Photogrammetric Modelling on Historical Monuments:

Nereid Monument and Tomb of Payava and Virtual Museum Experience

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Abstract

This is a study of the three-dimensional photogrammetric documentation process of historical monuments which are not in original locations examines need for recording and documenting. It is considering this is a fairly long way to go and it is important that it can be produced solutions in the fastest, most accurate, economic way. In that concept, photogrammetry is one of the economical and accurate methods. In this study, it is aimed to document and create the 3D model of Nereid Monument and Tomb of Payava which are examples of Cultural Heritage and Memorial Monument which is generally identified with large objects by means of digital photogrammetry using the 3D modelling possibilities provided by the developing technology. In this way, by providing documentation of historical monuments which are the one of the most important items of cultural heritage and urban information systems it has been demonstrated that structures can be modelled effectively. It has also been demonstrated that 3D models can also be used in the field of architecture and archaeology for the purpose of reconstruction, preservation and promotion of the historical monuments. It also includes examining the possibility that the 3D models can be alternative key for the monuments that are not in original location. Through modelling, it is aimed to provide nationwide recognition of monuments which are not possible to come back to Turkey and to do practice virtual museum experiences with them and to create a social consciousness on society for the monuments.

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1. Introduction

The primary focus of this dissertation is to establish a need for a standardized data for the documentation of historical monuments which are not exhibited in their original locations. It is also claimed that create accurate solutions for both the monuments and other historical architecture which are large scale. The collection of data that is so prevalent in the documentation of the monument but generally these historical objects is missing on the standard contexts. Many cultural factors such as time, nature and humanity are harming this cultural heritage, and many of them are also disappearing for the time. Most details of many historical monuments have been lost and looted on and just little remains to describe how the structure originally appeared. The fact that the people who left them us today and we have to protect them for future. The protection of the heritage preserved in a proper way has recently gained importance in the world. The development of standardized data for the documentation of historical monuments can bridge the gap between the importance of cultural heritage and future generation.

In this study leads to produce solutions in the fast, most accurate, most economical way. In this context, digital photogrammetric techniques, which have been widely used in the world, from the most important part of these solutions. Given the possibilities provided by developing technology, documentation, restoration, reconstruction, and presentation of many historical buildings can now be done by the digital photogrammetric method. One of the most important advantages of photogrammetry is that it enables modelling of objects in three dimensions (3D) in an accurate way. It is possible to examine the objects in the virtual environment, to look at the models and it became easy to analyse. Photogrammetry is the most important of these methods in terms of economy and speed because the modelling of large monuments can take time and the details of the work can be lost. With this method, these negativity goes down to a minimum.

It is known that Anatolia is very rich in cultural heritage because it hosts many civilizations from the prehistoric periods to the present day. Despite this wealth of Anatolia, the heritage protection in Turkey is still behind if compared to many other countries, but nowadays, the country has begun to work with documentation, restoration, reconstruction with the help of state support. The aim of the research is to examine the evolution of identity perspective over Nereid Monument and Tomb of Payava. The Lycian Historical District, I have chosen as an area of research has a mixed historical structure

both in terms of its ancient history and later in its 19th-century history which has entered the period of modern time, with both identity issues and historical events. Xanthos, on the UNESCO cultural heritage list, is one of the important Lycian historical cities. Nereid Monument and Tomb of Payava which are originally from the site are exhibited now in the British Museum collection.

The main research questions can be divided into two parts. First, explaining why the historical monuments are not displayed in the original location. A century ago, the monuments have taken from the original location which in Turkey due to a lack of legislation and political reasons for that period. Not being exhibited in the original location is not only for these monuments but also we can find various cultural objects they have same situations in many museum collections. It is a subject that is both sensitive within itself because of entering into politics of law and identity problems and preserves its validity today.

Secondly, because of that reasons, my other research purpose is that it can be created alternative solution with photogrammetric documentation. It is also to see whether technically large-scale monuments within the museum (i.e. structures within another structure) can be suitable or not for photogrammetric documentation. Since creating modelling is directly related to working condition and the places and it is affected by accurate model and details. Lastly, after the documentation is finished, a virtual museum will be created using the models. The people in the place where monuments belong will have a chance to see and get try to experience using virtual reality platform.

2. Research Design

This chapter outlines the research questions and objectives of this dissertation. As I mentioned before, to create an alternative solution using with 3D modelling, it has research questions. Firstly, there can be a problem when applying the photogrammetry method and for the monuments, it is a suitable method or not. Secondly, historically, reasons for taking the monuments because it is needed to see what the problem before suggests a solution. History can be defined as evidence-based linkage process with events in the past and information obtained at the end of this process. In historical research, the place, time, person and institutions where the events occurred should be specified and the causal link between them should be proved. I can say that I applied to a comparison of references that it is an appropriate method to place different perspectives and to compare historical evidence.

For the selection of research methodology, as I mentioned before, selected two monumental objects in British Museum and there are Nereid Monument and Tomb of Payava. The research has progressed in two stages; to search for historical backgrounds and to create a 3D model, photographing the monuments on the museum. The method can be described as experimental research because research questions about modelling and virtual museum will be seen through experience. The research has been carried out through an extensive work both on the British Museum, and studying sources such as previous case studies in the area and archival works that have been carried out in the field of site conservation were included in this study. The research questions are that what the Antiquities Law is in Late Ottoman Period and Turkey and other Western countries, what are the general features of the site and the features of the historical monuments and what is the future of the site. Especially, I examine as the historical concept, and to give place to other glances, I took part in the examination of Ottoman antiquities law in the 19th century.

3. Literature Review

This literature review examines the three main topics central to my research. The first main topic is that examine the reasons that Nereid Monument and Tomb of Payava are not exhibited in their original locations before referencing the history of the sites and their historical contexts. In order to identify solutions addressing the issue of heritage objects on display out with their context and even their original country, we will discuss why this is problematic and why it has so frequently occurred. The reasons for this dislocation are not only about the historical context but also related to political and legal contexts that made it easier for these objects/sites to be brought to other countries and religious and cultural reasons feed the problem gets bigger. Because of lack of Antiquities Law and late starting in Museum Studies, they affect to control the historical artefacts and monuments and make a barrier to create the perception of awareness of the history. On the other hand, religious rules which affect the identity of social influence to be known their own history. Ottoman and Turkish identities can be described as a conflict between East and West and it influences the development of Law and Museum Studies. However, though of negative reasons and results, during the time, we can see in Turkey, the purpose of the museum and collections led to dramatic changes with historical contexts and there has been the development of national consciousness if comparing the past.

Secondly, another aim of this study is to examine the increasing role of virtual museums in international cultural cooperation, which have become educational institutions at the same time with the regulations and innovations made. How do virtual museums with unlimited archives and exhibitions use the privileges of the digital world to influence the new communication model? Can virtual museums transform museums in a post-modern sense? In this context, how the transfer of cultural information to the museum will be considered when considering the conceptual dimension of representation and exhibition in the virtual museum environment. In that reason, photogrammetric documentation can make big difference for the informative database. Lastly, it is referenced that what the values and characteristics of monuments and site are and with all of the reasons of legacy, historical contexts, it becomes much easier to recognize the sensibility of the general situation.

