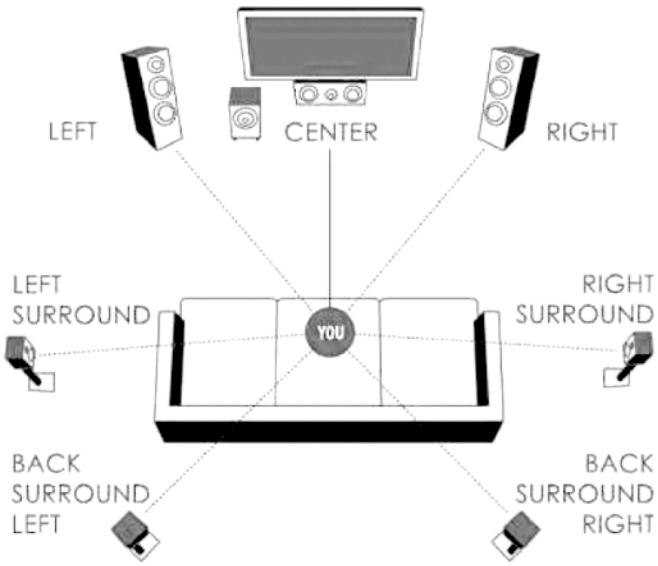
In 360 video, the surrounding effect of the sound is combined with the power of the image, at least 4 channels of sound recorded by the VR microphones of the recording stage in the space and the effects added in the editing to increase the immersive

effect on the audience. The visual effect of the sense of distance from the camera is also supported by the sound.

"Spatial" is the de facto standard audio format for VR sound. Spatial audio includes a 360° sound sphere that mirrors the visual sphere, with directed sounds linked to specific visual objects. Spatial audio, when used correctly, may serve to immerse the user in the VR environment and make it more convincing and captivating. The usage of an ambisonic microphone at the camera location and lavalier microphones to record main conversation is a widely established method for recording sound for a VR project. Additional microphones are sometimes concealed in the area to record any desired noises. (Tricart, 2018, p.40)

The audio component of VR is powerful, and the technology exists to bring high fidelity audio experiences into VR. Developers of VR systems tend to focus primarily on the vision part because vision is our strongest sense; however, the audio component of VR is powerful, and the technology exists to bring high fidelity audio experiences into VR. Audio is essential to art, entertainment, and vocal communication in the real world.(LaValle, 2019, p. 317)

Figure 32 In a surround-sound system, the aural displays (speakers) are world- fixed while the user listens from the center.



Source: LaValle (2019) Virtual Reality

Figure 33 Using headphones, the displays are user-fixed, unlike the case of a surround-sound system.

Source: LaValle (2019) Virtual Reality

Spatialized audio gives the listener a feeling of where sounds are originating from in three dimensions. Speakers can be stationary or move with the user's head. For a totally immersive experience, headphones are ideal because they filter out more of the outside world.(Jerald, 2015, p. 34)

What are the main distinctions? Aside from the apparent mobility of headphones, the following spring to mind right away: The created sound (or stimulus) with a surround-sound system is far away from the ears, but it is fairly close in headphones. When compared to distant speakers, the difference in distance means that substantially less power is required for headphones to create a comparable perceived loudness level. The degree of privacy allowed by the wearer of headphones is another implication depending on distance. (LaValle, 2019, p. 44)

2.3.6. Focus in 360 Video vs Traditional Video

The 360 video experience is a form in which the audience can keep the interest level at the highest level as a result of the application technique. VR Glasses isolates the experiencer from the outside world completely audio-visually, which maximizes the focus during the experience. 360 video allows him to witness the content from beginning to end with maximum concentration, while at the same time re-editing the content with his head movements, bringing a new perspective every time he watches it, realizing and making sense of what he did not see in the previous experience in the next.

Virtual reality headsets are mass-produced and worn by millions of people. In many respects, this trend is comparable to the home computer and web browser revolutions: as more people have access to technology, the range of things they can do with it expands dramatically.(LaValle, 2019, p. 9)

It takes more than just presenting material to create a completely immersive VR experience. The more a person physically interacts with a virtual environment in natural ways with his own body, the more engaged and present he feels in that virtual world. Although virtual reality interactions need both hardware and software to function in concert in complicated ways, the best interface strategies are simple and straightforward to use. When creating experiences, designers must consider input device capabilities—one input device may work well for one form of interaction but not for another.(Jerald, 2015, p. 43)

Figure 34 Screenshots of the 360° storytelling scenes in the archaeological VR application.

Source: Gödde et al. (2018) Virtual, Augmented and Mixed Reality: Applications in Health, Cultural Heritage, and Industry

360 camera recordings were used to generate the intro tale, and 360 renderings from 3D sceneries were composited with actor recordings against a green screen background for the rest of the program. The tale of the property's fictional owner, Gaius Vibius Sabinus, an aristocrat from a powerful Roman family, enriches the interactive tour of the archaeological site. He owns the home as well as a portion of the Baiae beach on the Lacus Baianus, where he relaxes with his family and friends. He is an avid collector of both original and well-done replicas of Greek art. Heliodorus, a local artist and copyist, and his student Saturninus pay a visit to the aristocrat in his villa to discuss his plans to buy a statue.(Gödde et al., 2018, p. 7)

Figure 35 Recording of actors for the 360˚ VR storytelling (a written consent for the publication of the photos has been obtained from the actors)

Source: Gödde et al. (2018) Virtual, Augmented and Mixed Reality: Applications in Health, Cultural Heritage, and Industry

When the viewer is allowed to look around while watching the tale via HMD-mediated VR video, the principles of shot composition and staging from film language grammar no longer apply. Saturninus pay a visit to the aristocrat in his villa to discuss his plans to buy a statue.(Gödde et al., 2018, p. 7)

3. IMPLEMENTATION AND PROJECT PRODUCTION

3.1 OVERVIEW

This section, which aims to experience the differences between 360 and Traditional Video in the theoretical parts of the study, in two short documentary projects that I produced simultaneously with applied and comparison, and to measure the effect it has on the audience with surveys, aims to create a chance to compare the production processes of both techniques in detail.

While designing the applications, preferences were made in the direction of the only character, less space, where the definitions of human-space relations could be made more easily. A lot of preliminary studies have been made about the character and lifestyle introduced by the content, and preliminary interviews and space research have been carried out with the character.

3.2. "A DAY OF THE SEAMAN" DOCUMENTARY 360 VIDEO PROJECT

3.2.1 Script Writing for 360 Video Project

After the interview with the Sea Person Korhan, the places where he spent his day were analyzed together and we agreed on the common voice-over text. Discoveries were made about the areas where the 360 cameras will be placed inside the spaces. Music selection to be used commonly in both documentaries was made.

Figure 36 VR 360 Video Scene Setup

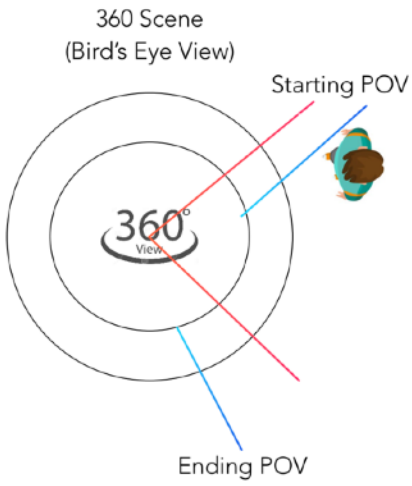


Figure 37 VR 360 Video Project Script

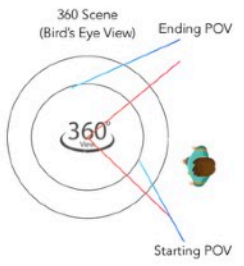
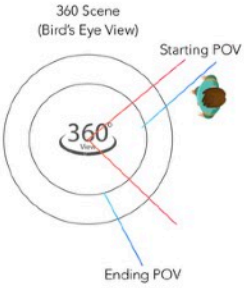
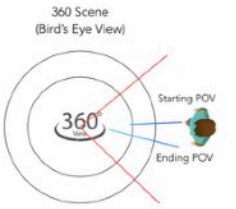
Sahne 1 Tekne İç - Gün	Uyandığım zaman teknede uyanıyorum ya da karavanda uyanıyorum iki tane base'im var. Aslında ikisi de mobil hayat. (İç ses)	Adastranın iç kabininde 360 kamera ortaya konumlandırılmıştır. Korhan kabinden çıkar önce mutfağa yönelir sonra kahvesini alıp oturur.	
Sahne 2 Tekne Havuzluk Dış - Gün	Teknede kamaradan çıktıktan sonra denizi görmek rüzgârın sesini duymak uyurken betonarme bir binanın içinde kalmaktansa tekrar da kalmayı ya da karavanda kalmayı yeğlerim (İç ses)	360 kamera dış havuzluktaki masanın üzerinde konumlanmıştır. Korhan dümeni ve tekne ekipmanlarını kontrol ederek kameranın sağından çıkar.	
Sahne 3 Tekne Burun Dış - Gün	Aslında bakarsan keyif aldığım zevk aldığım şeylerin aslına bakarsan hepsinin temeli tek bir şeye dayanıyor oda deniz. (İç ses)	360 kamera teknenin burnuna konumlandırılmıştır. Korhan dümenden burna doğru ilerlerken yelkenleri kontrol eder. 483 words	... 

