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Delivering cultural heritage and historical events to people through virtual reality

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Abstract. The concept of Society 5.0 promotes a human-centered society and uses advance technology as its core. In other words, human uses technology to improve and support their daily life. One of the best inventions in technology is digitalizing data. This means human found a new way in storing information, including information about culture and history. The technology in converting physical data into digital data is beneficial for historical and cultural archiving. People can see and watch historical events as if they had lived in that era of the event with extreme immersiveness. One technology that can provide the possibilities is called Virtual Reality animation. This research aims to promote the idea of using VR animation to recreate historical or traditional events for educational material and entertainment material. Methods in this research is mainly observation on today's state of Virtual Reality animation and people interest on history and tradition. The results shows that advanced technology Virtual Reality and Artificial Intelligence allows people to learn histories from the past and explore new things in the present to live in the better future.

Keywords: cultural heritage, historical event, Virtual Reality, Society 5.0

1. Introduction

Society 5.0 is a concept for the future society that was proclaimed by Japan. It promotes a human-centered society using advanced technology, such as Artificial Intelligence (AI), Internet of Things (IoT), big data, robot and the sharing economy as its core. This concept was first announced in April 2016, with the purpose to improve human life through autonomous technology. The goal of Society 5.0 is to realize a society where people enjoy life to the fullest. Economic growth and technological development exist for that purpose, and not for the prosperity of a select few [1]. Society 5.0 is a continuation of Society 4.0, which is an information society where it is a valuable asset in human life. In Society 5.0, all the information will be used for improving human's quality of life. Unlike Society 4.0, where humans are using cloud services to search, retrieve and analyzed data, Society 5.0 has AI to analyze big data and provide the result to humans in physical space in various forms [2]. This means AI will do the difficult part for human, which ends up with increasing human's quality of life. In Society 4.0, human already stores massive amount of data and information in cloud system, and in Society 5.0, the AI will deliver the data to human in various forms. One of the example is if when a person orders something, the delivery system will use drone to deliver the thing to them. This means the limitation in range of places will drop. This is a huge breakthrough, especially for people in rural



area that are separated from main road or people with limited access from big city. The other example is in transportation issue, where elderly population dominates rural area or town. It becomes difficult for people in that town or village to move from one place to another. Society 5.0 can provide the solution with familiarizing people to use autonomous vehicle driven by an AI. This gives human more freedom to move from one place to another. By using autonomous vehicle, human might not need to analyse the map and traffic condition since the AI will do it and drive the autonomous vehicle to the destination using the best route possible. Both examples show us that super smart society will give human the equalization between city people and rural people. That means location will not be an obstruction anymore since a robot or autonomous system will do them all. Thus it means every people will have the same access and chance, wherever they live, even for the people in rural area.

This super smart society with various advancement in technology will open many opportunities and possibilities in improving human's quality of life. Preparing for Society 5.0, Japan has made a revolution in their education focusing on human skills such as communication, leadership and endurance, curiosity, comprehension and reading skills. Japan's former education minister, Yoshimasa Hayashi also said that in the era of Google, people no longer need to memorize every single fact, many tasks are now best carried out by computer. In this era, where people can access many information from anywhere and anytime, human skills will be more valuable to have in the super smart society. The grade progression also need to be more flexible rather than focused on totally failing or passing. Education system will focus on equal understanding for every student, also Japan aimed to remove the barriers between subjects and disciplines, which means if a person is studying physics as a major, they should also study humanities, so that allows them combine their scientific knowledge with ethics in the future [3]. This means students will be more humane than just a human with hard skills.

Society 5.0 is a progression from previous society system (Society 1.0 to Society 4.0). People are using the resource from previous society to build the next society as well as learning from history to enhance human life in the future. There has been a statement that technology and tradition are incompatible. Technology will always replace tradition and the way people do things in the past, yet the technology would not exist without being preceded by tradition. For example, the popularity of traditional instrument like Cythara as seen in Figure 1, has been replaced by modern instrument such as electric guitar, piano, etc. Modern guitar itself are inspired by Babylonian instrument; modern guitar cannot exist without the existence of the Babylonian instrument itself. This is why modern human cannot forget about the existing culture, tradition and history as they are the ones that inspire modern people to invent new things for a better living in the future.