2.1. Antiquities Law and Museum Studies in Late Ottoman Period and Republican Period of Turkey

Basically, the main reason for the preservation of ancient objects is that every ancient object is proof of the past. These are the bonds that create the connection for us from the past to the present, and thus help a community to revive its history greatly. In addition, the ancient artefacts are goods that have great importance in the development of the aesthetic values of the societies. The protection of ancient artefacts is the protection of the history and aesthetic measures of a society (Mumcu, 1971). At the same time, history is home for aesthetics, societal values. Therefore, the protection of ancient artefacts is a great duty for society.

Antiquities Law is still new and controversial subject in Turkey. However, in Western Europe, Antiquity and preparing law is always examining and there is an established understanding of the law. (Mumcu,1971). Turkey, in terms of archaeology and history of art, has very important sites, objects, and traditional values. During history, Turkey has been a land of different empires, societies, and identities and the values tend to become it the antiquities stores. They have been plundered by foreigners because of many reasons, or they have been unconsciously destroyed by the people themselves, and then it has started to run out slowly due to the fact that the same irrelevance is partly due today (Mumcu, 1971).

Additionally, according to Islam, the construction of paintings and sculptures rather than trees, flowers and inanimate objects are prohibited and in the countries affiliated to the Islamic Culture, it has prevented the development of plastic arts. It is for this reason that indifference which has dominated the ancient art treasures for centuries can be explained. However, Islam-Turkish Culture has created important artworks and the architectural field has improved outside sculpture and painting. In the empire, in a period of the defeat and dissolution, ancient works, invaluable thousands of manuscripts and spectacle for the valuable goods stolen even from the mosques to go abroad (Mumcu,1971). In this case, it is clear that in a country which cannot protect its own works is evident that a wide and well-established love of ancient art cannot be mentioned.

Until 1846, we did not come across an attempt to protect and collect ancient objects in Ottoman Empire. In 1846, Marshal of the Imperial Arsenal, Ahmed Fethi Pasha made Hagia Irene Church a military antique museum (Shaw, 2007). In the old Byzantine church, not only military spolia but also relics from the Byzantine era (Shaw, 2011). This is

admitted the birth of the museum in Turkey and start point for the importance of ancient objects. Museology movement, albeit primitive, begin work in 1847 and there was no provision to save from getting smuggled antiquities and protect the homeland (Mumcu,1971). During this period, many important parts of monuments and artefacts were carried on outside of country such as Nereids Monuments and Tomb of Payava. Because of lack of law and controlling, they caused these important artworks to took over this period. The abduction of ancient objects was also very common in these areas until 1881. After Osman Hamdi Bey became director of the Museum, it is the introduction of a milestone in Turkish Archaeology and Art History. He generated Antiquities Law and established Istanbul Archaeological Museum. Interest in ancient artefacts, around intellectuals, was also beginning to increase. We see that the first scientific studies on the preservation of immovable (monumental) artefacts have been made (Mumcu, 1971).

In the Republican era, after the 1920s, the museums were related to general ideological perspective and objects were exhibited for territoriality rather than the aesthetic value of art (Shaw,2011). Ideological perspective is that after established new state, organs of state, culture, education have been adopted as a western value. However, through that history, Turkey has been able to balance the demands of maintaining a republic with Islamic traditions. The conflict comes from that approach. Especially in the early period, national museum was a part of a tool for reconstructing the identity and intended to inform about their pasts. Since every newly established state does want to create identity awareness, every suitable structure has begun to be used as a tool. Historical objects and museums are one of these topics. The establishment of the Museum of Hagia Sophia in 1935 and building new Western-style association such as the Istanbul Museum of Painting and Sculpture in 1952 are good examples of the period(Mumcu,1971).

After the recession period of 1960-80, the economic liberalization supported to begin an era of museum privatization in which establish private museums, donated to art and national ideologies without state intervention (Shaw, 2011). Mumcu criticized that all collections were under control by the state. In Europe, the state is still the important role for antiquities but, collections can be private and improve independently. Since specification and control on movable antiquities are quite difficult, mostly there is no additional property apply on antiquities. However, a museum can buy the antiquities or accept the donation in normal circumstances. For immovable artefacts, the controlled much significant and fundamental. In the 1980s, the system is changed and became liberal and

private. 1990s, modern through an emphasis on art in the Western modality and projecting a mode of identity production. (Guler, 2005).

2.3. General History

To begin with, Lycians culture has complex structures of history and also the unique value. There is no other region of Asia Minor, was so closely connected to with Greek in mythology as Lycia(Brewster,1993). It is a period in which the important political military and artistic event that is determinant for the classical period following the sixth century BC and the archaic Greek period, is experienced(Alpaslan,2005). The Lycians were an Indo-European people of the Luwian family which occupied Asia Minor from the third millennium BC. The Lycians came originally from Crete, which in ancient times was occupied by non-Greek peoples (Antony, 1998). According to Child, they shared many characteristics of the cultures of interior Asia Minor, including their Near Easter background. The architecture and art of Lycia were formed by the confluence of three quite distinct traditions, the local, the Near Eastern, and the Greek. This view has lost its accuracy and we cannot claim that Lycian architecture and art are affected from Near Easter directly. During this chapter, I will explain why Lycia has a local identity and is influenced by ancient Greek culture.

In general, Ancient Greek architecture until the 7th century B.C., a monumental structure was not found with dimensions exceeding human scale considerably. The absence of a centralized political structure, and thus the fact that no king or emperor has emerged to organize monumental structures by organizing thousands of workers - either by forced or wage - is a major cause of the failure to achieve major construction(Alpaslan,2005). Political structures in the eastern civilizations, which are more central than the Greeks, the king or the emperor's figure is frequently encountered. Egyptian King Menes, for example, he merged the Egyptian kingdoms, up and down parts about 3000 BC and in Mesopotamia, around 2350 BC the ruler of the city of Akkad I Sargon Sumer established a regional state by combining the city states. Hammurabi, the sixth king of the Babylonian dynasty, by around 1700 BC, Sumer and Akkad countries have formed an empire by combining them under a single administration (Antony, 1998). These powerful rulers of Mesopotamia have found the possibility of embodying their power through monumental constructions by ruling over large areas of many cities - sometimes several countries, by organizing the labour and raw materials there, with the help of military or economic power. In the Greek mainland, it is difficult to talk about a political structure in these days. Although the

Minoan civilization in the island of Crete, which is believed to have a significant impact on the relationship with Greek culture is unclear, had a king in the 1900s BC, its political structure was at a level that could not be compared with Mesopotamia or Egypt. (Antony, 1998).