Table 1 360 Video Script Writing Visuals vs Regular Video Script Writing Visuals

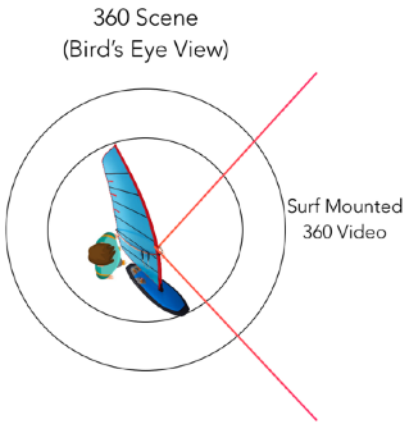
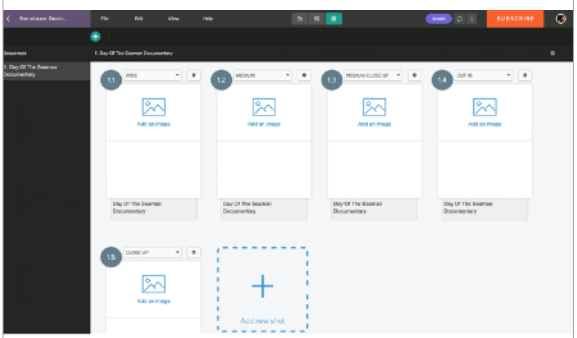
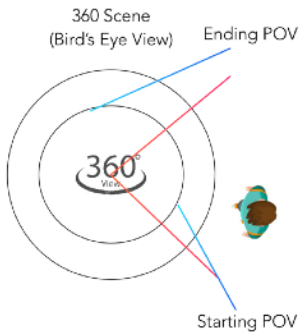
360 Video Script Writing Visuals	Regular Video Script Writing Visuals
	
Writing Scene Organization for 360 Videos - Pixelmator Pro	**Writing Scene Organization for Regular Video** - Celtx Studio

Table 2 360 Video Script Writing Visuals vs Regular Video Script Writing Visuals

	Sound	**Visual Guidance**	**Scene Installations**
Scene 1 Boat Inner - Day	When I wake up I wake up on the boat or I wake up in the trailer I have two bases. Actually, both are mobile life. (inner voice)	In the inner cabin of Adastra, 360 cameras are positioned in the middle. Korhan comes out of the cabin, first goes to the kitchen, then takes his coffee and sits down.	

While the 360 Video Scenario was evaluated together with the actor on the set, a short preliminary study was carried out in order to apply the motion mathematics used in daily life according to the unlimited view angle created by the 360-degree angle of the camera, without interrupting, and to reflect a mood in accordance with the content of the common text we had previously read, at the right point compared to the 360 camera.

3.2.2 Shooting Techniques Used in 360 Video Project

The 360 camera and VR microphone were positioned in accordance with the movement of the actors and the structure of the space, no additional light source was needed, the scenes were changed according to the scenario and according to the flow of the text and the need for spatial change.

Many different shooting techniques could be using during 360 video shooting such as utilizing 6 different Gopro hero cameras and stitching them via software or also utilizing 1 Gopro Fusion Camera which has 2 lenses and use it auto stitching software. There are countless options available in todays world for 360 Video Shooting.

Figure 38 360 Video Shooting Gopro Fusion 360 Camera Mounted to Light Stand

Figure 39 Gopro Fusion 360 Camera Mounted to Light Stand

Figure 40 , Gopro Fusion 360 Camera, Zoom H3VR Microphone

Figure 41 Zoom H3VR Microphone

Table 3 360 Video Shooting vs Regular Video Shooting Comparison Visuals

360 Video Shooting Comparison		Regular Video Shooting Comparison	
Gopro Fusion 360 Video Camera Attached to Mount		Canon 5D Mark IV DSLR Attached to Light Stand	

3.2.3. Editing Techniques Applied in 360 Video Project

Before the 360 Videos were uploaded to the Mac Os operating system, where the editing will be done, the Go Pro fusion studio was combined on a Windows-based PC. Then Final Cut Pro was placed in the order in the Script. During the installation, cut points were selected under the guidance of Korhan's voice and pre-selected music, which was recorded with a VR microphone. Scenes that were thought to cause motion sickness were removed. Then, several different resolutions were output with the rendering process.

Figure 42 Fusion Studio VR 360 Video Stitching Software

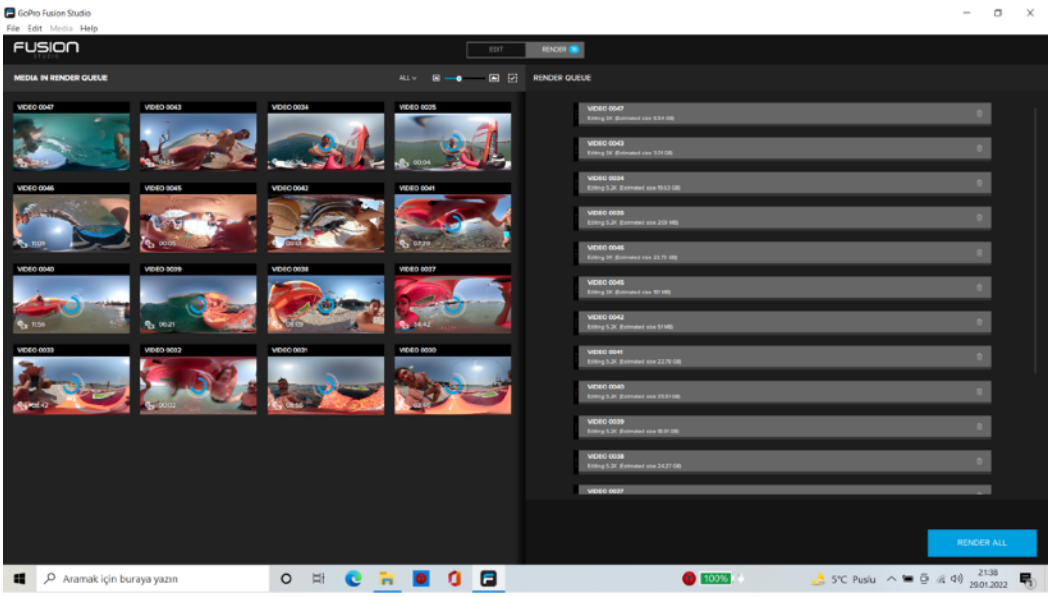
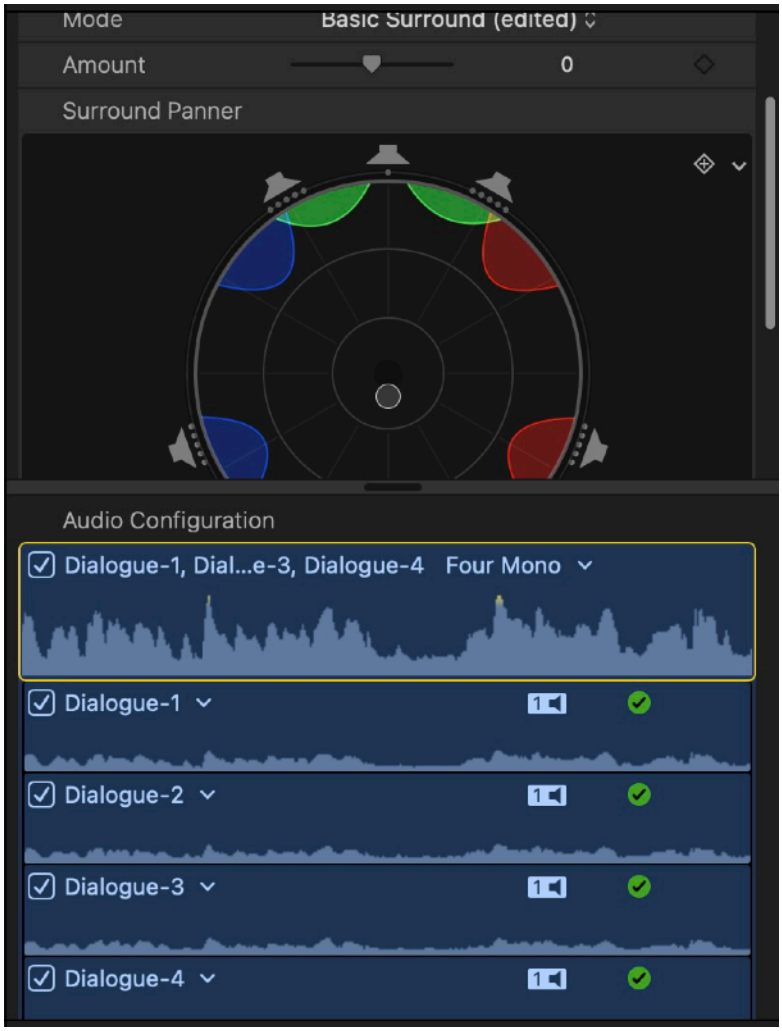


Figure 43 360 Video Editing Software Final Cut Pro

Figure 44 360 Video Editing Software Final Cut Pro 360 Sound Design Panel



In the use of sound in 360 video, both the different equipment used in the shooting and the techniques used in editing so that the experience can be perceived strongly during the viewing process and create a spatial sound perception. VR microphones have at least 4 capsules and have a 4-channel sound collection and recording feature. The four-channel sound is first combined in a 2-channel stereo mix according to the player who moves in the field in the editing. In this combination, the right and left sound perception of the viewer is activated and it is aimed to integrate with the space. For those who have surround feature of the headset systems of glasses or those who can create a 4-channel effect of headphones that are attached independently of the glasses, the sound is mixed as 4 independent channels by integrating the movements in the x, y, z axis of the montages in the visual.

