Investigation of the Interaction of Architecture and Digital Art Through the Projection Mapping Installations in Public Spaces

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ABSTRACT

Digital Art, which has emerged as a result of the development of various branches of art throughout the ages, has been in touch with its architectural discipline since its existence. After the artists searched for new ways to express themselves, and the technology gave the opportunity to the artists, the architectural discipline hosted many different digital art installations both in the interior, on the facades of buildings and in public spaces, and the architectural elements were used as screens.

Projection mapping method, which uses the facades as screens in public spaces, has managed to provide different spatial experiences as a result of multidisciplinary studies in recent years. These performances, realized by scanning the surface to be projected and then reflecting the visuals and videos prepared in accordance with this surface, aim to change the architectural space perception and establish a semi-physical, half virtual connection between the virtual and the real world.

In this study, the relationship between architecture and projection mapping which is a branch of digital art, the results it creates in public spaces, public space - projection mapping relations will be examined.

Keywords: digital art, architecture, public spaces, projection mapping, virtual

ÖZ

Çağlar boyunca sanat dallarının çeşitli şekilde evrilip gelişmesinin bir sonucu olarak karşımıza çıkan Dijital Sanat, mimarlık disiplini ile de varlığından beri içli dışlıdır. Sanatçıların kendilerini ifade etmek için çeşitli yeni yollar araması, ve teknolojinin de sanatçılara bu imkanı tanımasının üzerine, mimarlık disiplini, gerek iç mekanlarda, gerek binaların cephelerinde ve kamusal mekanlarda bir çok farklı dijital sanat enstalasyonuna ev sahipliği yapmış ve mimari elemanlar ekran olarak kullanılmıştır.

Daha çok kamusal mekanlarda, cepheleri ekran olarak kullanan projeksiyon haritalama yöntemi, son yıllarda çok disiplinli çalışmalar sonucu mekânsal anlamda farklı deneyimler yaşatmayı başarmıştır. Bir veya birden fazla projeksiyon yardımı ile, yansıtılmak istenen yüzeyin taranması ve daha sonrasında bu yüzeye uygun olarak hazırlanmış olan görsel ve videoların yansıtılması ile gerçekleştirilen bu performanslar, mimari mekan algısını değiştirip, sanal ve gerçek dünya arasında yarı fiziki yarı sanal bir bağlantı kurmayı amaçlamaktadır.

Bu çalışmada, mimarlık ve bir dijital sanat dalı olan projeksiyon haritalama arasındaki ilişki, kamusal alanlarda yarattığı sonuçlar, kamusal alan - projeksiyon haritalama ilişkileri incelenecektir.

Anahtar Kelimeler: dijital sanat, mimarlık, kamusal mekan, projeksiyon haritalama, sanal

DEDICATION

to my dad…

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Firstly, I would like to express my gratitude to my supervisor Asst. Prof. Dr. Müge Rıza, who always guided me and contributed to my studies throughout my master's study. Her vast knowledge has always guided me in writing this thesis.

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INTRODUCTION

If the change of the digitalized world is justified as the result of the contemporary period, its reflections and effects on architecture are undeniable. Modernity; With its dynamic, active and plural qualities, it paved the way for the existence of the space with the individual and hence the production of a flexible, intellectual and variable space.

Advances in information and communication technologies have made a new transformation of the social structures of societies. New communication systems have been established to facilitate the exchange of information, and as a result, socio-cultural changes have occurred. Computers that come into our lives to access information have started to be used in all areas of life and also in the field of art. The technology, which allows for options such as being able to intervene in the work of art and rearrangement when transitioning from analogue to digital environment, has also shown its effect in the field of architecture. Besides all of these, the evolutionary process of the use of equipment in the presentation of a still or moving image to the viewer through a display unit is supported by techniques and equipment developed on the presentation of digitally generated motion graphics and video images (Alpay, 2015). With this process of change, new concepts have come to the fore in the world of architecture.

As a result of developments in the field of art and technology, the architecture discipline has also managed to adapt itself to the new standards. According to the adaptation of architecture to the new era, new space needs and new expression techniques have emerged, the traditional design process has gone out, the search for new aesthetics have been entered, untested works in physical environments have begun.

Projection Mapping also known as 3D mapping is one of the most recent video projection systems used to transform practically any surface into a unique video show territory. Projection mapping, otherwise called video or visual mapping, is the mapping of any surface or item, projecting visuals to selected zones with the projection gadget; is a projection innovation generally used to change over irregularly shaped objects or surfaces into a screen surface. These objects or surfaces could be; building exteriors, interior spaces, or theatre scenes (Ozgul, 2018). Projection mapping transforms surfaces with buildings, complex system surfaces or any three-dimensional object by using the creative possibilities offered by digital technologies to chain the surfaces to a moving display area to activate every sensation of the individual (Catanese, 2013).

Within the framework of today's values, projection mapping can be described as a reconstruction environment within the scope of architectural design that combines digital technology and social contents. Projection mapping has offered many possibilities in architecture and public spaces, from changing the appearance of the smallest objects in interior spaces to using the facades of large buildings as screens.

When the activity areas of projection mapping are evaluated it could be; product and brand promotion or advertising oriented, information and historical content focused, building emphasis element, installation art tool, an active element in concert or performance oriented performing arts, interface providing urban focus or totally aesthetic. It can be seen that it is used in many different scopes that can manifest itself with concerns. As an alternative to two-dimensional planes, reflecting video or visuals on the façades of 3D objects or structures can be defined as architectural reflections and this application requires a specific design process for each object or building (Gökçen, 2016).

1.1 Aims and Objectives

The aim of the research is to observe the architectural interaction processes with projection mapping, which brings a fourth dimension to perception in architectural fronts in public spaces; to determine how it could interact with the public spaces. Projection mapping, which is created by meeting different disciplines such as architecture, visual communication-design, graphic-cinema on a common ground, is a hybrid design product; It is an intermediary in reaching a variable and flexible space, and to create a roadmap for future performances and also is to present examples that can explain the relations between these disciplines with architecture, and to create research headings that are developed in this direction and also future oriented.

1.2 Research Questions

It is asked how public spaces can take different user-oriented spaces with the projection mapping applied and how the concept of space evolves into other forms according to the desired purpose. How the different types of public spaces are transformed into different places by projection mapping method and how people use these spaces will be investigated. History of projection mapping, meaning of

projection mapping, usage areas of projection mapping will be questioned. In this sense, it could be summarized as;

Main Research Questions

- How projection mapping could be used in within architectural scope and what is projection mapping's contribution to the public spaces?