Opposite to this approach in the Greek world, there were structures that transcended the human scale in the East. Early dated a Greek temple with an Egyptian pyramid or to think of the Mesopotamian ziggurat side by side, the difference is revealed in a concrete way. In summary, BC in the 7th and 6th centuries, while Greek architecture was at the breaking point in terms of material, technology, and design, relationships established with the birth of this relationship led to the participation of eastern elements, and the idea of monumentality, which was not encountered in previous Greek architecture, was influential in Anatolia and Islands(Alpaslan,2005). Memorial has a different effect on the density of the eastern, Carian and Lycian areas can be attributed to the differences in response to the invasion of the Persians and also the culture. Lycia, Xanthos, in particular, faced significant resistance at the Persians Caria is no record that they encountered resistance at this level. Isocrates claims that the Persians could never occupy Lycia (Antony, 1998). Although this claim does not exactly reflect the truth, it can be considered that Lycia is more independent and free than its neighbours.

Between 5th and 4th BC centuries, the monumental tombs of the podium can be considered to be monumental in large dimensions besides other burial structures in Anatolia. In particular, The Mausoleum at Halicarnassus has gigantic dimensions as the extreme point reached by this type. The Lycian and Carian regions in the south-western part of Anatolia are ruled by local rulers until Alexander the Great. Unlike the modest burials of the Greek city-states governed by the Aristocracy, the construction of spectacular monumental tombs is a result of the wishes of local beings to embody the forces of the eastern kings (Borchardt, 1970,). Pericles and Mausolus, the proprietors of the Nereids Monument, Erbinna ruled the regions of many city states, thus reached the raw materials and labour required for the construction of the monumental structure.

The acropolis of Xanthos, which is divided into eastern and south-eastern necropolis areas, is on the hill forming the north-eastern part of the city. Sarcophagus forms an important part of the Lycian tomb architecture. Approximately 2000 sarcophagi reaching the typology of the work done to date has not reached the desired result(Alparslan,20015). The largest and most important was Xanthos whose original

Lycian name was Arnna. They had their own language, Indo-European which we can find inscribed on their more ancient tombs and sepulchral reliefs (Antony, 1998). When the Persians conquered in 545 BC the citizens of Xanthos put up a resistance. Herodotus mentioned how Persians army into the plain of Xanthos, the inhabitants came out to meet them: They did valorous deeds in the battle against odds. (Alparslan, 2002).

After conquered, all most every city has satrap which were the governors of Persian Empire. Although the kings of the Caria dynasty were who are not Persian called as satrap of the Persian, a Lycian ruler was never referred to as satrap. It can be deduced that the Persians received better in Caria than in Lycia(Alpaslan,2005). The architecture of this distinction between the two regions can be seen in the reflection. There are many elements that can be claimed to be of eastern origin in the podiatric grave monuments in the Caria region, which are not in the Greek building style. The Lion's Grave was built using the elements of the Dorian order that are not common in Anatolia. Although the Mausoleum is based on the elements of the Ionian order, there is a great deal of eastern influence. The monuments in Lycia can be described as examples of the pontoon of the Ion temple architecture, except the grave house in Xanthos(Alpaslan,2005). In this study, Lycia, Xanthos, Tomb of Payava and Nereids Monument will be examined.

FIGURE 1 NEREID MONUMENT

FIGURE 2 TOMB OF PAYAVA

Nereids Monument, Xanthos

It is not known for certain years how and for whom the Nereids Monument was built on a slope overlooking the city of Xanthos in southern Lycia. The building is the first example in Anatolia of grave structures in the form of a Greek temple on a podium (Borchhardt, 1970). Although it turns out that the subject of both the frieze and the size are required for an important person of the monument, there is no definitive consensus on this issue. Dinsmoor notes that his owner is a local prince in Xanthos (Dinsmoor, 1950). Çevik argues that the monument is a political work to finish Erbinna's ruling problems(Çevik,20012). Demargne thinks that it may have belonged to Erbinna, who embraced Greek culture and held himself with Greek heroes(Demargne,1990).

On the other hand, the Lycians showed receptive to Greek art and culture and created in the field of sculpture which showed itself in Hellenised form(Brewster,1993). Some of the sculpture were made by Greek artists like for example the three female figures and the reliefs of the Nereid Monument. According to Childs, the Nereids Monument clearly represents the influence of Greek architecture and sculpture in Xanthos, but local and eastern architecture has also found its place in the general form and detail of the building. In this monument, it cannot be said that it is the eastern effect because both the

model of the monument and the wall reliefs and sculptures it contains are directly influenced by the Greek and local art.

The temple on the podium has four columns on the short sides and 6 columns on the long sides. Among the columns, Nereid sculptures stand, which is the reason why the building is referred to as the "Nereids Monument". The columns carry the architrave, which contains the third frieze band under the saw-toothed frieze. Across the four corners of the roof and at both ends of the maze, there is acroterion that portrays characters from Greek myths. The monument was discovered by Charles Fellows in 1840 and moved to London almost as a whole and rebuilt at the British Museum (Fellows,1839).

Tomb of Payava, Xanthos

Tomb of Payava, which was taken to the British Museum in 1845 from Xanthos, is a sarcophagus with two burial chambers, wooden architectural limitations, and embossed reliefs. Middle block, south narrow: two standing figurines are in action. It is the person who is crowned, Payava standing on the left side of the figures of war clothing. Middle block, southern narrow side: two standing figures are in crowning action. The honor crown is worn because of his victories. The inscription on the right hand confirms this argument. In the battle scene described on the east side, Payava is on horseback and he is placed in the center of the scene. He will be victorious against the soldiers who participated in the satrap rebellion and the soldiers coming from behind will be on the second plan. The northern narrow face is described as a crowning of three figurines. The naked figure is crowned because of his sports success (Childs. 1978).

Charles Fellows introduces the monument to the world, explaining the surroundings, the discovery starts to increase. The journals took place between the 1841-1842 period and the monuments remained in place until 1843-1844 because of the massive block cut process, where the reliefs were found. After G. Scharf made drawings reliefs, assistant Armstrong completed the mowing and packaging of the monument between 24 November 1843 and 9 February 1844 (Fellow, 1839). The date is February 14, 1844, when the artefacts from the road connecting the camp site to the scaffold on the river were loaded on the ships. The monument, which reached London, was first exhibited in 1848 in Synopsis' 142 room as the "Tomb of the Lycian Satrap". In the late 19th century, the sarcophagus was re-arranged at number 950 in the Mausoleum Room. The monument was first published in A. Smith Catalogue in 1900, and in 1969 it was introduced to the

publicity. In London today, the hyposorion section has been completely rebuilt and the sarcophagus has been completed with the assistance of a small original part(Alpaslan,2005).