Figure 45 360 Video Editing Software Final Cut Pro Spherical Video Projection

Table 4 360 Video Editing vs Regular Video Editing Comparison Visuals

360 Video Editing Visuals	Regular Video Editing Visuals
Color Waveforms in 360 Videos - Final Cut Pro	**Color Curves in Regular Videos** - Final Cut Pro

3.2.4. Audience Experience in 360 Video Project

Both documentaries were watched one after the other and Evaluation Forms with a response time not exceeding 2 minutes were applied.

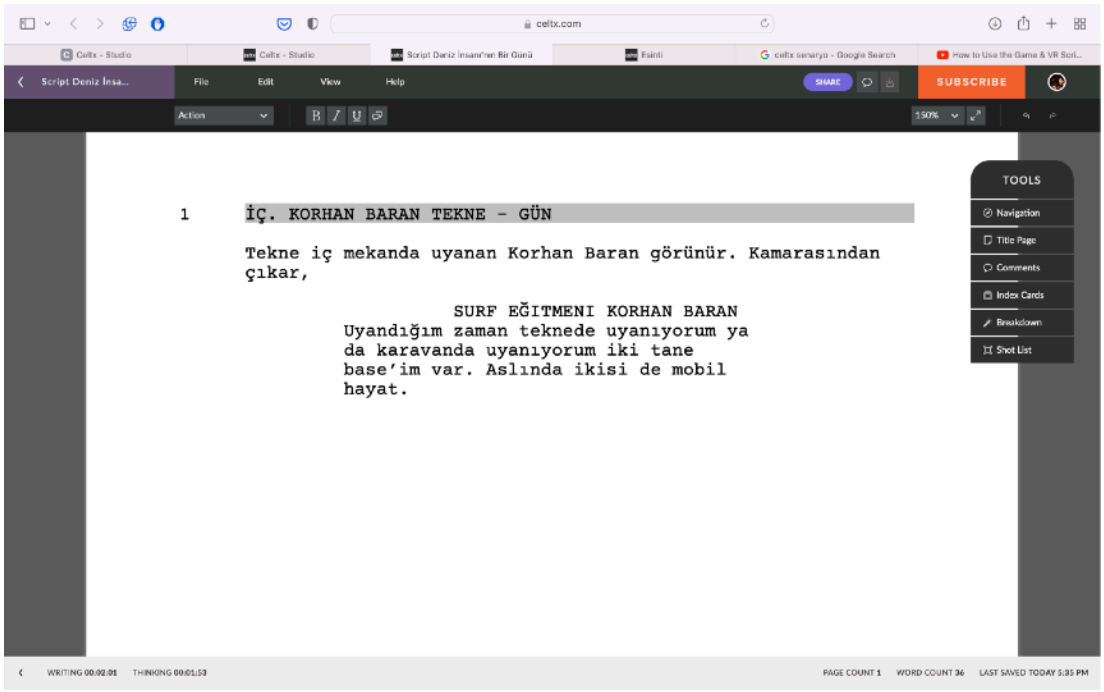
The audience was chosen from the students or graduates of the art and design faculties of the universities. After the survey, verbal opinions of the audience about the experience in general were also noted. During follow-up, all participants completed both experiences completely without interruption. All of the viewers we offered filled out the questionnaire completely.

3.3. "A DAY OF THE SEAMAN" DOCUMENTARY REGULAR (TRADITIONAL) VIDEO PROJECT

3.3.1 Script Writing for Regular Video Project

After the interview with the Sea Person Korhan, the places where he spent his day were analyzed together and we agreed on the common voice-over text. Scenes suitable for the venue were named, plans and camera locations were determined. Music selection to be used jointly in both documentaries was made.

Figure 46 Regular Video and Film Writing Software Celtx



INTERNAL. KORHAN BARAN'S BOAT - DAY

Waking up inside his boat, Korhan Baran appears. He gets out of his cabin, makes himself a cup of coffee, sits down at the table and drinks his coffee. He then moves from inside the boat to the outer cockpit.

SURF INSTRUCTOR KORHAN BARAN

When I wake up I wake up on the boat or I wake up in the trailer I have two bases. Actually, both are mobile life.(INNER VOICE)

PLAN 1: KORHAN BARAN APPEARES WAKING UP IN CABINET, CLOSE-UP SHOT

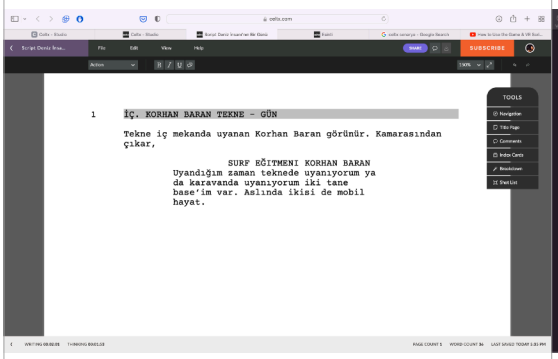
PLAN 2: EXITS THE CABINET AND GOES TO KITCHEN, WIDE ANGLE SHOT

PLAN 3: PREPARES TEA, CLOSE-UP SHOT

PLAN 4: SIT DOWNS TO TABLE WITH A CUP OF TEA, WIDE ANGLE SHOT

PLAN 5: DRINKS HIS TEA, CLOSE-UP SHOT

Table 5 360 Video Script Writing vs Regular Video Video Script Writing Visuals

Regular Video Script Writing Visuals	360 Video Script Writing Visuals
	
Writing Script for Regular Videos - Celtx Studio	**Writing Script for 360 Videos** - Apple Pages for Macintosh

3.3.2 Shooting Techniques Used in Regular Video Project

Shots were taken from positions corresponding to the scenes and plans in the scenario and with the appropriate lenses. It was shot in the same light conditions as simultaneous or very close-up shots in the same light conditions used in the 360 video before. No additional light was used. A different lens was not used for the shooting of the detailed plans, and all the shots were completed with 24-105 mm.

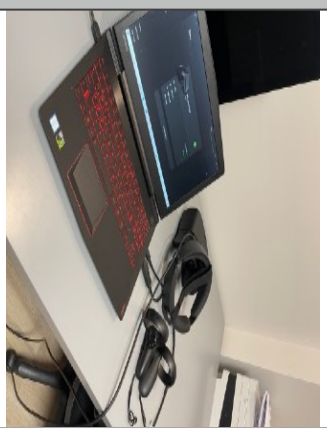
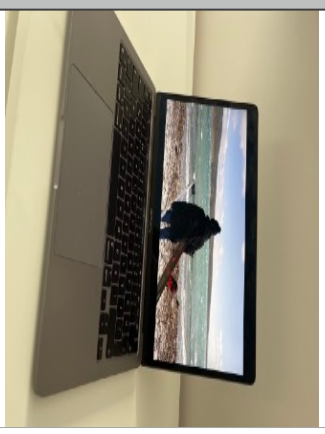
360 Video Viewing Experience Visuals		Regular Video Viewing Experience Visuals	
Oculus Rift S Connected to Windows PC		Macbook Pro Regular Video Preview	

Figure 47 Regular Video Shooting Camera Canon 5D Mark IV and Microphone

Figure 48 Rode Microphone Regular Video Shooting Camera Canon 5D Mark IV

The camera tracking movement was carried out by hand without using an additional equipment in the scenes.

There weren't too many re-shots and the plans that were suitable for the scenario that would reflect the mood of the actor, in general, were timed considering the flow of the text.

Table 6 Regular Video Microphone vs 360 Video Microphone Comparison

Regular Video Microphone Comparison		360 Video Microphone Comparison	
Rode Wireless Go Microphone		Zoom H3VR 360° Audio Recorder Microphone Wind Cover Off	

In the documentary experience "One Day of a Sea Person", which is prepared in the traditional format, the stereo microphone recording two channels on the camera was used to capture the ambient sounds. This recording was placed in stereo.

3.3.3. Editing Techniques Applied in Regular Video Project

The shots corresponding to the scenes and plans in the script were placed one after the other on the common text voiced by Korhan and the music was mixed.

Regular video editing techniques was used and Final Cut Pro on MacBook computer was utilized. Standarts Color Correction was applied and overall rhythm is protected by marking the beats in the sound and cutting the videos accordingly.

Figure 49 360 Video Editing in Final Cut Pro Software

Figure 50 360 Video Editing and Color Correction in Final Cut Pro Software

While mixing the stereo ambient sound recordings and Korhan's sound recordings, attention was paid to increase the sounds heard in the boat (rope and sail sounds hitting the mast, wind hum, the sound of the waves) in a way that would coincide with the speech gaps and strengthen the spatial definitions.

Table 7 Regular Video Editing vs 360 Video Editing Comparison

Regular Video Editing Visuals	360 Video Editing Visuals
Adjusting Regular Videos - Final Cut Pro	**Adjusting 360 Videos and Projection** - Final Cut Pro

3.3.4. Audience Experience in Regular Video Project

During the documentary content, which was played on the computer screen, the audience focused on a single point (computer screen) at the desk from where they were sitting, while the scenes and plans in different scales changed in a rhythm in harmony with the soundtrack of the film, we took care of avoiding distracting elements in the environment.