Sub Research Questions

- What is projection mapping and it's applications?
- What is digital art?
- What is public art?
- How architecture can be integrated to the projection mapping performances?
- What is the connection between façade of the building and the content of the projection mapping?
- How could projection mapping be used as a tool for social gatherings in public spaces?
- How could projection mapping change the identity of public spaces?

1.3 Problem Statement

Architecture and public space design is a process involving more than one discipline and in which different participants play a role. With the projection mapping method, which can be defined as a virtual intervention to the existing texture, the change of the physical environment is achieved without disrupting the built order. Considering all these, projection mapping, which is a branch of digital art, has been used for different purposes in public spaces especially in recent years. This study was conducted to determine these usage purposes and to explain their relationship with public spaces.

1.4 Methodology

The study starts with a literature review. In this context, first of all, the definition and sub-branches of digital art were focused on. The reason for this is to create the infrastructure of projection mapping technique, which is fed from many digital arts branches. Digital Art, and history of Digital Art examined accordingly to the milestones, which started with the first examples of Digital Art created by computers. After the introduction of digital art branches and their relationship with architecture, the focus was on projection mapping, which is the basis of the thesis. Definition, history and current usage areas of projection mapping were examined through examples. Application fields defined into four, which are Festivals, Exhibitions, Performances and Advertisements. Then, in order to examine its relationship with public spaces, a research was conducted on public spaces. Typologies of public spaces, streets and squares, have been studied. The reason for this is that the projection mapping method is made especially in public open spaces and interact with the public spaces. Afterwards, the public art, which is the general understanding of the projection mapping method in public spaces, and the branches of public art were examined. In order to understand what kind of changes the projection mapping method creates in public spaces, different examples around the world have been questioned in the context of social interaction and spatial transformation. The thesis, which is a comparative study, ends with the examination of 3 different samples from different parts of the world. These examples are three different works that provide the reflection of indoor and indoor activity to the exterior, reflect the historical and cultural texture to the city, and independent from the structure and the environment in terms of content. These examples have selected accordingly to the application fields and content that they have.

1.5 Limitation of the Study

The thesis comparatively questions the relationship between projection mapping and public spaces, which are among the branches of digital art. The comparison is limited to the examination of projection mapping examples that relate to squares and streets. The reason for this is that the relationship between public spaces, streets and squares, with projection mapped buildings has an important place in the context of social interaction and identity. In order to make the comparison correctly, it was taken into consideration that the examples were made for different purposes, interacted with different public space typologies, and had different contents and purposes.

1.6 Structure of the Thesis

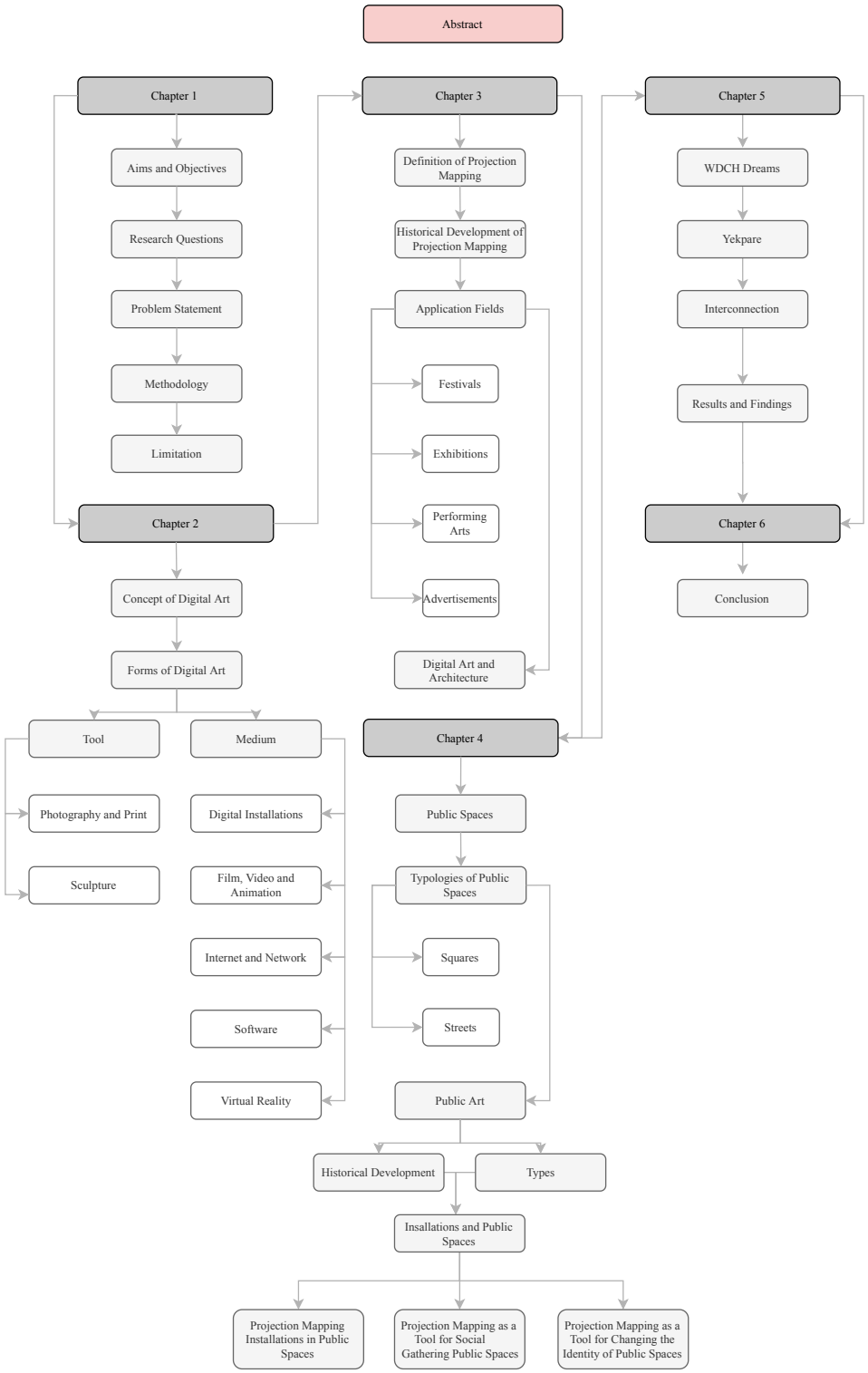
This study divides into two parts which consists the literature review in the first part, the comparative case study examination in the second part. Literature review starts with the understanding the Digital Art, which is an important input for to be able to understand the Projection Mapping (Table 1).