4. Documentation

Monuments are proofs of world history and many technics for presentation, reconstructions, and restorations of the monuments are improved. During the time, many organizations established and they are aiming to be guided by an international and national doctrine follow that is based on theory, experience, and ethics (Kalman,2014). The examining principles that claim the best in the heritage presentation practices for monuments are discussed in this chapter. The data is required and used for complete documentation which should be produced with sufficient accuracy, detailed, shareable, understandable. Photogrammetry is the best way to produce accuracy, texture coverage, high resolution and 3D documentation data for monumental structure. However, it is claimed that it has both advantages and disadvantages of the methodology. During applying on 3D modelling for Nereid Monument and Tomb of Payava, it is discussed both terms of situations.

Before describing the methodology, I would like to make clear that the term of 'best practices' as described by charters and documents have been illustrated over the years by Western heritage specialists(Kalman,2014). In general, the charters and conventions have been announced under UNESCO, the United Nations agency is responsible for culture and by ICOMOS, the International Council on Monuments and Sites, a non-governmental organization that is under the UNESCO. Charters and their documents are adopted assemblies of ICOMOS. Many are named after the city where the meeting occurred. Thus, the Athens Convention (1931), the Chart of Venice (1964) and the Granada Agreement (1985) and the Nara Document on Authenticity (1994) are resolutions in which the need for photogrammetric documentation of the monuments is also mentioned, as part of their protection, study, and conservation (Ioannidis and Georgopoulos, 2004).

UNESCO (1946) has special role this goal and ICOMOS (International Council for Monuments and Sites) is the most important one, but also CIPA (International Committee for Architectural Photogrammetry), ICOM (International Council for Museums), ICCROM (International Centre for the Conservation and Restoration of Monuments) are all related to this task. In short, the documentation should be considered as a part of the general presentation of the Cultural Heritage. This covers also the historical documentation, the architectural documentation, the bibliographic documentation etc. (Ioannidis and Georgopoulos, 2004).

4.1. Method as a Photogrammetry

Conventional two-dimensional photometric applications are insufficient for many applications. For this reason, three-dimensional account, with photogrammetry, questioning, analysis, simulation and visualization of the monuments have gained importance. With today's CAD technology, a perspective of a monumental surface can be obtained and there is a possibility of three-dimensional visualization. It is possible to examine the objects in the virtual environment and to look at the models. In terms of cultural representation, as the result, modelling and this representation should be automatically defined(Alkis,2003). Three-dimensional visualization is used for a variety of purposes. For example, it can be able to make the right decisions in the planning of environment, city and geographical places, spatial visualization for tourism, mining, hydrology and so on. It is also used in animation studies in the production of interactive 3D projections in virtual reality studies(Alkis,2003).

This method is also called Close-up Photogrammetry, is metrology of technique used to obtain three-dimensional spatial information about an object. In the digital photogrammetry, it is necessary to capture consecutive and overlapping images from different stations in order to obtain three-dimensional data and achieve high accuracy(Alkis,2003). In order to achieve this condition, the camera layout must be well designed and the positional model most suitable for processing need to be selected. In addition to achieving high dimensional accuracy, how many cameras which is also called camera network design, where and how to place them and the number of control points on the object and how their position should be achieved are ensured by using the appropriate optimization method.

Most of the applications of close-up Photogrammetry constitute non-topographic applications. One of the characteristics of non-topographic photogrammetry is that requests and needs differ from practice to practice. However, the aim of the photogrammetric measurement process is to raise the quality within the boundaries defined by these demands and needs. High quality is possible by optimizing each project separately in terms of accuracy and economy(Alkic,2003). At the end of the project, in order to achieve the desired accuracy, it is necessary to realize the components that bring the photogrammetric measuring system to the stage. These are planning and network design, shooting preparations, measurement tasks and evaluation can be grouped into four groups. These basic components also represent the basic stages of measuring and evaluating a monument by the photogrammetric method.

Sufficient data is obtained for the purposes of restoration, preservation, and restoration from the photography of the historical buildings and constructions, from the three-dimensional coordinates in the computer environment. While scaled drawings of complex shapes and motifs in historic buildings cannot be made with the classical method often, photogrammetric methods give these shapes in their actual locations and with all the details and the desired scale. The images obtained by photogrammetric methods have proved to be very important in architectural projects including the renovation or repair of surfaces containing complex building parts and in projects in other areas. Photogrammetry does not only involve the study of buildings in the study area. At the same time, the renovation of buildings after various damages, the amount of deformation and the measurement of restoration work are also included in the photogrammetry(Alkis,2004).

The use of photogrammetry in historical artefacts and monuments, which is part of the use of architecture and archaeological sites, is known as Landscape Photogrammetry and Close Photogrammetry (Ioannidis and Georgopoulos, 2004). Nowadays, with many reasons, legacy, and controlling problems, monuments can be damaged and displaced from original locations and as a result, these archaeological regions are completely losing their characters. Various methods can be applied to avoid this situation. However, for monumental documentation, the photogrammetry is the most important of these methods in terms of finance and speed. In these applications, the historic monuments are appropriately photographed locally and necessary processes can be done to obtain models and sections. The obtained data are very important and necessary documents in the documentation and protection of historical monuments. The evaluation of the received pictures can be done graphically or numerically. In this way, a lot of information can be obtained which cannot be compared with the detail to be obtained by known measurement methods (Alkis, 2003).

Contemporary architectural photogrammetry methods can be examined in three sub headings and there is single image method (monoscopic method), stereo image method (stereoscopic method) and X-ray beam method (Hanke, K, and Grussenmeyer, 2002). In these cases, the geometry of the architectural object surface desired to be documented is generally known, and single image method is partially preferred if the surface texture is desired to be documented but for better results, the other two are more suitable for documenting the shape, size, and position of the architectural object surface.

4.1.1. Stereo Image Method

The stereo photogrammetric method has similarities with the working principles of the human eye. Due to the distance between the eyes, the two images sent to the brain are

different. From these two different perspectives, a three-dimensional spatial impression is related to the ability of the human brain to integrate into the perception system. In photogrammetry applications; In order to obtain a three-dimensional spatial impression, images taken from both ends of a certain distance (base) and taken parallel to the camera's optical axes should be directed to the respective eyes separately. Such images are conjugate images that document the same area in parallel perspectives. (Pomaska, 1999). In other words, at least two photographs are required for contemporary applications. Stereo cameras for stereo photographing for architectural use, twin machines mounted on a stereo base bar, or a single machine scrolling on a bar(Pomaska,1999). Obtained pairs of stereo images are observed together and measurements are performed in the computer environment. However, the performance and usage density of digital systems are increasing rapidly.

4.1.2. Stereo X-Ray Beam Method

It is a method of photogrammetry that allows a complex building to be measured in a precise manner to allow geometry to emerge. It is also referred to as multi-image photogrammetry because of a large number of photographs that cover the whole object. It is based on the concept of triangulation (photogrammetric triangulation). Thus, a network of triangles is established between the positions of the camera, the documented area centres and the control points (Bock and Pomaska, 2002). Photographs are taken from randomly selected points and need not be documented at the points where the machine is located. However, for the whole building, it is necessary to be able to obtain homogeneous photographs covering the whole and to be able to carry out control measurements. For this reason, it is preferable that the photo orientations are realized one after the other but in different angles and partial overlaps. By marking the conjugate points on the different images documenting the same surface, the software calculates the three-dimensional coordinates of these points. It is the most widely used method today; because made with camera shots of different properties, each with their partially overlapping photographs and flexible melt point shooting in the same quota (Pomaska, 199). The results can be transferred directly to applications that can be performed in a reliable, precise and computer-aided design (CAD) environment.