Regular MacBook Pro 15 inch screen was used while watching contents and regular sound levels was active while listening audio from the computer. The main objective was the make audience feel comfortable and relaxed during watching as if they were watching from their home in order to get usual reactions.

4. EVALUATION FORM AND RESULTS

4.1 OVERVIEW

In this part of the study, it is aimed to measure the effects of the short documentary "One Day of a Seaman", which was produced in two different formats (360VR-Traditional) prepared as an application, on the audience, and to evaluate these surveys and to obtain data that will lead to results.

4.2. PURPOSE OF THE EVALUATION FORM

In order to measure the effects of the applications in different techniques in the thesis, an evaluation form was prepared with the basic questions that can be applied quickly. With the evaluation of the forms, it was aimed to bring out the differences between viewing experiences and impact measurements between 360 video and traditional video.

4.2.1 Application Method of the Evaluation Form

The questions in the form were designed in the form of a single comment question, in which we can get a short opinioun about the effects of two different experiences, in a two-choice 360 or traditional format, and a small and brief space is left to express opinions so that it does not take more than 2 minutes to answer.

Silence and calmness of the space was also important while filling the evaluation form since distractions, noise and movements could make people answer it differently.

Figure 51 Experiencing 360 Video with Oculus Go VR Headset

Figure 52 Experiencing 360 Video with Oculus Rift S VR Headset

Figure 53 Experiencing 360 Video with Oculus Rift S VR Headset

4.2.2 Evaluation Form

EVALUATION FORM

Age :

Gender :

Education :

Please answer the following questions in order to evaluate the 360 video and traditional video you have experienced in terms of technical and aesthetic aspects.

1. Which experience created a stronger sense of being in and feeling the environment?

A) 360 B) Traditional

2. Which experience did you find stronger in terms of storytelling power?

A) 360 B) Traditional

3. Which experience was stronger in terms of character recognition?

A) 360 B) Traditional

4. Which experience was more functional in terms of establishing human-space relationship and recognizing/perceiving space?

A) 360 B) Traditional

5. Which technique would you consider more effective in terms of narration and the sound experience you have experienced?

A) 360 B) Traditional

6. Which documentary project episode would you like to watch again?

A) 360 B) Traditional

7. Can you position 360 VR video as a new technique and a different aesthetic in terms of visual and narrative experience?

A) YES B) NO

Share your additional ideas and opinions if you want about 360 VR Video and Regular Video content.

……..

4.2.3 Evaluation Chart and Results

EVALUATION CHART

Table 8 Evaluation Chart According To The Results of Surveys.

Question Number / Evulation Criteria	360 Video	Regular Video
1. Immersive Effect	18	2
2. Storytelling	11	9
3. Character Recognition	13	7
4. Space Perception	15	5
5. Sound Experience	12	8
6. Likelihood to Watch Again	18	2
7. Narrative Innovation	15	5

4.3. FORM EVALUATIONS

As a result of the forms applied, 360 video was 90 percent stronger than traditional video in terms of immersive effect and re-watching rates, It was evaluated 75-25 percent of its power of space perception and being seen as an innovative expression, It was 65-35 percent in terms of recognizing and understanding the character. It is determined that the sound experience is more effective ahead by 60-40 percent. However, it is very close to traditional narration by 55-45 percent in terms of storytelling. The satisfaction regarding the weights and resolutions of the glasses is also expressed at the level of 70 percent.

In the results, it can be concluded that 360 video should improve itself in the process, especially in terms of storytelling, technically and aesthetically, and that the glasses should be renewed especially in terms of weight and resolution.

Table 9 Different Participants While Experiencing 360 Video

5. CONCLUSION

In this study, 360 VR video and Regular video were compared and evaluated in terms of aesthetics and techniques by creating a unique documentary project called "One Day of a Sea Person" in 2 different formats which are 360 and Regular video. All processes of both production models were analyzed in detail, the hardware differences and methods used were compared, the products that emerged with the production of the same story in two different formats were presented to the audience's experiences and data obtained through an evaluation form were analyzed and traceability and impact priority inferences were reached.

360 Video, which has many technical, aesthetic differences and innovations in storytelling compared to the traditional film narrative structure, is a part of artistic production and marketing activities in many fields, including prestigious film festivals and the metaverse world. While 360 video and storytelling are widely used in digital arts, it has also become possible to experience the intensely interactive aspects of 360 video contents in VR environments for education, design, gaming and therapeutic purposes. This new process removes the audience from being a spectator, brings multiple choices to the flow of the script and redefines it as a part of the play, scenario structures, location definitions and even acting have been differentiated.

In the short documentary film project of 360 video, the parts of the same content shot with traditional film narration, prepared with the same text and music, were experienced by the same audience, and then it was aimed to reinforce the study outputs by applying an evaluation form.

When the evaluation form results are analyzed and inferences are made, in the 360 video experience of the viewer; it is observed that viewers found it more effective in terms of recognizing characters and human-space relationship, they had a stronger feeling of being in it, they were more satisfied with the VR audio experience where the desire to watch again was more intense, and they could accept 360 video as a new technique and aesthetic in storytelling. Our study also drew our attention to the fact that they expressed verbal concerns about the weight, price and hygiene during use of the glasses used in their experience.

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APPENDICES

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APPENDIX A EVALUATION FORM IN NATIVE LANGUAGE

DEĞERLENDİRME FORMU

Yaş :

Cinsiyet :

Eğitim :

Yaşadığınız 360 video ve geleneksel deneyimi teknik, ve estetik yönleriyle değerlendirmek amacıyla lütfen aşağıdaki sorularımızı cevaplayınız.

1. Hangi deneyim daha güçlü bir içinde olma ve ortamı hissetme duygusu yarattı ?

A) 360 B) Geleneksel

2. Hangi deneyimi hikaye anlatım gücü, açısından daha güçlü buldunuz ?

A) 360 B) Geleneksel

3. Hangi deneyim karakteri tanıma açısından daha güçlüydü ?

A) 360 B) Geleneksel

4. Hangi deneyim insan mekan ilişkisi kurma ve mekanı tanıma/algılama açısından daha işlevseldi ?

A) 360 B) Geleneksel

5. Yaşadığınız ses deneyimini anlatıma katkısı açısından hangi teknikte daha etkili olarak değerlendiririsiniz ?

A) 360 B) Geleneksel

6. Hangi belgesel projesi bölümünü tekrar izlemek istersiniz ?

A) 360 B) Geleneksel

7. Görsel ve anlatı deneyimi açısından 360 VR videoyu yeni bir teknik ve farklı bir estetik olarak konumlandırabilir misiniz ?

A) EVET B) HAYIR

İzlenme konforu açısından öncelikle gözlüklerin ağırlıkları ve çözünürlüklerini değerlendiriniz, varsa eklemek istediğiniz fikirlerinizi paylaşınız.

……..

APPENDIX B INTERVIEW

Please tell us about you, your vr project experience, your 360 video project experience.

Hello I am Markus Berger, I work at Dokuz Eylül University, teaching mostly in the field of animation. I came to VR and 360 Video mostly because of a few project that we did in that field working with the neurologist and psychiatrist. Both for Alzheimer's patients and also Schizophrenics so that's how I got into 360 video.

When did you meet with 360 video and which content have you created in 360 video form ?

There is this one project where we tried to get people with Alzheimer's to go out on a farmers market and do buying and selling there and it might be hard for them to get their physically. I think it's also not an environment where somebody can measure what they are doing.

So we built a market where we moved in let's say Google Street view fashion but not with photographs pathways with videos through the market and they can select things that they want to buy. It’s simple but an interesting experience to move around in 360 video somehow.

Additionally, we have one project where we specifically aim to people with schizophrenic disorder, to help them. Apparently a lot of them are smoking cigarattes a lot so it's trying to get them quit smoking with a different sessions so every session is about another theme. So for example a guy trying to compare two different person smoking and non smoking in 360 video. In the experience a non smoker person walks up steep stairs and smoker walking up steep stairs and then compare what kind of a difference that experiences have. We tried that to shoot that with 360 video. Third project is where we were trying to integrate schizophrenics more into society because a lot of them tense to not go out a lot. We set them in to a tram or a ferryboat

to get them to physically meet with friends. That's where we also used 360 video mostly.

Explain your VR and 360 video projects in more depth.

This one session where people gets to a home of friends and they sit and and have a talk and have tea and then they sing a song together. That’s where we used tripod with a 360 video camera and put into a chair. Actors were playing and we were recording that. Another one was they go to a coffee shop and order whatever they want to drink. So that we had a little interaction where you know the different kinds of coffee would pop up and you would select them. According to that video that is coming up changes. We had another side project where we made people experience schizophrenia like audio and visual hallucinations. There we also shot more or less steady video in 360 and composited different things with it.

Do you think that adding 3D CGI and visual effects enhances 360 video experience ? In what terms ?

I think it doesn't necessarily have to make it better but you can definitely use it to make your content stronger.It depends on the situation. I haven't tried too much for putting 3-D CGI with 360 video. To integrate it into the video so it feels like it's in the same place, that might be something I need to try out more. I think it's that should be very promising but you know doing simple 2D video compositing and 360 can be very effectfuş.