After the explanation and categorization of Digital Art, in the chapter three the Projection Mapping which is an another medium emerged from the Digital Art will be examined. Projection Mapping's meaning, history and application fields are reviewed.

Chapter four consists the Public Space – Projection Mapping interactions. Selected work will be reviewed in terms of different aspects. This chapter also includes the definition of Public Spaces and the functions they host. Projection Mapping will be examined as a tool for both Social Gatherings in Public Spaces and Changing the Identities of Public Spaces .

Chapter five is the case study part. This part includes three different case studies selected from different locations. They will be reviewed accordingly to the general output of the literature review. After that, study will finish with the conclusion part.

Table 1: Structure of the Thesis (Author)



Chapter 2

DIGITALIZATION OF ART

2.1 Concept of Digital Art

The rapid development of technology and science in recent years has inevitably affected the production and display methods of art. As the products of this interaction, besides being influenced in various ways, new branches of art have also emerged. Digital art, which is a combination of digital media and art, is generally referred to as the art form in which computers play a role in the production process (Akten, 2008). Computers and software play an active role in the production of art, rather than the use of computers and indirect software as just an auxiliary tool within the traditional logic framework (Purves, 2005).

As Paul highlighted in ‘A Companion to Digital Art’, digital art is very difficult to define. Indeed, digital art is a branch that is difficult to be precisely bordered as it brings with it technology and rapid changes. Paul states that the examples of digital art were first called "computer art", and later the name "multimedia art" was used, and today all these works are known as "new media art" (Paul, 2016).

According to the dictionary "Glossary of Digital Art and Printmaking" published by The Digital Art Practices & Terminology Task Force (DAPTTF) in 2005, digital art defined as, "art created by one or more digital processes or technologies" (Johnson & Shaw, 2005).

According to these definitions, digital art in terms of both production and physical content, it receives a great deal of help from science and technology, and production techniques can evolve and differ with technological advances. The word 'digital' is used as works in which computer and software are used as tools / media / creative support, since the form of the work is not determined precisely (Wands, 2006).

One of the best examples of the relationship of art with technology is modernism, which was formed after the Industrial Revolution and has been affecting our lives even today. Modernism; In many fields such as architecture, philosophy, science and art, it can be recognized as a versatile way of thinking that rejects the patterns of the past and adopts new and novelty. With the 18th century industrial revolution, iron and steel and textile industries came to life, mechanization and industry started to play an important role in the life of societies. Scholastic thoughts and dogmas have now lost their connectivity, and science and art have prevailed and gained value against the oppression of the church. The working class has been formed and the foundations of capitalism have been laid in parallel. Art was also influenced by social and technological developments (Atan, Uçan, & Bilsel, 2015).

Walter Gropius, who is one of the founders of the Bauhaus school, which has an important place in the development of Germany in many ways and also advocates the unity of art and technology, explains the relationship between art and technology as follows; The transition from handicraft to industry means the transition from personal to collective experience (Tepecik, 2002).

The 1990’s witnessed an unprecedented speed of technological change in the digital environment. Even if the foundations of many digital technologies are based 60 years

ago, the widespread use of these technologies coincides with the last 10 years of the 20th century. In this period, the development of the World Wide Web (WWW) included the concept of global connectivity in the 1990s and beyond, while hardware and software had more details and their accessibility increased. In line with these developments, the artists did not hesitate to take steps first, reflecting the dynamics and technologies of their own times. Before they made the digital revolution feel so much, they were working on digital media. At first, the products of his works were exhibited in conferences, festivals and symposia of technology and electronic environment, and were perceived as having a special place in the art world. However, as the late century approaches, digital art has become an established term, and various museums and galleries around the world have begun to collect works with this title and organize exhibitions displaying digital art products (Paul, 2008).

Technology and Science started in Europe especially in the 20th century and made its presence in the world. As a historical process, it was in the 20th century that it started to do most of the work done by manpower in the past through modern tools and machines. The 21st century world is called the information age. The speed of access to information has increased more and more compared to previous years. Because with the improvements on both the developing hardware and the software side, the information started to control the machine and the tools and the concept of artificial intelligence emerged.

In 1946, the first computer ENIAC (Figure 1) (electronic Numerical integrator and Computer), which was developed for the purpose of performing weapons and nuclear calculations, has the capacity of electronic data processing, developed the mathematical calculations in the first computer samples developed by the US scientists

and started with ENIAC. The data obtained as a result were used for aesthetic purposes. Among the forms of art, mathematical, geometric, scientific, abstract and technological foundations were recorded as the driving force in the beginning of digital art.

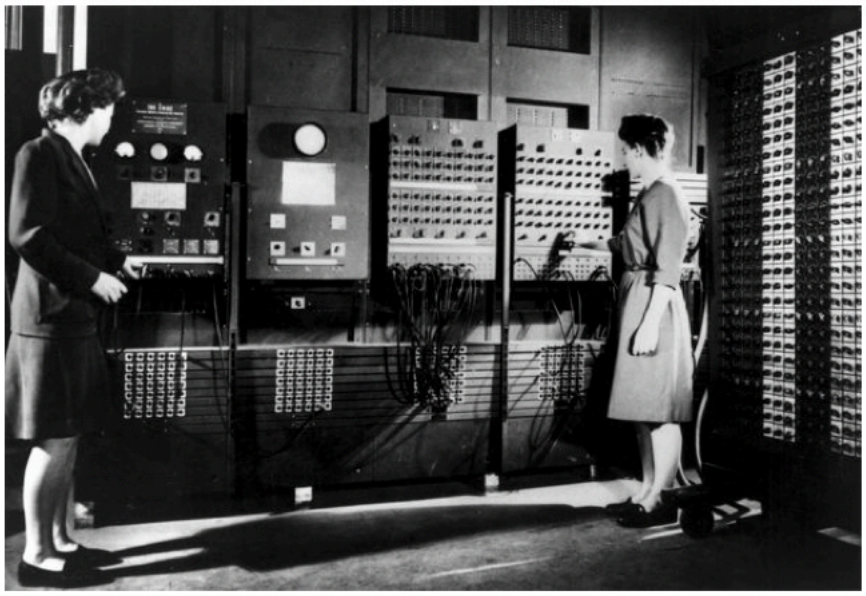


Figure 1: Photo of ENIAC (URL1)

Another example is American Mathematician and artist Ben Laposky, who is considered one of the pioneers of digital art, created electronic images from waveforms with the help of oscilloscope in the early 1950s. While producing his works, he was inspired by Abstract Geometric Painting, Cubism, Synchronism and Futurism. Laposky has named his works 'oscillons' (Figure 2). These works, created with the help of oscilloscopes, were exhibited in more than 216 exhibitions in the USA and abroad from 1952 to 1975 and became the subject of more than 160 publications (King, 2002).