It is evident that the adaptation of the developments in the field of contemporary photogrammetry to architectural conservation studies increases the productivity. Among the methods introduced, single image method is especially important in terms of speeding up the analytical documentation process and it can be used by experts such as art

historians, archaeologist and architects who are habitually working in the computer environment, as well as material scientists who are involved in the interdisciplinary nature of the conservation area. When this software is enriched with analytical information hardware, it allows evaluations to be carried out sensitively enough to be acceptable for analytical documentation. On the other hand, stereo image method, the three-dimensional spatial impression of the structure is obtained in a sensitive way, a lot of times in the history of over a century of architectural photogrammetry based on the principle that tested the validity of a method is unquestionable. Contemporary tools that use this method have not yet become widespread. Among the reasons for this are the fact that measurement software based on the stereo method can only be used effectively with specialized eyes and digital plotters cannot be economically present. In the case of three dimensional spatial impressions, measurement software using the newer beam bundle method compared to stereo method and as well as being able to be used by all the restoration specialist architects and civil engineers who are habitually working in the computer environment and is capable of transferring data directly to the CAD environment of the age of the drawing tool (Bock and Pomaska, 2002).

4.2. Method Application

During the process of photo shooting in British Museum, in a short time, within almost four hours, it had to finish for the relevant documentation of monuments. To see the differences between the photogrammetric documentations and work conditions of monuments, the descriptions of two monuments are separated. In general, the contributions of architectural photogrammetry applications are as follows; it is important to reveal all the subtleties of the surfaces. It became more economical than other methods in terms of accuracy. Applications for surface paintings and control include minor mistakes. It allows giving fast results of future studies. Compared with manual work, large volumes of data can be obtained faster. This method is more reliable than manual research. After 3D models obtained in architectural photogrammetry, generated 3D models, animations can be done on or within the tour. three-dimensional data can be obtained directly. This situation is increasingly important in the CAD field.

For comparison of monuments, they have completed different work conditions and also different scale and details which affect the 3D modelling process. First, Nereid Monument is in a narrow room of Department of Greece and Rome in the museum and the light source is not enough for the shooting. The single perspective view is not sufficient to obtain a corrected and scaled view of the object because monumental structures are made up a series of large planes and it became difficult to capture data.

FIGURE 3 3D MODEL OF TOMB OF PAYAVA

FIGURE 4 SOUTH FACADE OF TOMB OF PAYAVA

The colour of walls, dark blue, and yellow light sources influenced the colour scales of white marbles and the colour card must be used continuously to get it to a minimum deformation. The digital image correction process consists of the following steps are that firstly, the photographing is performed by positioning the photographic machine (camera) so that the surface of the architectural object to be documented faces as close to the centre as possible. Secondly, correction of building planes with the help of software on the obtained digital images(Hamamcioglu,2002). In other words, to better results, at least two photographic machines are required for contemporary applications.

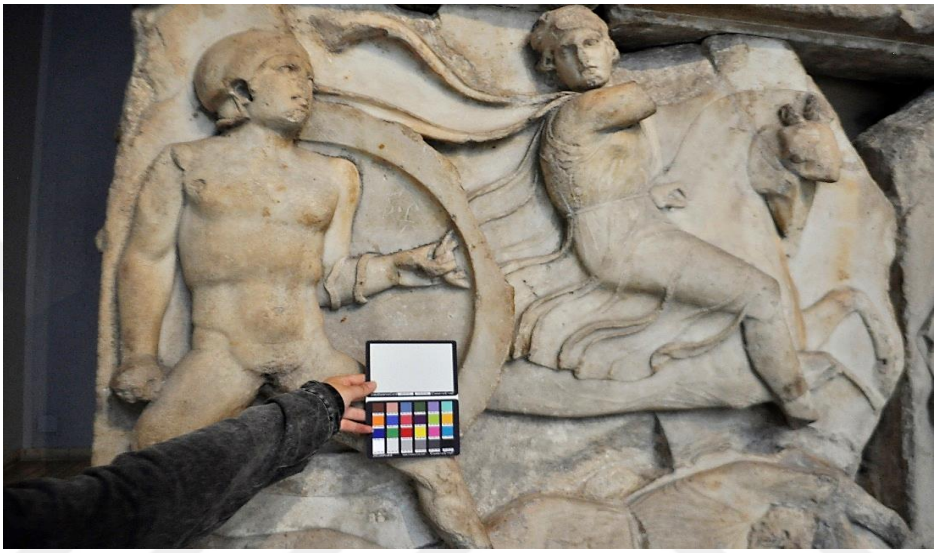

FIGURE 5 COLOUR CORRECTION WITH COLOUR CARD ON NEREID MONUMENT

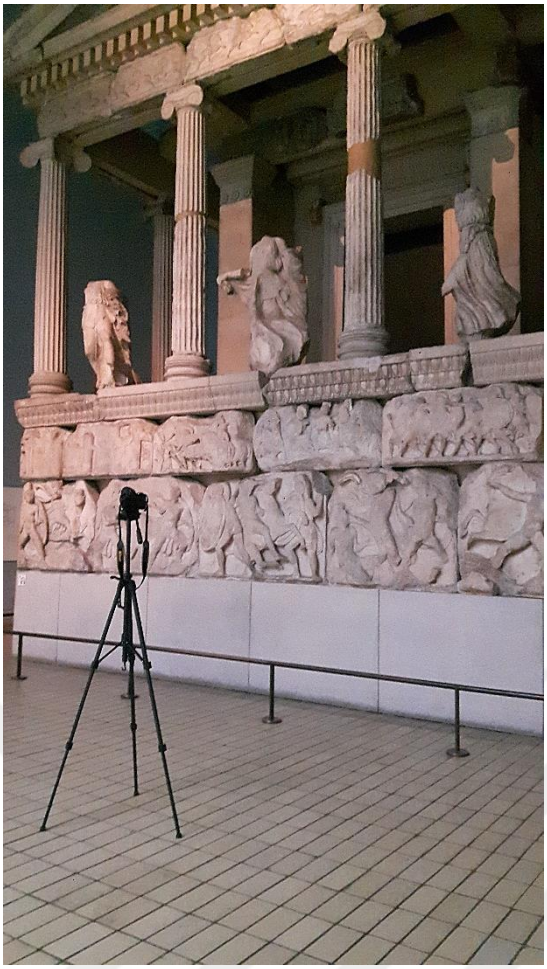

FIGURE 6 SAMPLE OF THE POSITION OF CAMERA ON NEREID MONUMENT

FIGURE 7 CAMERA POSITION ON SECOND FLOOR

As a result; Contemporary Architecture Photogrammetry shortens the working time in the field and some of the table-top processes are performed in the digital environment and through personal computers. Accordingly, it is a contemporary documentation technique directed towards a widespread user population. Measurements and visual presentations based on them; sensitive and reliable. Contemporary techniques have not been limited to only allowing the acquisition of scaled drawings such as plans, sections, facades of the present situation. Three dimensional and detailed visual products specific to the analysis, evaluation and synthesis processes of the architectural conservation area can also be prepared easily and precisely in the digital environment. The major disadvantages of laser scanners are that they do not give enough information about the texture of the objects, or they make this information worse by the photogrammetry. In the case of the photogrammetry method, vertically translated pictures of the facades belonging to the facade are produced and the model integration can easily be done.