Figure 1. Instrument Called "Cythara" from Stuttgart Psalter (France)

In the current era of technology, animation also gains a new media for create the animation, that is virtual reality animation. VR itself is a display media for information, not only animation, but also other type of information, such as image, words, video, etc. Virtual reality animation is a new media for digital animation that provide a new space for animator and filmmaker to create their artwork. VR

animation give animator a new perspective in creating their work through 3D space. Animator and filmmaker can create their work in 3-Dimensional perspective, and the viewer also can enjoy the works in 3-dimensional experience. VR animation and VR movie can provide a new way to enjoy an animation or film. Viewer will have a lot more freedom to look at wherever part of the movie that they wanted to see. VR animation and VR movie can give a different visual experience than a flat screen, and more immersive experience for the viewer.

Technology is created based on the problem in history, which is why human will always need history to advance further. Information era allowing us to make a massive cloud database, starting from document or even a video. By using VR animation, we can recreate history events, archiving traditional dance and ceremony, and later using it for either education or even entertainment. The merging between physical space and digital space means that we can go through the barrier of space and time, and using that ability to inspire younger generation or to preserve tradition and history.

2. Methodology

This research uses various literature references, journal and books. This research aims to promote the idea of using VR animation to recreate historical or traditional events for educational material and entertainment material. First step is to know the state of today Virtual Reality animation technology and the state of people's interest to history and tradition. Next is to identify possibilities and the limitation that might appeared and also identify challenges to achieve this idea in relation to Society 5.0 concept. This research provides conclusion on whether this is a promising idea to preserve and archive tradition or is difficult to achieve due several factors found during the research.

3. Results and discussions

3.1. *Human, cultural heritage and history*

Through the history, human already create many tradition and cultural heritage. Human also have six million years, starting from our ancestor. "Heritage" is a property, something that is inherited, passed down from previous generations. In the case of "cultural heritage," the heritage does not consist of money or property, but of culture, values and traditions. Cultural heritage implies a shared bond, our belonging to a community. It represents our history and our identity; our bond to the past, to our present, and the future [4]. UNESCO differentiate cultural heritage to several main category, that is tangible cultural heritage and intangible cultural heritage. Tangible cultural heritage is a cultural heritage that have a physical form, and it can also categorize into 3 categories, that is movable cultural heritage, immovable cultural heritage and underwater cultural heritage. Movable cultural heritage are cultural heritage that can be moved, such as paintings, coins, manuscripts, etc. Immovable cultural heritage are cultural heritage that cannot be moved, such as monuments, archaeological site, etc. Underwater cultural heritage are cultural heritage that located under the water, such as shipwreck, underwater cities, underwater ruins, etc. Intangible cultural heritage are cultural heritage that don't have a physical form, such as oral tradition, traditional ritual, performing arts, etc [5]. In the history of human, many cultural heritage have already been made. Each of the cultural heritage have their own uniqueness and representing the identity of an area, tribe and race. Every cultural heritage have their own function and usefulness, and are a result of human's wisdom in order to improve their quality of life, or even their status in their society.

History is the study of the past. Professor Arthur Marwick in his article define history as the bodies of knowledge about the past produced by historians, together with everything that is involved in the production, communication of, and teaching about that knowledge [6]. Historian is a researcher who produce knowledge about the past. In a long history of human, there are many important historical events that were happened. These historical events sometimes lead to another important historical event. These historical events contain the success and failure of human being, and are one of exemplary source for present human to face the future.

3.2. *The act to preserve cultural heritage and archiving historical events*

The act to protect the cultural property started at the end of nineteenth century. It started as an agreement at war, which is to apply immunity to cultural property during war. Three decades later, in 1935, the preamble of the Treaty on the Protection of Artistic and Scientific Institutions, a pan-American initiative also known as the Roerich Pact, formulated the idea that cultural property, which “form the cultural treasure of peoples” must “be respected and protected in time of war and in peace”. [7] People starting to see cultural property as a valuable object, and people starting to see the value of cultural heritage. The agreement keep being revised to be better until these days.

Today, we can enjoy the result of the agreement with so many cultural heritages that are exist until now. Each area has its own cultural site and cultural heritage which represent the identity of that area and the people who are living in that place. The act to preserve cultural heritage starting as an agreement to give immunity to cultural properties during war, this means historical event affecting our awareness on the value of cultural heritage. How and when the moment happened also archived so people in the future could know about what happened in the past.