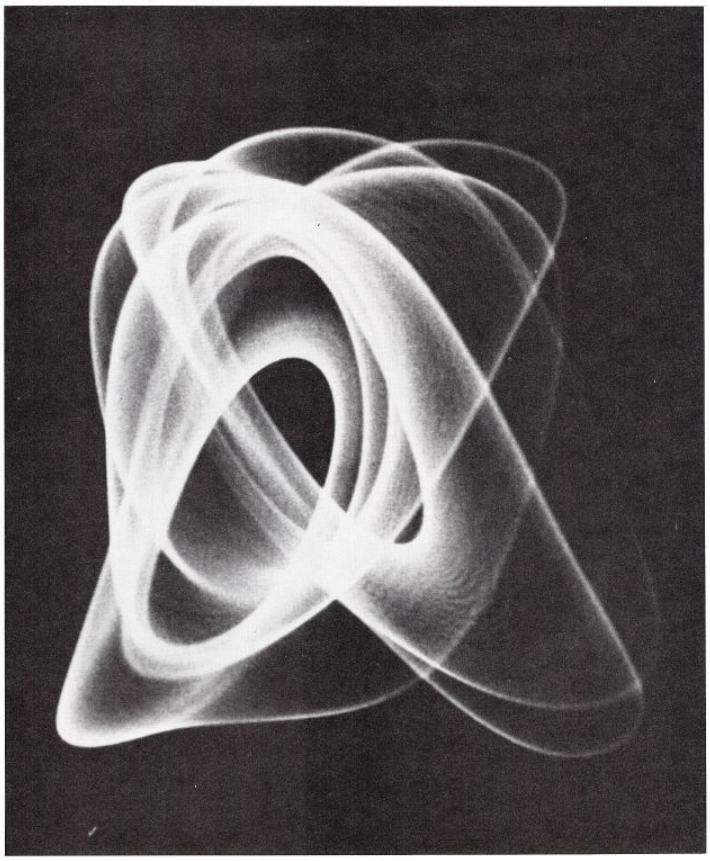


Figure 2: Oscillon 45 by Laposky (URL2)

Another artist, considered one of the pioneers of digital art, is mathematician Herbert W. Franke. Electronic abstractions, which were his first works in 1956, have great similarities with Laposky's work.

Later, director John Whitney Sr, who is the person who has undertaken another remarkable work, usually produces experimental films, and has turned to technology and mathematics to realize his artistic goals (Moritz, 1997). John Whitney's Spirals (Figure 3) is one of his important works under the category of digital art. The works of Charles Csuri, Michael Noll, Frieder Nake, Edward Zajec and Kenneth Knowlton, who asked examples of the first computer and art field, also played an important role in the development of the field.

Figure 3: Spirals by John Whitney (URL3)

In 1966, an organization called Experiments in Art and Technology (EAT) was created in New York in order to bring together scientists and artists specialized in technology in a common roof. This was followed by other centers established in Argentina, England, Yugoslavia and Japan and organized several exhibitions under this roof worldwide.

2.2 Forms of Digital Art

Digital art has such a wide spectrum that it does not define only one aesthetic understanding or phenomenon. Digital art products in various forms reflect aesthetic languages based on different foundations, and technological and art-historical development (Purves, 2005).

Today, digital art does not describe only one aesthetic field in terms of artistic practices. Artists benefit from digital possibilities in artistic practices such as digital technologies, printing, photography and video. While the works carry the characteristics of digital directly, sometimes it is not easy to say clearly which works have digital or analogue features (Paul, 2008).

Many curators and critics defines digital art as; evolutionary development experienced by mechanical and electrical processes in photography, film and video. According to this definition, photography is considered to have evolved and evolved from the art of pattern and painting. The film, on the other hand, is a stretch of the photograph because it consists of photographs that are put together. Their physical structures are the same as tools, but they are formatted differently to capture motion. Again, according to these definitions, we can mention that the video leads the developments in film technology and likewise, the internet has emerged with the development of mass media such as radio and television. An evolutionary approach to digital art based on technological developments, as well as providing a historical framework for the development of digital tools and other media utilized by contemporary artists (Wands, 2006).

It is quite difficult to claim that digital art forms that are intertwined with each other can be separated and grouped with precise and clear lines. Often these works combine various elements (such as the combination of music and installations) and challenge a purely formal classification. However, another important thing is to be aware of the formal aspects on which art is based and nurtured. Ultimately, every object contains ways of expressing itself, even if it is virtual. Paul, in his book Digital Art, which is considered as one of the important building blocks in the definition and classification of this art, is about using technology as a tool and medium in the classification of digital art (Paul, 2008).

Digital technologies, a tool for the creation of traditional art objects such as photography, print, sculpture or music, refer to digital technologies that are produced, stored and presented only in digital format, using interactive or participatory features. Although these two species have the same characteristics within each other, they differ

from each other in terms of expression and aesthetic phenomena. But these two categories should be seen as a hybrid species rather than a definitive classification. The classification in this part of the study was made based on Paul's book called Digital Art.

2.3 Digital Technologies as a Tool for Digital Art

Digital technologies, with the rapid technological developments, is a resource that more and more artists are using every day to produce their works in the fields of painting, drawing, sculpture, and photography. In some cases, the created examples clearly demonstrate the use of digital technologies, while in some cases it is not clear that an artwork is produced in the digital process. In particular, interventions in the field of photography make it difficult to say with certainty that the products are produced in analogue or digital environments and provide the formation of new hybrid forms. In the early 20th century, some of the techniques used by the Cubist, Dadaists and surrealist have become more practical with the help of digital technologies (Paul, 2008).