Compare 3D CGI and visual effects workflow in 360 video vs regular video ?

I'm sure you need the tools to work with the spherical video but those are integrated in software like Adobe After Effects. The compositing itself is not so much different I found. There might be a difference in an performance maybe because you had to work with larger resolutions than you usually would. Distortion is an issue because, you have to get a spherical thing and transform it into a rectungular form.

Can you compare the differences between 360 video and regular video in terms of Script Writing, Shooting Technique, Editing Technique, Viewing Experience.

Overview of Differences

The point of view is an important topic. Often 360 video will be used to make it some kind of a first person experience. Which is being utilized in normal video or film as well. But especiall in 360 video you use it all the time in order to have a different kind of storytelling. The projects are fundamentally different I think because of Point of View.

Script Writing

In scriptwriting you would have to develop a totally different approach for the project if it's 360 video.

Shooting Technique

Cinematography is an important subject. Of course you don't have a specific frame as you have in regular video. The person viewing is finding the frame at the time of viewing. I guess you need to find different ways to direct the attention of the viewer. Because you can't say, look at this. You have to find a way to tell the person to look right since something important is coming from there. Also connected to cinematography is camera movement. Tilt and pan are basically done by rotating the head. Moving the camera can be pretty tricky, because in handheld camera whoever has watched 360 video know the experience. Handheld moving 360 video can in handheld position could be quite challenging sometimes. That is called motion sickness, simulation sickness. You need be careful about how you move the camera.

Editing Technique

When you watch a regular film the camera stays in the same environment jumps from place to place. You wouldn’t do that in 360 probably. You would stay or slowly move from one place to another. Again the viewer is constantly finding the most interesting subjects by theöselves in 360 video. In my experience in the editing we did dull editing with long shots. It might be hard to really have like a fast pace editing in 360 video. We didn't work in stereoscopic 360.

Streoscopic 360 Video Differences

Normal 360 and Stereoscopic 360 differs. The image slightly offsets by the how far eyes are apart. It creates a 3D effect. That’s how we see it in real life. If you would close one eye you wouldn't have the same feeling of depth. Stereoscopic 360 Cameras have more than 2 lenses while Standart 360 cameras mostly has 2 lenses.

Viewing Experience

They're both completely different when we compare to regular and 360. I have been seeing 360 videos used for documentares for example. Which can be quiet fascinating experience. Where you have people telling their stories. In 360 you sit at a table with other guys in front of you. They are looking at you and telling you a story.

Please describe how audience reacts to the 360 video in your experience.

When 360 video came out everybody tried to shoot everything in 360. Watching something mediocre in 360 doesn't make it less mediocre. For example in one video where we tried to emulate schizophrenic hallucinations we got some big reactions from people. It was the one where we had a plant turning into a snake and coming towards the camera. There was one woman afraid of snakes and it was almost a traumatic experience for her. Also another video we created an ambience where there was a bedroom. All of a sudden everywhere becomes blood in 360 video and I

remember when people watched it, some people had a faster heart rates after and while watching the experience.

Where do you think that 360 video is located in todays storytelling world and how do you see the future of it ?

I think it won't replace traditional film. For example here in Turkey, VR headsets are not very common in homes. If that changes and it might change the next years. If it’s more common, I am sure that more content will be created for that. I think 360 videos will play a role in that because it is way of storytelling. We have not really found out what we can do with it. There will be people who will find whole new ways to use 360 video at it will make more exciting.

Does it has the power to replace traditional video and become more powerful than it ?

It has a huge potential but I also think it has limitations. That will keep it from in a major way replace traditional video. The motion sickness problem, in 3D VR like a game engine, you can move around and the environment changes. You can walk forward you can lay down and look down and look up. With 360 video the one who is shooting 360 video places to camera and this is where the camera. You can't move it lef or right so it's limited iin freedom. I think it won't replace anything really but it can become its own thing and I think it has a potential.

APPENDIX C TRADITIONAL VIDEO SCRIPT

DENİZ İNSANININ BİR GÜNÜ

BELGESEL

ÖMER KARTELLİ - KORHAN BARAN

2022

(1) İÇ. KORHAN BARAN TEKNE - GÜN

Teknesinin iç mekanında uyanan Korhan Baran görünür. Kamarasından çıkar, kensidine kahve yapar, masaya oturup kahvesini içer. Sonrasında tekne içerisinden dış havuzluğa doğru hareket eder.

SURF EĞITMENI KORHAN BARAN
Uyandığım zaman teknede uyanıyorum ya da karavanda uyanıyorum iki tane base'im var. Aslında ikisi de mobil hayat.(İÇ SES)

PLAN 1: YAKIN PLAN KAMARADA UYANAN KORHAN BARAN GÖRÜNÜR.

PLAN 2: GENEL PLAN KAMARADAN ÇIKAR MUTFAĞA DOĞRU YÖNELIR.

PLAN 3: YAKIN PLAN ÇAYDANLIĞIN ALTI ÇAKMAKLA ATEŞLER.

PLAN 4: BEL PLAN KAHVESİYLE KOLTUĞA DOĞRU YÖNELİR.

PLAN 5: YAKIN PLAN KAHVESİNDEN YUDUM ALIR.

(2) DIŞ. KORHAN BARAN TEKNE HAVUZLUK - GÜN

Tekneyi sefere hazırlarken görülür. Günlük tekne işleri ile uğraşmaktadır. Dümen kontrolu yapar ve teknenin burun tarafına yelkene doğru yönelir. Ana yelkeni de kontrol eder.

KORHAN BARAN
Teknede kamaradan çıktın sonra denizi görmek rüzgârın sesini duymak uyurken betonarme bir binanın içinde kalmaktansa tekrar da kalmayı ya da karavanda kalmayı yeğlerim. Aslında bakarsan keyif aldığım zevk aldığım şeylerin aslına bakarsan hepsinin temeli tek bir şeye dayanıyor oda deniz.(İÇ SES)

PLAN 1: BEL PLAN DÜMENİN ARKASINDA KONTROLLERİ YAPAR

PLAN 2: GENEL PLAN TEKNENİN BURNUNA DOĞRU İLERLEYEN KORHAN, YELKEN KONTROLÜ YAPAR

PLAN 3: BEL PLAN TEKNENİN KIÇINA DOĞRU İLERLER.

(3) DIŞ. MARİNA PONTONU - GÜN

TEKNESİNDEN(ADASTRA) İNEN KORHAN PONTONDAN KARAYA DOĞRU İLERLER

PLAN 1: GENEL PLAN TEKNESİNDEN KARAYA ADIM ATAR

PLAN 2: BEL PLAN TEKNELERİN ARASINDA YÜRÜYEN KORHAN'I KAMERA TAKİP EDER.

(4) DIŞ. KARAVAN BAHÇESİ - GÜN

Korhan karavan bahçesinden karavanın girişine doğru ilerler. Karavanın kapısını açar.

KORHAN BARAN
Rüzgâr sörfü olsun kitesurf olsun dalış olsun yelkencilik yatçılık.Denizde olduğum sürece kendime çok daha iyi hissediyorum birincisi karada olduğumdan.(İÇ SES)

PLAN 1: BEL PLAN SAZLIKLARIN ARASINDAN KORHAN'IN İLERLEYIŞINI ARKADAN TAKIP EDER.

PLAN 2: BEL PLAN, KARAVANIN KAPISINI AÇAR VE IÇERIYE DOĞRU YÖNELIR.

(5) İÇ. KARAVAN KABİNİ - GÜN

Korhan karavan kabinin içerisine girerek beresini ve surf malzemelerini alır. Malzemeleri toparladıktan sonra karavanına doğru yönelir.

KORHAN BARAN
Bunu olabildiğince sürdürülebilir bir hayata dönüştürmek istedim yaşantım boyunca.(İÇ SES)

PLAN 1: GENEL PLAN, YATAĞIN ÜZERINDEN BERESINI ALIR, KAMERA PAN YAPAR VE TAKIP EDER.

PLAN 2: BEL PLAN, KARAVANIN KAPISINDA SÖRF IÇIN GEREKLI MALZEMELERI ALMIŞ OLAN KORHAN, KAMERANIN PAN HAREKETIYLE DIŞARIYA DOĞRU YÖNELIR

PLAN 3: GENEL PLAN, SABIT KAMERA KORHAN'IN KARAVANIN BAHÇE KAPISINDAN ÇIKIŞINI IZLER.

(6) İÇ. KAMYONET - GÜN

Korhan kamyoneti surf okuluna doğru kullanır.

KORHAN BARAN
Sörf hayatımda yaptığım en güzel spor ve en keyif aldığım şeylerden biri.(İÇ SES)

PLAN 1: YAKIN PLAN, KAMYONETI KULLANAN KORHAN SABIT KAMERAYLA GÖRÜLÜR.

(7) DIŞ. SÖRF OKULU - GÜN

Korhan sörf okuluna doğru ilerler, elinde sörf malzemeleri görülür.

KORHAN BARAN
Hayatın bir noktasına denize entegre etmek bir çok insana tavsiye edebileceğim bir şey.Denizde olmak bana huzur veriyor mutluluk veriyor benim ruhumu besliyor. Gün benim için ikiye ayrılıyor rüzgârlı gün ve rüzgârsız gün olarak.(İÇ SES)

PLAN 1: GENEL PLAN, KORHAN BU Bİ SÖRF OKULUNA DOĞRU GİRER VE KAMERA ONU TAKIP EDER.