The heritage cycle diagram made by English Heritage in 2005 (as seen in Figure 2), give us fundamental concept on how to protect and preserve cultural heritage. The cycle is, by understanding the historic environment people will value it, by valuing it they will want to care for it, by caring for it they will help people enjoy it, and from enjoying the historic environment comes a thirst to understand [8].

The importance of protecting and preserving cultural heritage is an act that required participation of many people; therefore, people need to be aware of this issue, the goal is to make people care for cultural heritage and care about history. When all the people are care about protecting cultural heritage, the act to preserve cultural heritage will not be a difficult task anymore, rather people will have a personal satisfaction that the thing that they care is giving them an enjoyment.

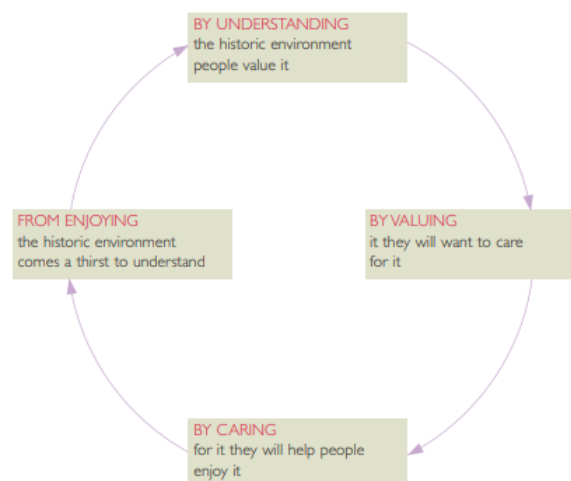


Figure 2. The Heritage Cycle Diagram Made by English Heritage in 2005

3.3. *Using technology for preserving cultural heritage*

The rapid advancement of technology has provided us with so many new media in storing and displaying information. The changing of lifestyle in modern human where internet is one of the basic need, has improve our access to information that are difficult to access in the past. Distance has not become for us to know what happening in around the world. The cloud system has made change our data storing behaviour from offline storing to online data storing.

Today we can convert any kind of information into digital form, starting from a document, image, video, 3D object, 3D animation, etc. The introduction of virtual reality and augmented reality also giving us a new media to explore and a new way to receive information. In animation, VR animation and movie starting to gain popularity, VR animation and VR movie already start to be made. The abundance of modern technology giving us a new way to explore and enjoying the world.

In the previous heritage cycle diagram, we know the importance of the interest of the masses on cultural heritage. To attract people and to encourage them to care for the cultural heritage, and one of the way is by using the abundance of technology for preserving cultural heritage and introducing people to cultural heritage around them and even cultural heritage around the world. In the strategic objective of Historic England, there are an objective to "Expanding the digital availability of our assets to improve both access to our resources and users' experience of them" [9]. This means technology are taking part in promoting cultural heritage to people.

Some people know that if they want to enjoy cultural heritage, there are some ways to access them such as going to museum or going to the site of the cultural heritage. That is applied only for the tangible cultural heritage, for intangible cultural heritage, people will search for video or literature. In addition, all of these are applied only for people in big city and have access to museum in their city. However, people from rural areas or small village may not have easy access to museum due to a far distance to the museum.

The basic concept of Society 5.0 is using technology for improving human's life. This includes eliminating the limitation of the previous method using technology. The idea is how to deliver a museum to the people and give a chance for people with limited access to museum, to enjoy museum without worrying about distance and to give them the same exact experience as if they are in the museum itself. Before we expect people to care for cultural heritage, we want people to know about it first in an exciting experience possible, so later they will be aware that the cultural heritage needs to be protected and preserved. Using the 3D scanner and motion capture, human can digitalize any tangible cultural heritage and recreate intangible cultural heritage scene. The quality of 3D scanner today is excellent. People can record all the detail of every cultural heritage. For intangible cultural heritage like a traditional dance, traditional custom or ritual, the scene can be recreated using motion capture and animation. The same thing will be applied to historical events that can be recreated using motion capture and animation. Using VR and animation, people may get the extreme immersiveness of what happened in that event.