2.3.1 Digital Imaging: Photography and Print

Photography, which is one of the effective visual communication materials of today, witnessed revolutionary technological developments in the production process. The most important of these was that the photographs started to be produced with the help of digital technology. Digital photography is a photography method that uses digital technologies to create images of objects. Before digital photography, it was possible for images to be transferred to printed media by recording images in photographic film and then making various interventions in chemical environments. After digital photography, without the need for chemical processes, images can be viewed and even

printed and processed immediately after taking them with the aid of digital technology and computer (İşlek, 2009).

With the advancement of archiving technology, digital images have become products that last longer than before, ready to be stored under safe conditions and ready for reprinting. Prints come in a variety of forms, from photographs that can be printed and stored in the smallest format, to the size that can be printed as a single piece at the desired width and height with the help of special printers. These images can be displayed individually as an art product or integrated into installations, sculptures or video shows (Wands, 2006).

2.3.2 Sculpture

Sculpture art, in the words of John Smythe Memes; It can be defined as "*the first discipline in which people acquire skills in artistic field*" (Memes, 2019). This discipline, which dates back to stone sculptures made for magical and religious purposes in primitive periods, has turned into three-dimensional artistic forms produced with aesthetic and monumental concerns in the historical process; It has also strengthened cooperation with other design-related areas such as architecture and industry (Poyraz & Dolunay, 2014).

One of the most important examples of using digital technologies as tools is sculptures. Digital technologies are increasingly used in the various stages of the creation and production of sculptural objects, from the modelling process to the autonomous control of manufacturing machines. While some sculptors make use of technologies in both the initial design process and the creation of physical objects, others receive assistance from digital technologies in transforming CAD (computer-aided design) drawings into sculptures that exist only in the virtual space.

Today, 3D Printers, which can be printed with the desired history, are used for artistic purposes from the designs produced by drawing and modelling in software such as Maya, Zbrush, 3DSMax. With the help of these technologies, interactive, virtual, moving and complex works of art can be produced with old materials and sculpting methods, which are quite difficult and even impossible to produce.

Charles A. Csuri, another of the leading artists of sculpture design in digital media, also defined and evaluated the sculptures produced in computer media as an art form.

2.4 Digital Technologies as a Medium for Digital Art

Unlike being used as a digital technology tool, using digital technology as an environment is one of the most important parts of digital art production. Art branches, which were produced through alternative disciplines such as installation, film, video, animation, internet and network art, software art, or which are not very long in history, have been very close with technology in recent years and have played an active role from the production of digital art to its presentation. These genres, presented in digital format, allowed the participants to be intimately involved with spaces and digital displays, allowing them to play an active role in art as a participant rather than the audience. While using digital art types and technologies as an environment, it explores the various possibilities, possibilities and features offered by this medium and new perspectives are blended and presented with art and technology.

2.4.1 Digital Installations

Installation is making something belong to a place, loading and organizing a special meaning for place and place. The meaning of any object consists of its relationship with other objects, which is what the objects merge and assemble together. This act of regulation first of all defines space and place. It is a whole consisting of place,

meaning, identity, history features. The identity of the place is determined by the location, the general spatial configuration and the method of characterizing the combination. Above all, space is an indispensable part of existence (Norberg-Schulz, Genius Loci; Towards a Phenomenology of Architecture, 1980).

It means the installation art, space arrangement and exhibitions that relate to space. According to The Oxford Dictionary of Art (1988), installation; It refers to the arrangement or the environment that was in the galleries in the 1970s and specially designed for a particular exhibition. The Glossary of Art, Architecture and Design since 1945 (1992), on the other hand, characterizes the installation as a relationship building designed based on the specific features of a gallery space. The art of installation, features came to the agenda at the end of the 1980s, when the artists had a special relationship with the space and specialized on this subject (Reiss, 1999).

The art of placement took different forms and looked for new expressions, especially since the early 1980s, with the help of technological developments and new possibilities. By embracing a number of other disciplines where technology is actively used, various placements, both interactive and only navigable, appear in different parts of the world. The art of installation has taken the form of Video Art, where technological devices are used as art production and art objects, as well as documentary, short films and performance art, as in the work created by Nam June Paik by stacking hundreds of monitors on top of each other and named as Pyramid. (Ozaytan, 1997).

2.4.2 Film, Video and Animation

The transition from traditional animation, film and video to digital technologies has had enormous effects both in the production and marketing of the product. While

traditional animation was created by drawing each frame separately and showing the images at a certain speed, it is now completely replaced by computer-aided programs and modelling tools. The first of the effects of computers on the art of animation came through the creation of animation cameras that can be controlled digitally. Three-dimensional animations are works that are unique to digital media and are quite different from animations created using analogue methods. Continuously developing software programs were installed on personal computers and eliminated the need for high-demand systems for animation. Along with high-quality digital video cameras, rapid technological advances in this field have made video and DVD production a widespread culture and facilitated access to movies, video and animation, called motion pictures (Wands, 2006).

Combining the computer and video developed in the late 1980s led to the creation of more complex video art with new technological advances in projection (Dempsey, 2002). In the cinema, while the audience is alone with visual interaction in an environment isolated with the film, tools such as monitors, screens and televisions come to the fore in any video placement. In this context, the new media of the late 20th century has been video art and its hybrid forms and derivatives. Today, the search for new forms of expression continues by combining video art with many other media and tools. For example, with the help of technologies developed with architectural façades, projections and projections made by reflecting projection appear in different scales.

2.4.3 Internet and Network Art

Digital art became a new form of expression in the mid-1990s with the creation of the World Wide Web (WWW). Since the beginning of the development process in the late 1960s, the network called ARPANET has been growing steadily. With the National

Science Foundation's inclusion in the development of the network in 1984, it proceeded at an unprecedented pace. Among the leading organizations of Net Art was The THING formation, founded in 1991 by New York-based Wolfgang Staehle, an electronic messaging system dedicated to a contemporary art and cultural theory (Paul, 2008).

The World Wide Web, now known as WWW, was developed and developed by Tim Berners-Lee to assist physicists working in the European Particle Physics Laboratory (CERN) in the early 1990s and became a form suitable for art practice in the mid-1990s (Dempsey, 2002).

With the spread of Mosaic in 1993, Netscape Navigator in 1994 and Internet Explorer in 1995, it interacted with different art forms such as internet art, performance art, pop art, and conceptual art.

2.4.4 Software Art

Although the origins of most forms of digital art are based on traditionalism, software art can be defined as a branch of art that is produced and maintained in fully digital environments. In traditional art forms, visual aesthetics are considered as a signature of the artist, while in software art, visuals are created with codes based on texts. This coding system, which is accepted as a form of creative software, appears as a signature of new works of art (Paul, 2008).