4.3. Possible Problems

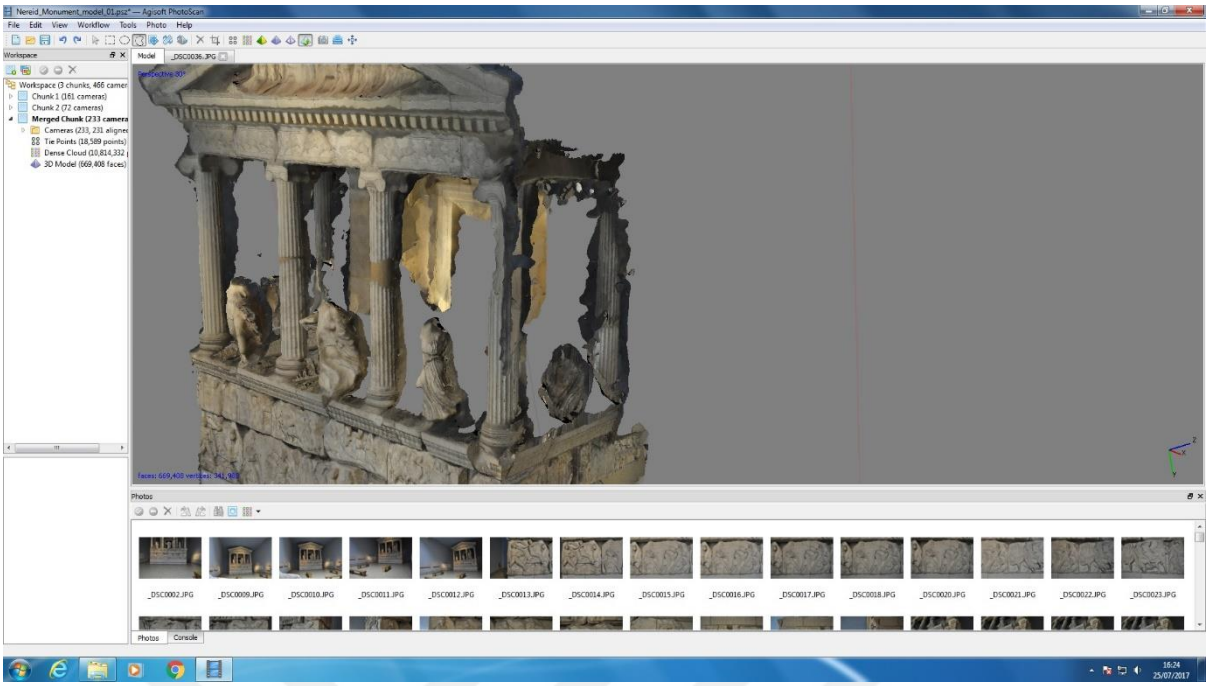

FIGURE 8 TEXTURE DISTORSION CONSTRUCTION ON MONUMENT

In the course of large-scale monument recording, one will be meet with many problems. The different architectural elements and ornament create more complicated surfaces in the object which demand both in the stage of data acquisition and during data processing(Ioannidis.2001). On the other hand, in order to provide the necessary large image scales, the shooting distances must be small. This is an additional question, as space limitations make the widespread situation worse, as more images and more flexible systems are needed. Often it is necessary to take a small base and stereo pairs with convergence on the axis of the camera which the monuments do not have. In addition, the accuracy requirements are very high, which makes things worse. Finally, with its large image scales, the greatest range of relief reveals the most serious problems that present difficulties in the overall accuracy of the image orientation settings, stereo vision and photogrammetric adjustments (Ioannidis.2001). All these problems may be faced with

various actions that are practically tested.