PLAN 2: BEL PLAN, KORHAN DENİZE DOĞRU İLERLER,DENİZ KIYISINA GELİR DURUR. RÜZGARI ANALİZ EDER. KAMERA ONU TAKİP EDER.

PLAN 3: GENEL PLAN, KORHAN SÖRF TAHTALARININ OLUŞTURDUĞU KORİDORUN ARASINDAN İLERLERKEN KAMERA ONU TAKİP EDER.

(8) DIŞ. SÖRF DENEYİMİ - GÜN

Korhan suya çıkar ve rüzgar sörfü yaparak su üzerinde estetik hareketler yaparak kaymaya başlar.

KORHAN BARAN
Rüzgârlı günlerde genelde eğer hava çok rüzgârlıysa rüzgâr sörfü yapmayı, kitesurf yapmayı, foil yapmayı tercih ederim. Daha sakin havalarda adastrayla denize çıkıp yelken yapmayı tercih ediyorum. Eğer hiç rüzgâr yoksa o zaman dalış yapmayı tercih ediyorum. (İÇ SES)

PLAN 1: GENEL PLAN, DRONE SÖRFÇÜLERI TAKIP EDER.

PLAN 2: BEL PLAN, SÖRFÇÜLER SU ÜZERİNDE FREESTYLE HAREKETLER YAPAR.

(SON)

SÜRE:

MAX 2 DK

MÜZİK:

DEER -

ANBR

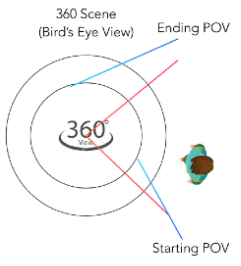
ÇEKİM MEKANLARI: İZMİR, ÇEŞME, ALAÇATI, PORT ALAÇATI

APPENDIX D 360 VIDEO SCRIPT

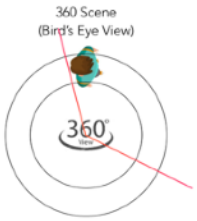
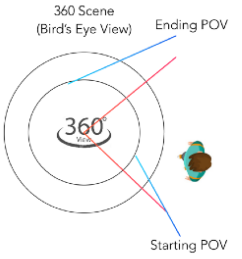
DENIZ İNSANININ BIR GÜNÜ

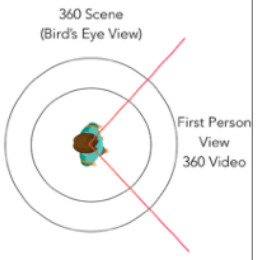
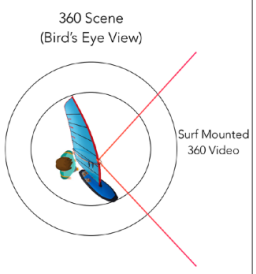
360 BELGESEL ÇEKIM SENARYOSU

İSİM	Deniz İnsanının Bir Günü
YAZAR	Ömer Kartelli - Korhan Baran
VERSİYON	1.1.4
TARİH	14/01/2022
Bir deniz insanının günlük hayatından bir kesit içeren belgesel parçasında sörfçü Korhan Baran'ın denizle olan ilişkisi ve duygusal bağı anlatılmaktadır.	

	Ses	**Görsel Yönlendirme**	**Sahne Yerleştirmeleri**
Sahne 1 **Tekne** **İç - Gün**	Uyandığım zaman teknede uyanıyorum ya da karavanda uyanıyorum iki tane base'im var. Aslında ikisi de mobil hayat. (İç ses)	Adastranın iç kabininde 360 kamera ortaya konumlandırılmıştır. Korhan kabinden çıkar önce mutfağa yönelir sonra kahvesini alıp oturur.	

Sahne 2 **Tekne** **Havuzluk** **Dış - Gün**	Teknede kamaradan çıktıktan sonra denizi görmek rüzgârın sesini duymak uyurken betonarme bir binanın içinde kalmaktansa tekrar da kalmayı ya da karavanda kalmayı yeğlerim (İç ses)	360 kamera dış havuzluktaki masanın üzerinde konumlanmıştır. Korhan dümeni ve tekne ekipmanlarını kontrol ederek kameranın sağından çıkar.	
Sahne 3 **Tekne** **Burun** **Dış - Gün**	Aslında bakarsan keyif aldığım zevk aldığım şeylerin aslına bakarsan hepsinin temeli tek bir şeye dayanıyor oda deniz. (İç ses)	360 kamera teknenin burnuna konumlandırılmıştır. Korhan dümenden burna doğru ilerlerken yelkenleri kontrol eder.	…
Sahne 4 **Marina** **Ponton** **Dış - Gün**	Tekneden dışarı çıkar rüzgar, dalga ve yelken sesleri …	360 kamera marina pontonunun ortasına konumlandırılmıştır. Korhan tekneden karaya doğru yönelir.	

Sahne 5 Kamyonet Dış - Gün	Rüzgâr sörfü olsun kitesurf olsun dalış olsun yelkencilik yatçılık(İç Ses)	360 kamera kamyonetin ön yolcu koltuğuna konumlanmıştır. Direksiyon kullanan Korhan ve yolu görülür. Kamyonetin arkası doludur.	… 
Sahne 6 Karavan İç - Gün	Surf Eşyasını Alır Denizde olduğum sürece kendime çok daha iyi hissediyorum birincisi karada olduğumdan.(İç Ses)	360 kamera karavan iç kabininin ortasına konumlandırılmıştır. Korhan şapka ve sörfle ilgili malzemeleri alıp çıkar.	
Sahne 7 Karavan Bahçesi İç - Gün	Bunu olabildiğince sürdürülebilir bir hayata dönüştürmek istedim yaşantım boyunca.(İç Ses)	360 kamera karavan bahçesinin ortasına konumlandırılmıştır. Korhan ekipmanlarını alıp 360 kameranın yanında geçerek dışarı çıkar.	
Sahne 8 Sörf Okulu Bahçesi Dış - Gün	Sörf hayatımda yaptığım en güzel spor ve en keyif aldığım şeylerden biri hayatın bir noktasına denize entegre etmek bir çok insana tavsiye edebileceğim bir şey.(İç Ses)	360 kamera sahilde kum zeminin üzerine ve göz seviyesinde konumlandırılmıştır. Korhan sırasıyla kameraya, sahile doğru yürür ve havayı analiz eder.	…

Sahne 9 Sörf Okulu İç - Gün	Denizde olmak bana huzur veriyor mutluluk veriyor benim ruhumu besliyor. (İç Ses)	360 kamera koridorda surf tahtalarının bulunduğu koridorun ortasına konumlandırılmıştır. Korhan kameranın yanından gelip geçer.	…
Sahne 10 Rüzgar Sörfü Board Üstü Dış - Gün	Gün benim için ikiye ayrılıyor rüzgârlı gün ve rüzgârsız gün olarak. Rüzgârlı günlerde genelde eğer hava çok rüzgârlıysa rüzgâr sörfü yapmayı, kitesurf yapmayı, foil yapmayı tercih ederim. (İç Ses)	360 kamera sörfçünün kaskının üzerine konumlandırılmıştır. Sörf tahtasının üzerinde ilerleyişini çeker.	
Sahne 11 Rüzgar Sörfü Yelkeni Üstü Dış - Gün	Daha sakin havalarda adastrayla denize çıkıp yelken yapmayı tercih ediyorum. Eğer hiç rüzgâr yoksa o zaman dalış yapmayı tercih ediyorum.(İç Ses)	360 kamera rüzgar sörfü direğinin üzerine konumlandırılmıştır. Sörf koyunu ve aksiyonun daha genel plandan görünmesi sağlanır.	

APPENDIX E GLOSSARY

VIRTUAL REALITY ESSENTIAL GLOSSARY

Term	Definition
180 Video	Videos that show 180 degrees of a scene from the user's point of view are 'cut off' on each side of the viewer's head, at the borders of their line of sight. This configuration, unlike 360 video, offers for a more focused viewing experience and decreases the amount of movement required.
360 Video	Videos that display a 360-degree view of a scene from the user's perspective. This implies that the full scene is viewable from every angle, allowing the spectator to glance in any direction without losing immersion.
Ambisonics	Ambisonics is a term used to describe a technique for capturing and playing sounds in 360 degrees. This is accomplished by capturing sounds from all directions with a specific array of at least four microphones. These sounds are then saved and decoded in preparation for usage with surround sound and 360-degree films.
Aspect Ratio	The ratio of vertical lines of pixels to horizontal lines of pixels on a screen, i.e., the width of the screen as opposed to the height of the screen, is known as the aspect ratio. It is commonly expressed in the form width:height.