2.4.5 Virtual Reality

The history of virtual reality can go back to the 1960s as a multi-dimensional simulation of the real world. Sensorama (Figure 4), created by cinematographer Morton Heilig in 1992, can be considered as one of the first examples in this field. he would allow him to interact with the screen in front of a screen where they could

choose from different pre-recorded rides using bicycles or even a helicopter. Sensorama had a wide field of view optics for viewing 3D photo slides, and stereo sound as well as fragrance and wind generators to enhance the realism of the environment (Gutierrez, Thalmann, & Vexo, 2008).

Figure 4: Sensorama by Morton Heilig, 1962 (URL4)

In addition to these developments, the term virtual reality was first used in 1983 by Jaron Lanier, the founder of the virtual reality company VPL. Lanier defines virtual reality as an environment where people share the same virtual world and interact with each other through virtual objects (Doesinger, 2008).

Although virtual reality applications have combined virtual and reality and created a new world, they do not seek escape from the real world. While virtual reality represents

the transition from concrete to abstract, it can also be a technology used to express concrete. For example, recently used simulators are examples of the most successful commercial applications of virtual reality. These new technologies, which are created, aim to synchronize the hand, eye and mental activities of the users and provide the most realistic experience. The professional success of an air pilot and the safety of passengers depend on the training and experience of simulators (Wands, 2006).

Today, art and science are working together to create complex methods of producing inevitably new forms of expression within a technologically focused way of life. In the evolving and developing of new media environments, artists are in close contact with scientists and technicians, not only as practitioners of transforming tools with the help of changing dynamics, but also in creating new forms of interaction and interface designs (Lugrin, Palmer, & Crooks, 2005).

As a form of art, virtual reality has found its place in today's New Media environment, and it has entered our lives as a sub-branch of Digital Art, which is based on the essence of the fact that the abstract data produced as mathematical data and processing create outputs that do not have a physical presence through a technical environment. While the methods of perception, comprehension and expression differ in the age of digital revolution, more abstract themes such as consciousness or perception of virtual reality offer new, different and creative constructions.

2.4.6 Sound and Music

The effects of digital technologies on sound art and music have evolved over time in an evolutionary nature, and the emergence of very new narrative techniques and forms. Performance artists and musicians, like other artists, have incorporated digital technologies into their own arts and kept up with the developments. Technological

developments have brought the possibilities of artists in the process of creating their works out of bounds, allowing them to control their performances more meticulously and to control more output. Although the development of computers has advanced sound and music art in a very positive way, the real revolution is the discovery of MIDI, which means the Musical Instrument Digital Interface. MIDI is a format that dates back to the 1980s. When digital audio is used synchronously with text, MIDI offers artists the opportunity to record unusual recordings on their own computers. When they are converted into a format suitable for MP3 players, these recordings can reach international audiences via the internet (Wands, 2006).

2.5 Digital Art and Architecture

The discipline of architecture always occupies an uncertain position and is classified between art and technical, social and solid sciences. This uncertainty can be considered as a feature that gives architecture its uniqueness and richness. Although such uncertainty prevails, art has always been accepted by architects as a marginal method for studying architectural issues and developing their own creative methods. The intertwining of art and architecture means that the architects working in this field at some point have an experimental area where they do not encounter the difficult restrictions found in daily architectural practices. Art is interpreted as a different genre and often has much less restrictive factors. As the history of architecture proves to us, the effect of using art as a means of conducting formal and conceptual research is enormous, and the influence of most of the great architects, from Le Corbusier to Oscar Niemeyer, from Libeskind to Alsop, has had an impact on their professional lives.

With the development of digital technologies, the forms of expression in the field of art began to differ. The artists met new opportunities to express themselves and started

using them in different fields. This new form of expression, arising from the close interaction of art and technology, also revealed a different form of expression, largely based on interactive technologies (Filho, 2005). Starting in the 1980s, the architecture discipline has started to turn into an area that covers a large amount of screen-based digital hardware and different software since the 1990s (Doesinger, 2008).

Such technological developments in different disciplines have also made their impact felt in the field of architecture. The new definition for today's architecture depends on the effectiveness of new forms based on interdisciplinary collaboration. Interactive new spatial definitions emerge through the collaborative work of artists, architects and even scientists. Interactive environments are aimed at a connection between the physical world and the virtual world rather than being created entirely in computer environment. Such studies in history have been the area of interest of media artists. However, architects have developed new methods and brought them closer to digital media by blending architecture and technology at different points using digital techniques and technology for a while. This was one of the most important factors that allowed architecture to be considered as a cultural activity. In this process, media designers and artists have begun to realize their projects in collaboration with architects, the interdisciplinary interaction has strengthened and they have started to take their projects with a more spatial approach. Digital technologies are now defined as a result of a combination of different disciplines, and spatial studies enable different disciplines to produce in this field rather than merely an architectural responsibility (Bullivant, 2005).

Chapter 3

PROJECTION MAPPING

3.1 Definition of Projection Mapping

Throughout history, avant-garde artists have challenged the possibilities of time and searched for new techniques, tools and materials to express themselves. This method, called video mapping, projection mapping, 3D mapping or spatial augmented reality, was born out of the desire of the artists to create different works of art in different places with the help of developing technologies, and over time, it has become a new method of digital art, where different disciplines work together (Catanese, 2013).

Projection mapping is recognized as one of the newest video projection techniques used to transform almost any and complex / plain surface onto a dynamic video display screen. This method, is used for mapping any object or surface, to project images to the desired regions or the whole with the help of a projection device, and to convert objects, usually organic and irregular, into a screen surface. it can also be called a projection technology.

Projection mapping in architecture is basically the reflection of the visuals created by using light, colour and movement elements directly to the buildings or special materials on the buildings through projections. First, all lines and location information of the building are transferred to the computer environment with the help of cameras and scanners, and then the moving images designed by 3D animation experts are

arranged according to the coordinates and lines of the building with special software. The visuals reflected from the appropriate distance and position through the projection meet with the audience in a way to create a visual illusion perception. Although the technique used is based on transferring the image to a giant floor or building, the impressive effect of the works depends on the productions. Since the building surfaces have a certain architectural language, elements such as windows, reliefs or columns should form an integrity in the work, and even interpret the work in a formal way (Turgut, 2015).