Since VR tools was released to public in 2016, it immediately gained popularity among people, but the slow development for the content and the lack variety content for VR has made it pummel in popularity. VR has so many potentials, but it is not without a flaw. Some people have health issues when using VR, such as headaches, eyestrain, dizziness, and nausea. These issues can be solved at the hardware level by delivering balanced experiences with high refresh and frame rates. Gaming industry guidelines used by Epic, Oculus, Marvel, and Intel recommend that games completely avoid any use of induced motion, acceleration or "fake motion", which are often the main cause of discomfort and motion sickness [10]. Despite the flaw, VR can give people the new and immersive experience in enjoying digital environment, thus it will be beneficial for introducing people to the topic of cultural heritage and history

With the state of VR today, there is some new development in animation and film making where filmmaker and animator who have access to VR toolkit, are trying to make film and animation on VR. For a filmmaker and animator, VR film and VR movie are giving them the new perspective on how to make their film and animation. Unfortunately, the popularity of VR animation is not really great. Only some segmented community are aware of this new media. This is happened partly because the VR tools is not dispersing yet into people's daily life, and VR, also AR, are still used as an additional media to support the main media.

Some museums in the world have used VR for displaying some of their collection namely Louvre, Patterson Automotive Museum, National Museum of Finland, etc. In the National Museum of Finland, there was an exhibition created by ZOAN Studio, where people can head back in time to the

year 1863, as they explore R. W. Ekman's painting *The Opening of the Diet 1863* by Alexander II. The VR headset allows people to feel as if they are stepping inside the painting. Visitors find themselves within the scene and can look around at the Hall of Mirrors from a 3D perspective. They can even speak with the Russian Emperor and other characters depicted in the painting. It is part of an exhibit detailing Finnish life and politics in the 1860s, under the Russian Empire [11]. The main idea is to make people to get immersive experience by using VR exhibit while they are in the museum. This means only people who visit the museum are able to enjoy the exhibition. In this case, VR are being used as the additional attraction exhibit for people to come to the museum as seen in Figure 3. The aims is to attract people to come to the museum, so the museum will get the income for maintaining their collection. While using the cloud service to store the digitalize data of the museum collection for later delivering them to the people at home, will make museum loss in income. One of the solution for this is to make digitalize collection to be accessed by paying for the permit. So, if people wanted to gain access to the content of the VR collection of the museum, they will need to pay the access permit, or using subscribe method to pay for it monthly. This subscribe method will be beneficial for university with history major or culture and history institution.



Figure 3. Screenshot of VR "R. W. Ekman's Painting, *The Opening of the Diet 1863* by Alexander II" in National Museum of Finland Created by ZOAN Studio

3.4. Society 5.0

With how Society 5.0 works, we can deliver anything to people and give the best comfort using big data and AI. People will have an access to every desired content on the internet without having to think about an obstruction like distance or time. The idea is to make human life comfortable by using advance technology. Robot will do the hard work for people, so people will be more valued by their soft skill, how they communicate, how they lead people, how they respond to their every daily problem using technology in their arsenal

The massive consumption of internet in daily life and the disperse of technology in people's daily life, will make it easier for Society 5.0 to be accepted. The advantage of using AI for analyzing big data means human do not need to go through the process of eliminating non desired content. For example, if someone wanted to know about a topic, the AI will analyzed the data that have that content and provide the person with the most accurate and suitable for him or her. This is suitable for someone to learning something, because with abundant information in big data, there some information that are not suitable for what the person wanted, or even it contain the wrong information. With the organized archiving and accurate digitalizing information, we can make sure that every content is in a good quality.

4. Conclusion

The Society 5.0 allows human life to become more prosperous and comfortable. The elimination of limitation that are previously exist in information era will be done by AI, robot, and other autonomous technology. The idea to bring museum into people's home will make people to aware of the importance in preserving cultural heritage and historical events, and also will give people a new exciting way to enjoy history. Using big data, AI and VR as it main tools, distance is not an obstacle anymore for people in a village. In the end everyone will have equal chance to learn and experience the advancement of technology. This idea is not without a flaw, and it is not something that can be fully fixed. For example is that not every house have VR tools and the lack of variety content in VR has made people to view VR as second rate entertainment. How big company using VR as supported media also made VR to viewed only as something that can always be replaced with other media. Also VR animation is still new and required more attention to film maker and animator to make it disperse in people's daily consumption. The massive amount of cultural heritage also means more works to build a massive digital archive of cultural heritage around the world. Challenge is needed to make human's life more prosperous and raise awareness of younger generation to preserve cultural heritage and to know history as well as to prove that technology and tradition can exist together at the same time.

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