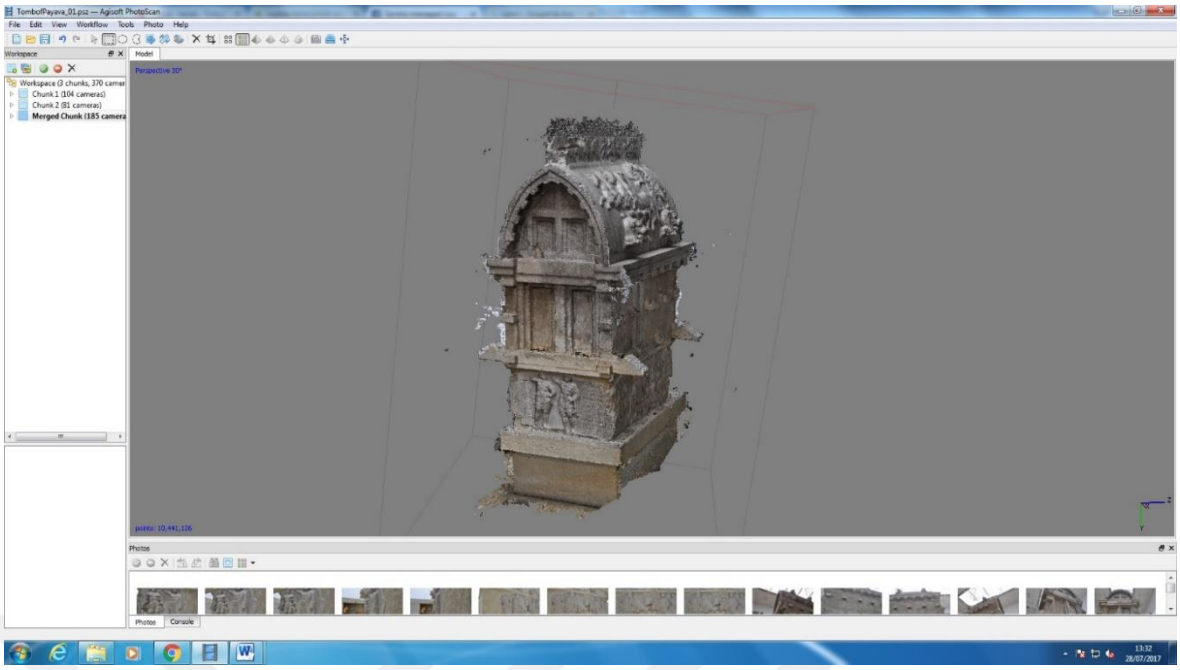

FIGURE 9 SAMPLE OF MONUMENT MODEL

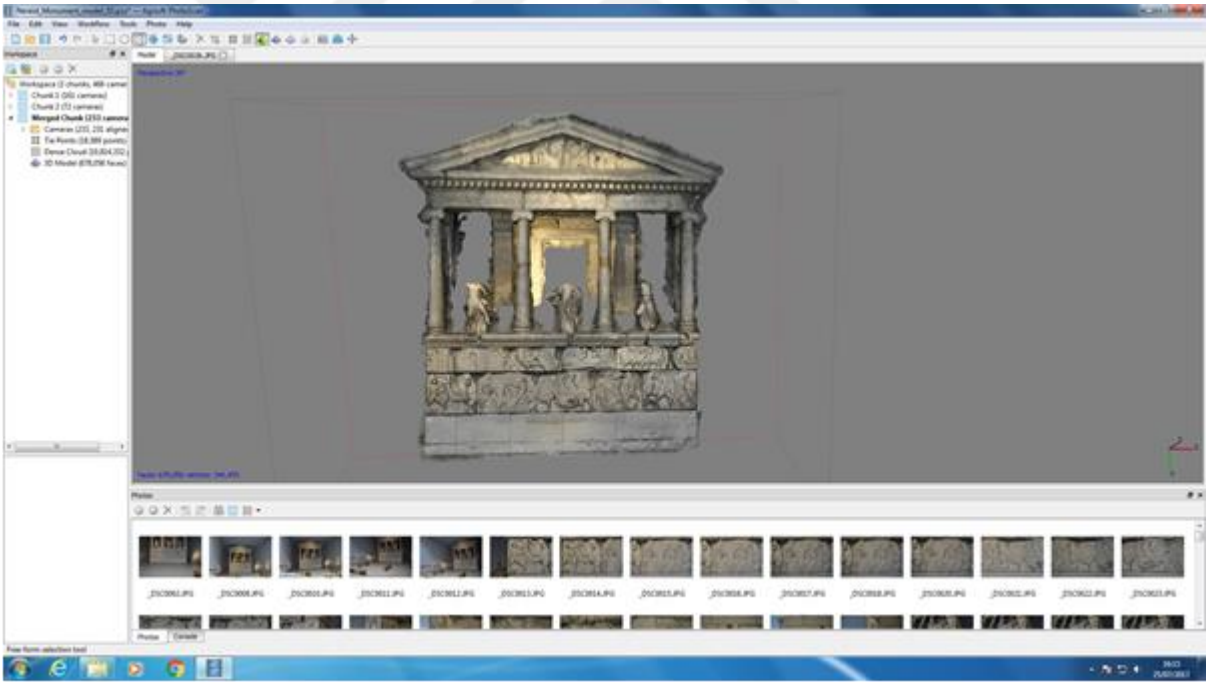

FIGURE 10 LAST VERSION OF NEREID MONUMENT

The development of methods used in the documentation and monitoring of cultural heritage is important both in terms of architectural preservation practices, art history, architectural history, archaeology and architectural research. In addition to all these advantages, there are several disadvantages that may limit the use of photogrammetric

products in some projects. It is a mixed technique and requires special inputs. It can be not suitable for small applications. The standard of the details and the quality of the products can be very good but it is directly related to shooting conditions and affects the quality of modelling. However, these values may be too high for the project in question. Even if the product is capable of monetary value, the actual price may be higher when the project is compared to the whole. Most important for the part is the careful and correct planning for the image acquisition. The correct position of the camera related to the object may, to a great extent, influence the quality of the product. Careful selection of the camera, the lens, and the lighting combined with detailed planning are of extreme importance(Ioannidis an Georgopoulos, 2004).

4.4. Post Modern Museology and the Virtual Museums

Through the collection of exhibitions and objects that protect social codes as a means of corporate communication, the cultural diversity of the cultural diversity brought by the capitalists to a certain extent allows them to collect the material at a certain level. The cultural heritage as a cultural industry, the collection of cultural assets as cultural capital (Adorno, 2013), supports the emergence of virtual museums as a new museum perspective in the 21st century.

Intercultural communication is an issue to be addressed in various dimensions. Cultural codes influence the verbal, nonverbal and behavioural patterns of societies. This study will focus on the impact of the virtual museum can be seen as the institutional dimension of intercultural communication. Art and virtual museum on the promotion of cultural heritage are also able to interact on an international scale. When we consider it in this plane, the virtual museums are indefinitely accessible, and a large collection of digital platforms makes it easy for followers to virtually visit different countries. When we look at culture theory at the level of intercultural relations, mainly oral communication comes to the forefront.

However, as communication progresses at the institutional level, it is observed that cultural spreading influences societies more quickly and effectively. When digital museums are thought to be cultural institutions of the countries they are affiliated with, they have the chance to realize international cultural events in the digital environment. Countries on this level allow for a certain degree of flexibility that is complementary to a cultural continuity by providing meaning to their own cultures and other cultures (Theunissen, 2010). Experiencing other cultures through virtual museums allows the

transformation of social identities. In some cases, this transformation in cultural identities brings with it the commodification of the cultures. According to Adorno and Horkheimer, the entities that can be examined in relation to the concept of culture industry also reflect the industrialized state of advertising (Walsh, 1992: 64). For this reason, the exhibition of cultural heritage and works of art through virtual museums actually enhances intercultural recognition and on the other hand, the culture accelerates the commodification process. Cultural promotion of the American and Western Europe-based virtual museums shows that the activities of the communication are mainly carried out on tourism and promotion when considering the importance of the history, culture, and anthropology of the local societies in the new museology understanding.

In addition to digital collections, multi-media systems that can be used in the museum are out of the classical representation in the works, creating a new reality. The planar narrative that modernity brings is based on "interactivity" since the 1980s (Witcomb, 2007). The technological environment created through the use of multimedia media provides feedback for the museum visitor and offers an option and allows them to develop different perspectives. The question that needs to be asked here is the difficulty in expressing the existing museum and collection as "virtual". According to Bozkus, simulations are not virtual because the virtual museum is a mirror of what is actually concrete, even if there is not a real in the world, with simulation technique and multimedia being used in the world. However, this virtual museum is not a mirror of reality and it is experimental virtual museum which is not British Museum. Given the growth of Internet and computer technologies in the last two decades, it brings to mind that the world can play an active role in promoting arts and cultural heritage and intercultural communication. The virtual museum has significant contributions to the emergence and accessibility of cultural values of the country.