According to Catanese, projection mapping turns the surfaces into a moving display area that aims to chain the active surfaces of each individual with the help of digital technologies. Moreover, with the help of the complex system surfaces or the method of mirroring any three-dimensional object, with the creative possibilities are offered by digital technologies (Catanese, 2013).

Head defines projection mapping as; projection mapping is transformed with animation and various visuals by transforming the contours and depth of the structures, objects, the surfaces to be projected. Moreover, the physical reality of the structure or object with the help of illumination by means of light, by strengthening the lines and dimensions of the structure by transforming it into a virtual form in the computer environment. (Head, 2012).

The purpose of projection mapping is to create a physical illusion with a combination of visual and audio tools. Kılıç defines projection mapping as the projection of 3D motion graphics or video images to 3D objects (cars, trees, objects) or city landscapes

(public spaces, facades, buildings) with the help of projection in order to create a visual illusion (Kılıç E. , 2013).

According to the above-mentioned definitions, there is no clear and definite limit on surfaces. For their purposes, artists can use the three-dimensional surfaces they desire as a reflection surface. This provides artists with rich possibilities in terms of the creative process.

3.2 Historical Development of Projection Mapping

Historically, perhaps, the traces of projection mapping in the past, interpreted with technology at that time, can be considered as the use of light in spaces. Light, used dramatically in ancient times to emphasize the profiles of churches and highlight the sculptures of saints, is also indispensable for religious rituals. Light, an exciting concept especially in the Baroque era, captivates even the French nobility of the period (Catanese, 2013).

With the birth of the title of light designer in the seventeenth century, it was also possible to design gardens and spaces that can be used at night with the help of light. Light has always been a tool that changes the perception of spaces and allows them to be used at different times (Catanese, 2013).

Projection mapping is also fed by the painting technique called ‘trompe l'oeil’ (Figure 5), another art branch that has come to life with the possibilities of the past. Trompe l’oeil, a French word, means fooling the eye (Britannica Encyclopaedia). Trompe l’oeil is a painting technique that aims to give a three-dimensional look to the walls and ceilings in order to create an illusion of surfaces. With the help of this method, with the careful use and application of painting and shading, artists and architects can obtain

three-dimensional visuals within the spaces. Rather than decorating only one surface for decorative purposes, the main purpose of the technique is to create a sense of depth within the space and to make the space differentiate and create illusion (Schneider, Tonn, Petzold, & Donath, 2007).

Figure 5: Trompe l'oeil Example Escaping Criticism (1874) (URL5)

In the 20th century, before the definition of projection mapping emerged, the use of artificial light came to the fore in experimental and artistic works by Bauhaus artists, artificial light was used as a new tool in design and came to life in various art branches such as theatre, film and installation (Theodorou, 2013).

The first historically recorded example of the projection mapping method was used in the horror tunnel named Haunted Mansion, which was presented to the visitors at Disneyland in 1969. In this project, it is aimed to present a closer to reality virtual experience by projecting videos with different mimics in order to produce optical illusions on various human busts (Figure 6). This study was also noted as the first

known example of reflection on uneven surfaces (Catanese, 2013). In the project, various actors were filmed using a 16mm film while they were singing to reflect on the busts, and then projected on the busts with projection. In addition to using projection mapping for the first time, Disney has one of the first patents on this subject, Apparatus and Method for Projection Upon a Three-Dimensional Object, considering its patent application in 1991 (California Patent No. 5,325,473, 1994).

Figure 6: Human Busts at Haunted Mansion Ride in Disneyland (URL6)

Another oldest recorded example of projection mapping was seen in the movie 'Displacement' (Figure 7), which was applied by Michael Naimark in 1980. In this installation, a living room where two artists were found and moved was recorded on a 16mm film with the help of a camera rotating inside the room. Later, the items in the room were painted in white to act as a screen for projection and projection was placed at the point where the camera rotated. A virtual space is created inside the physical space with the projector, which is in the same position as the camera and rotates at the same speed. This work of Naimark is one of the first studies on how physical space can be transformed into different places with the help of projection. The work titled Displacements was produced three times between 1980-1984 and was exhibited for the third time at the San Francisco Museum of Modern Art in 1984 (Naimark).

Figure 7: Scene from Displacements by Michael Naimark (1980) (URL7)

Another application that sheds light on the use of projection mapping on large surfaces today is the virtual reality system called Cave (CAVE Automatic Virtual Environment), which was held in 1992 at the University of Chicago, Illinois. The Cave (Figure 8) system aims to create a missing cube and consists of four large screens placed around the person who experiences it, illuminated with the help of projection. The user wears 3D glasses to be able to fully view and experience these images and the space. The interaction between the user and the installation is provided by gloves or joystick type controllers. Besides the visual, the speakers around the screens reinforce the experience.

Figure 8: Example of CAVE System (URL8)

The projection mapping method, which has made progress in the artistic sense, has also attracted academicians and started to be the subject of academic articles. In the article entitled The Office of the Future: A Unified Approach to Image-Based Modelling and Spatially Immersive Displays, published by a group of academics in 1998 under the NSF Science and Technology Centre for Computer Graphics and Scientific Visualization at the University of North Carolina, ideas were presented on how offices will change in the future (Figure 9). In the future offices, it is foreseen to have animated info graphics that work integrated with the system called Cave, and interactive video projections combined with real surfaces (Raskar et al., 1998).

The first project that can be counted not only by visual interaction, but also by projection mapping which allows the interaction of projection and objects, is the project I / O Bulb (Input / Output Bulb) launched by John Unnderkoffler in 1999 (Figure 10). With this project, Unnderkoffler observed how the building model placed on a plane formed shadows between selected hours by using the projection device as artificial light (Underkoffler, 1999).