Term	Definition
Augmented Reality	Virtual reality and augmented reality are comparable technologies, but there are a few important distinctions. It just overlays visual or auditory information over the real world as viewed through the user's eyes, rather than attempting to construct an altogether distinct world within the confines of VR gear and utilizing it to replace the real world. It Glters out additional items or provides information pertinent to what the user is seeing at any particular moment, according on the user's needs.
CAVE (Cave Automatic Virtual Environment)	To give the appearance of a genuine environment, a cave automated virtual environment, or CAVE, employs projections on the walls and ceiling of a chamber. A spectator can move around inside the cave at any time, creating the feeling of immersion.
Degrees of Freedom (6DOF, 3DOF)	The numerous degrees of mobility accessible to an item inside a space are referred to as degrees of freedom or DOF. There are six different forms of movement, which are further separated into translation (a straight line movement in a certain direction) and rotation (a movement about the x-, y-, or z-axis).
Equirectangular Projection/Video	A spherical picture is transferred to a flat plane via an equirectangular projection. A map of the world laid out on a flat surface rather than a globe is an excellent illustration. Using a method known as stitching, many equirectangular pictures taken by various cameras at different angles may be put together to generate a spherical movie.
Eye tracking	Eye tracking is a technique used in headsets to track and quantify the user's gaze direction. It is possible to recreate the eyes' natural process of bringing items into/out of focus based on what the user is concentrating on using this information.

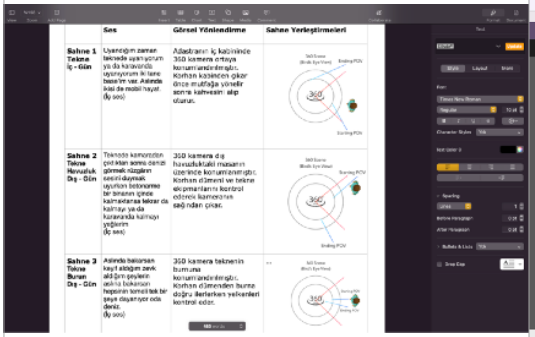
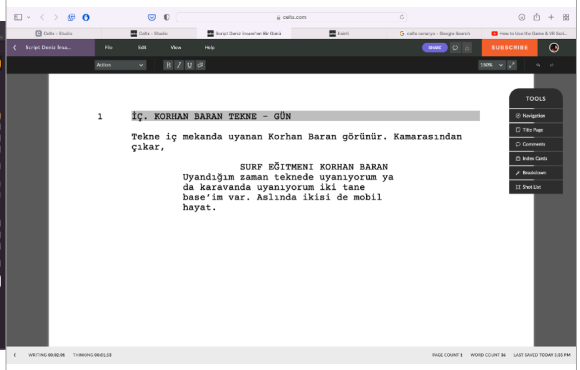
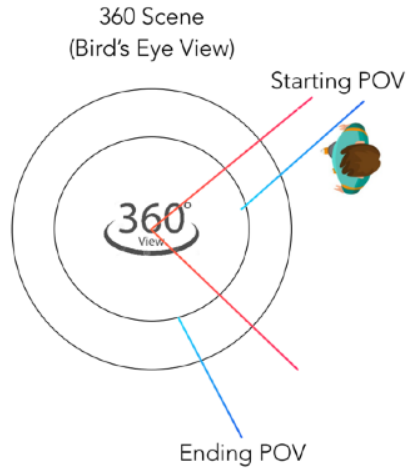
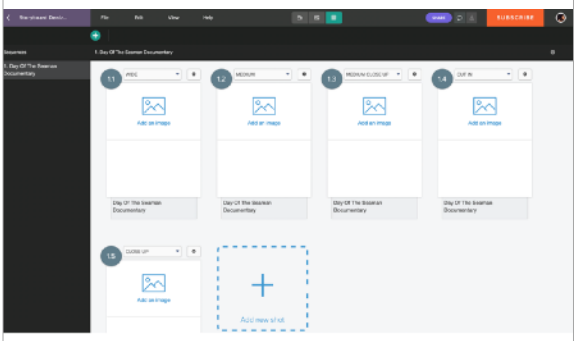
Term	Definition
FOV (Field of View)	The total number of degrees observable from a given point of view at any given time is known as the field of vision.
Mixed Reality	Mixed reality technology allows artificial content to interact with real-world environment by overlaying it on top of the actual world. Furthermore, because mixed reality content is constantly updated for interaction, it may be engaged with in real time.
Virtual Reality	Virtual reality, or VR, differs from augmented reality in that it generates an artificial environment for the user to explore. It creates an interactive 3D world around the user that can be modified at anytime, allowing them to immerse themselves in movies, games, or otherwise inaccessible places or events as if they were physically present.
360 Video	360-degree images or films are visuals that capture and portray the view from every angle at the same time.
Immersion	The feeling of being a part of a virtual environment is known as immersion. It is achieved when music, design, atmosphere, imagery, and other elements work together to provide the impression of really existing in the virtual environment. The objective of a developer is to perfect this combination of stimuli in order to provide the most realistic and engaging user experience possible.

Source 1: https://delight-vr.com/xr-glossary/

Source 2: Cameron, J., Gould, G., Ma, A., Chen, A., & Lui, S. (2021). 360 Essentials: A Beginner's Guide To Immersive Video Storytelling. Ryerson University Library Toronto.

APPENDIX F PROJECT VISUALS WRITING PART COMPARISON

COMPARING 360 VIDEO AND REGULAR VIDEO PRODUCTION STAGES WITH VISUALS STAGE 1: WRITING

360 Video Script Writing Visuals	Regular Video Script Writing Visuals
	
Writing Script for 360 Videos - Apple Pages for Macintosh	**Writing Script for Regular Videos** - Celtx Studio
	
Writing Scene Organization for 360 Videos - Pixelmator Pro	**Writing Scene Organization for Regular Video** - Celtx Studio

APPENDIX G PROJECT VISUALS SHOOTING PART COMPARISON

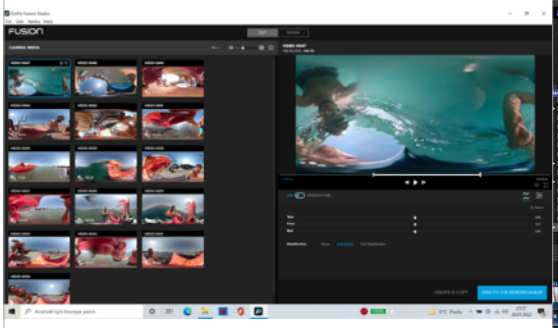
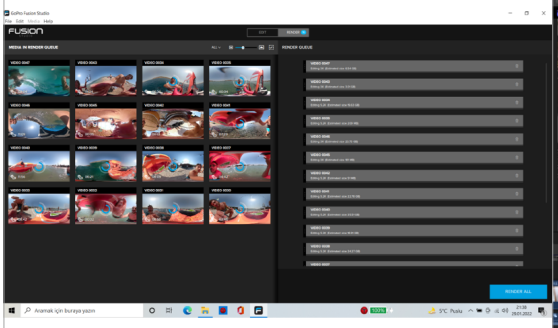
COMPARING 360 VIDEO AND REGULAR VIDEO PRODUCTION STAGES WITH VISUALS STAGE 2: SHOOTING

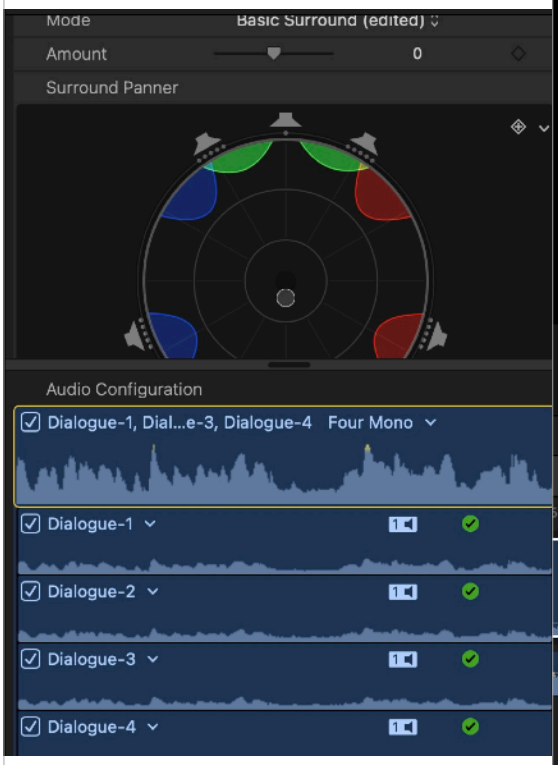
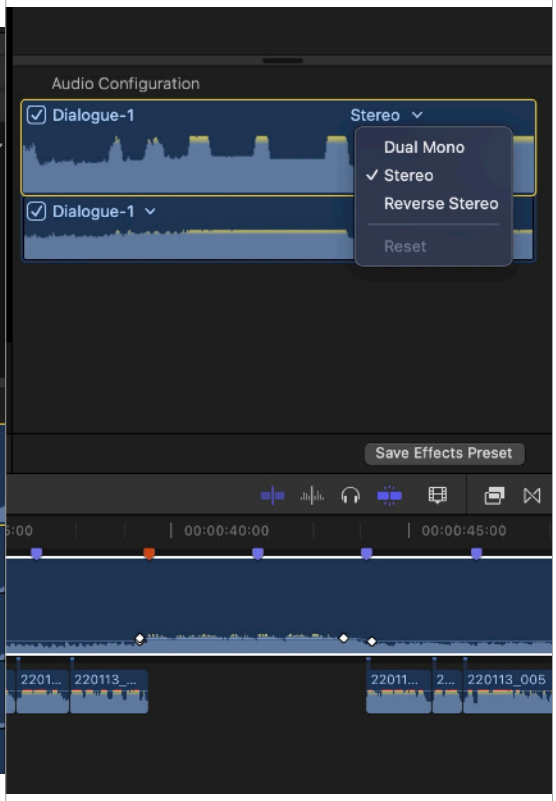
360 Video Shooting All Visuals		Regular Video Shooting All Visuals	
Gopro Fusion 360 Video Camera		Canon 5D Mark IV Regular Video Camera DSLR	
Zoom H3VR 360° Audio Recorder Microphone		Rode Videomic Go Microphone for Standart Sound	
Gopro Fusion 360 Video Camera - Beach Shooting Scene		Canon 5D Mark IV Regular Video Camera DSLR - Beach Shooting Scene	
Zoom H3VR 360° Audio Recorder Microphone		Rode Videomic Go Microphone for Standart Sound	