Case Study: Underwater Cultural Heritage Virtual Museum in Turkey

The main theme of the "Kaş Archaeo Park Pilot Project" which is the first virtual museum project in Turkey in the field of archaeology is to display the cultural heritage that cannot be reached with the concept of "work not belonging to one time". This virtual project allows the replicas of wrecks from the first ages to be visited on the south and west coasts of Turkey (Varinlioglu, 2007). In a virtual museum, where replicas of a submerged boat are transferred in the closest way to the truth, a contemporary technology provides a national resource for marine history research. Kaş Archeopark Pilot Project, the other

virtual museum in Turkey, beyond their experience, they are advancing in an interdisciplinary lane. In the comprehensive project, the combination of different sciences such as archaeology, underwater scanning technology, instrumental deep diving and wreck diving provide a coordinated way of transferring marine history, which is missing on the southern coast of Turkey, to a common database of local finds (Varinlioglu, 2007).

FIGURE 11 VIEW OF ARCHAEO PARK TRIAL PROJECT (HTTPS://WWW.YOUTUBE.COM/WATCH?V=G88WJM_KXHE)

The gradual transfer of maritime history to the virtual environment is the greatest contribution to the implementation of virtual museums in Turkey, where a scientific-based project is clearly shared among all academic circles engaged in research on this subject. From the point of view of information communication, the archaeological park project, the introduction of the history of the country and the demonstration of its protection, are supported on the international scale by being supported by the visually rich exhibition technique. This project, which will provide promotion on a global scale, is the first comprehensive scientific work initiated in the virtual environment for the protection and promotion of cultural heritage in Turkey.

FIGURE 12 FINISHED MODEL

FIGURE 13 VIEW OF VIRTUAL MUSEUM

The geometric documentation methods described in the previous sections provide useful alternative recording products rather than gradually complement traditional drawing lines. Two main possibilities are thought to be appropriate and are gradually gaining acceptance. Firstly, the creation of virtual museum and data as a basic layer for an information system, related to the monument. In this way, the technological advancements have enabled the three-dimensional visualizations of the monuments on the computer screens and the 3D models have been created, containing and managing specialized

information and relating it to the specific parts of the monument. Their combined use with photogrammetric procedures, such as the production Unity Game Engine allows the realistic 3D representation of complex monuments (i.e. sculptures). In this context, virtual reality tours have been created for simple or more complex monuments.

This ability has greatly contributed to the comprehensive examination of monuments and the creation of virtual visits. Virtual museums can be accessed electronically visual, audio and text file art and culture and history are the digital treasures that share with the people in the area. In multimedia, it offers international platforming from many different sources, out of the traditional time-and-space presentation. The development of virtual museums in Turkey in the context of this Culture and Art Communication framework, which is more common in the world than ever before, is based on the production of works in terms of post-modern exhibition practices in the museums. In order to analyse post-modern museums today, basically two separate methods applicable. First, a reading is done through the museum's visuals to see how the object and the text are combined. The second one examines the museum environment from the perspective of Foucault in terms of management and state dominance (Witchcomb, 2003). Apart from being a leading educational institution in the public sphere, it is also a socializing place. Reading practice, which is to be done through museum exhibitions when considering from the standpoint of virtual museums, is a new experience in terms of museum visitor and virtual exhibition.

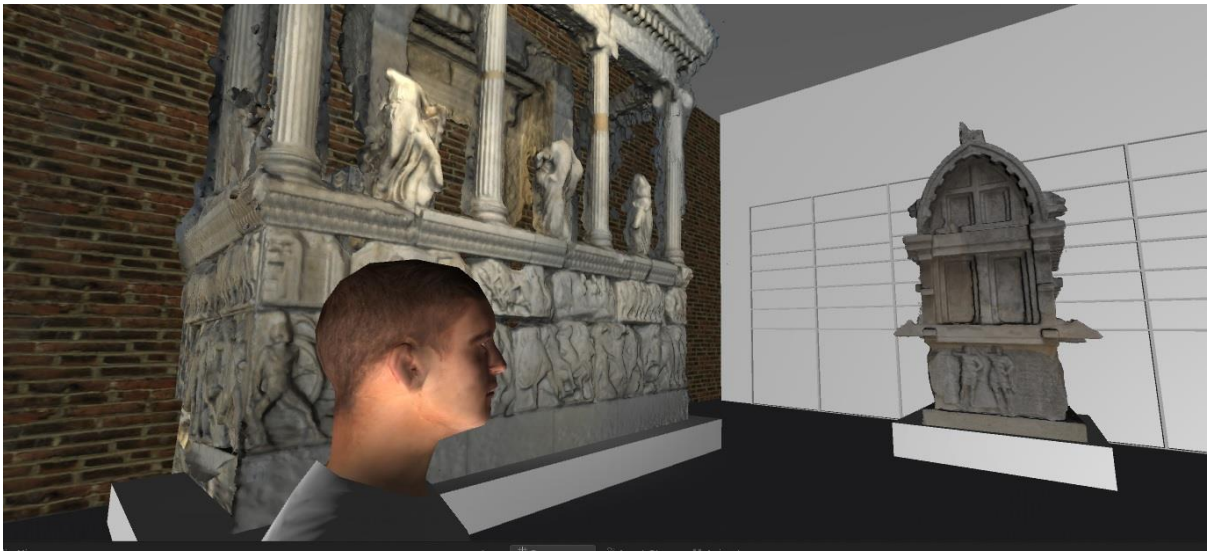

FIGURE 14 POSITION OF PLAYER WITH MONUMENTS

As I mentioned before, the virtual museum gives sources out of the traditional time-and-space presentation and allow the cultural objects to reach other people without being tied to a certain place. Visual museums as cultural venues allow the visitor an impression of infinity. Whether it is objects or videos, objects are imaged in the memory of reading

history and art. According to archaeologist and museum scientist Kevin Walsh (1992), the past has taken place outside the representation of space and space in postmodern museums, where people display their socio-cultural codes through exhibitions. When considered from this point of view, postmodern museums are separated from certain subtitles and key words by isolating them from time and space when their works belong to them. This abstraction process in the virtual museum actually causes the identity of the work to become blurred. For this reason, although the virtual museum offers a wealth of things we are not used to, they affect the formation of our physical world due to superficial shallowness. In order to minimize this and reduce the negative effect, using the HTC Vive headset uses "room scale" tracking technology, which allows the user to move in 3D space and at the same time, move real space so it reduces problem of blur and confusion.

FIGURE 15 USING HTC VIVE WITH UNITY ENGINE PLATFORM

As a result, considering the postmodern museum understanding and changing exhibition strategies, the virtual museum, which people from different geographies can access from anywhere, where the internet connection is available, is a product of a new memory imagination. The use of unlimited space and archives in representation and exhibition in virtual museums adds a new dimension to intercultural communication, where objects are accessible on a transnational platform. It emphasizes that unlimited knowledge and unlimited imagination are the limitless sources of virtual learning. In front of the museum in the context of various spatial and economic problems in Turkey, the emergence of alternative venues could be contacted again as a virtual museum online has been realized thanks to organizing national and international exhibitions.

For future researching area, it can be creating a larger data of 3D documentation of Lycian area because the day goes by, structural deformation continues and it needs alternative documentation.

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