360 Video Shooting All Visuals		Regular Video Shooting All Visuals	
Gopro Fusion 360 Video Camera Attached to Mount		Canon 5D Mark IV DSLR Attached to Tripod	
Shooting with both 360 and regular cameras combined		Shooting with both 360 and regular cameras combined	
Zoom H3VR 360° Audio Recorder Microphone Wind Cover Off		Rode Wireless Go Microphone	
Gopro Fusion 360 Video Camera - Ready to Film		Canon 5D Mark IV DSLR - Ready to Film	

APPENDIX H PROJECT VISUALS EDITING PART COMPARISON

COMPARING 360 VIDEO AND REGULAR VIDEO PRODUCTION STAGES WITH VISUALS STAGE 3: EDITING

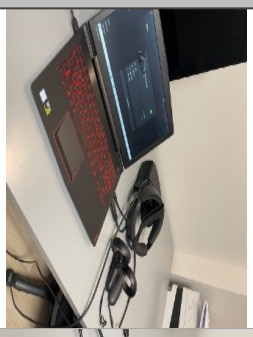
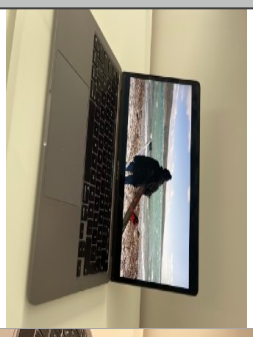
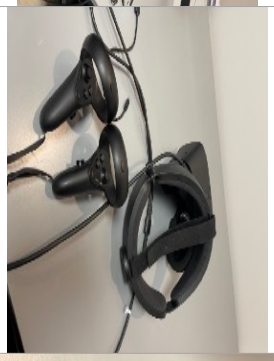
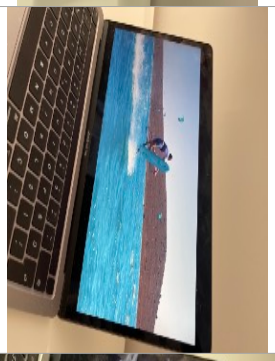
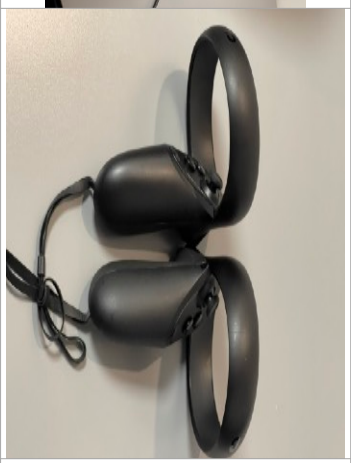
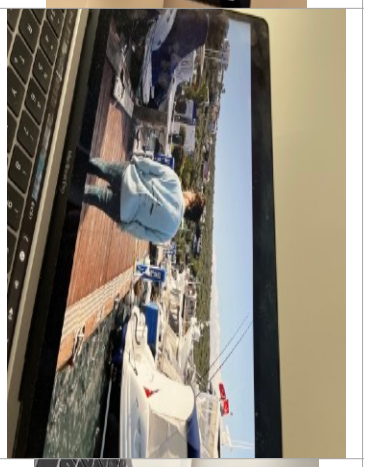
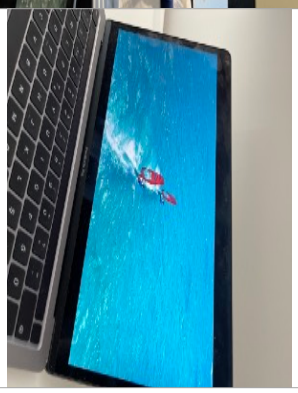
360 Video Editing Visuals	Regular Video Editing Visuals
	
Editing/Stitching 360 Videos - Fusion Studio	**Editing Regular Videos** - Final Cut Pro
	
Exporting Stitched 360 Videos - Fusion Studio	**Browsing and Editing Regular Videos** - Final Cut Pro

360 Video Editing Visuals	Regular Video Editing Visuals
	
Sound Editing 360 Videos - Final Cut Pro	**Sound Editing Regular Videos** - Final Cut Pro
Color Correction 360 Videos - Final Cut Pro	**Color Wheels Regular Videos** - Final Cut Pro

360 Video Editing Visuals	Regular Video Editing Visuals
Adjusting 360 Videos - Final Cut Pro	**Adjusting Regular Videos** - Final Cut Pro
Projection in 360 Videos - Final Cut Pro	**Projection in Regular Videos** - Final Cut Pro
Color Waveforms in 360 Videos - Final Cut Pro	**Color Curves in Regular Videos** - Final Cut Pro

APPENDIX I PROJECT VISUALS VIEWING PART COMPARISON

COMPARING 360 VIDEO AND REGULAR VIDEO PRODUCTION STAGES WITH VISUALS
STAGE 4: VIEWING

360 Video Viewing Experience Visuals		Regular Video Viewing Experience Visuals	
Oculus Rift S Connected to Windows PC		Macbook Pro Regular Video Preview	
Oculus Rift S and Left, Right Controller		Macbook Pro Regular Video Preview	
Oculus Rift S Left, Right Controller		Macbook Pro Regular Video Preview	
Virtual Avatar Body Experience for Oculus		Macbook Pro Regular Video Preview	

APPENDIX J PAST EXPERIENCE IN THE FIELD OF VIRTUAL REALITY

Virtual reality topic is in my focus for almost 8 years. The first time I started this process was while I was doing in the last years of high school. That time I was doing a project for Tubitak and won the big prize in the national competition in Tubitak. During my undergraduate studies in Bahcsehir University, there was a laboratory called VRFIRST laboratory, in this laboratory we were doing researches about the future of VR / AR / MR and some other terms in the media industry. We knew that the future of media could have the potential to evolve in the area of 360° Content. I took part in many different projects during my assistant period in VRFIRST laboratory. Additionally, I created content for their social media and marketing strategies during my working period there. I had to change to get to know many talented people around the world who were enthusiasts about the future of VR/AR.

CURRICULUM VITAE: EXPERIENCE

Name & Surname: Ömer Kartelli

Place and Year of Birth: [redacted]

Email: [redacted]

Primary Language: Turkish

Foreign Language: English (advanced) / Spanish (Intermediate) / French (Elementary)

Primary Education: Mavisehir Primary School

Secondary Education: Izmir Atatürk High School, 2016

Secondary Education AFS Exchange 1 Year: Avenida De Los Toreros Instituto de Bilingua Madrid, Spain, 2015

Undergraduate: Bahcesehir University, 2020

Erasmus Progem: (2 Semesters): Inseec Business School Paris, France 2018

Postgraduate: Yasar University, 2022

Name of Institute: Art and Design

Name of Master's Program: Art and Design

Working Life:

2013-2014	AFS Turkish Culture Foundation - Exchange Program Committee
2014-2015	Rotary Interact Karsiyaka - Media Content Creator
2016-2018	TEDX Bahcesehir University - Media Specialist
2016-2018	VRFIRST Virtual Reality Lab Assistant - Bahcesehir University
2018 - Present	Vivaldo Media Company Founder

CURRICULUM VITAE: AWARDS AND PATENTS

Awards:

- **TUBITAK** Aegeon Region Research Projects Competition Winner in Technological Design - 2016
- Girne American University Short Film Competition Best Short Film Award - **Girne American University** - 2016
- **KALDER** Yaşamda Kalite Derneği - Quality In Life Foundation Project Competition Winner - 2016
- **TUBITAK** Turkey Research Projects Competition Winner in Technological Design - The Scientific and Technological Research Council Of Turkey - 2016
- Education and Informatics Network Documentary Competition Winner - Turkish Ministry Of National Education **EBA Eğitim Bilişim Ağı** - 2016
- Regional Swimming Competition 3rd Prize Award - **Gençlik ve Spor Bakanlığı** - Turkish Ministry of Youth and Sports
- Genius Science And Art Olympiad Short Film Section Honorable Mention - Genius Olympiads - Genius Olimpiyatları - **Suny State University of New York** - June 2016
- International Children's Rights Film Festival Short Film Competition - Best Short Film Award - International Children's Rights Foundation - **Uluslararası Çocuk Hakları Film Festivali** 2016

Patents:

Starts - Science, Technology and Arts (Marka)

TR 2017 72700 · Issued Aug 14, 2017

Otomobillerin Su Tehditine Karşı Swimbag Güvenlik Sistemi (Patent)

TR 20160428001 · Issued Apr 28, 2016