Figure 9: Conceptual Visualization of the Office of the Future (URL9)

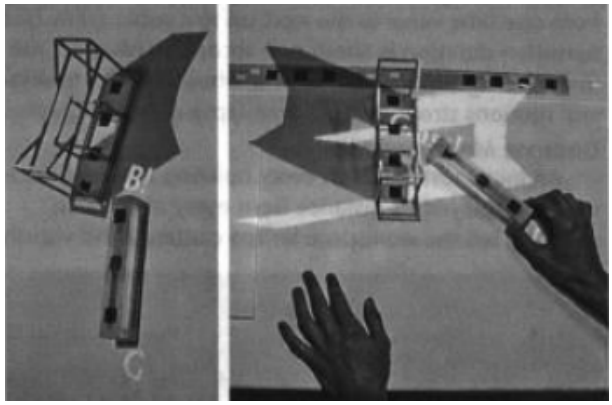


Figure 10: I / O Bulb (Input / Output Bulb) Study by Unnderkoffler (URL10)

In 1998, Ramesh and his team, who discussed how the offices will be shaped in the future with the developing technologies, focused on changing the appearance of the objects with the help of visuals prepared in virtual environment with their work called Shader Lamps in 2001 (Figure 11). With this project, which they did with the help of physical models, they worked on the application of the projection mapping technique on the surfaces of objects that do not have a linear plane and worked on new algorithms that make the lighting process more practical. Another aim of the project was to delete the three-dimensional objects illuminated with the help of a single projection with the help of another projector and ensure a perfect experience in all respects. Ramesh and his team's work in this area has formed the basic principles of projection mapping techniques in the contemporary sense (Raskar, Welch, Low, & Bandyopadhyay, 1999).

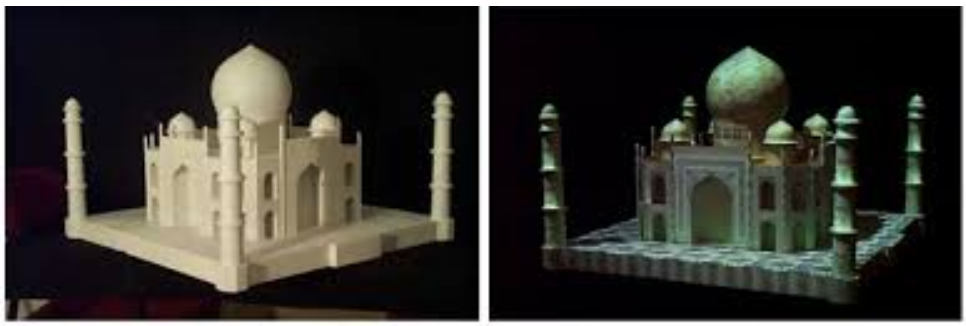


Figure 11: Illuminating the Physical Model of Taj Mahal in Shader Lamps (URL11)

Another academic study that supports the use of projection mapping in interactive places was made by Oliver Bimber and his team working on the presentation styles of art works in the Bauhaus organization in Weimar. In the article they published under the title 'Superimposing Pictorial Artwork with Projected Imagery', they aimed to interact with the audience using the projection mapping technique during the exhibition of paintings prepared with the oil painting technique (Figure 12). The creation of this technique was inspired by the uncovered draft works on the lower layer of the oil painting of Joseph and Jacob in Egypt, one of the scenes in The Book of Genesis by Jacopo Pontormo, in 1518. In this article, Bimber and his team produced algorithms for real-time rendering and studied presentation techniques. Visitors do not need any extra screens to see the different layers while associating with this technique, the original of the work (Bimber et al., 2004).

Figure 12: Concept Sketch and Prototype of Pictorial Artwork (URL12)

Aiming to establish an interactive relationship with the audience in the exhibition area, Bimber and his team have made various experiments on many famous artworks. What we can evaluate as the most important of their work is the work they do on the projection mapping of the creation of Adam. In this project, with the projection

mapping work they made on the work, they darkened certain parts of the work of art, and presented it to the audience with motion graphics and text. They used the same technique by presenting the oil painting layer process of Rembrandt's self-portrait work to the audience interactively (Figure 12). Using projection mapping as an information screen for works opens doors for digital media use in museums and art galleries. Digital storytelling techniques and digital content creation / management tools, special presentation techniques, and evolving display technologies are recognized as new tools available to artists and designers.

Figure 13: Rembrandt's Self Portrait in Various Cleaning Stages (URL13)

In 2004, Raskar and his project team focused on the idea of portable smart projections and examined their relationship with physical spaces in the article published under RFIG Lamps: Interacting with a Self-Describing World via Photo sensing Wireless Tags and Projectors. The aim of the project is to find the answer to the question of how

we can benefit from this technology by including the projection mapping techniques in our daily life as a result of the integration of interactive motion graphics into real spaces. In the article, the subjects about the self-description of the objects in the physical world, the transfer of their geometries, histories or user information to the other side are discussed by using projection mapping and radio frequency identity and geometry (RFIG) technology (Figure 14). With this new technique called interactive projection, users are provided with the opportunity to access information about the responded objects, communicate interactively and update information if necessary (Raskar,et al., 2004).

Figure 14: Handheld Projector Identifies the Objects, Warehouse Scenario of RFIG Lamps, (URL14)

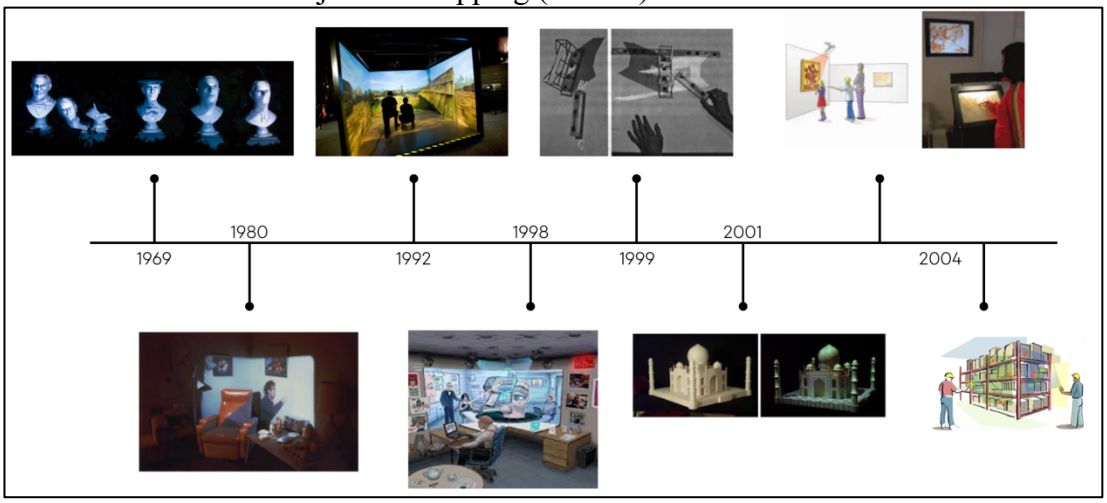
Another important step in shaping the contemporary use of Projection Mapping is the video projection mapping studies published by Raskar and Bimber in 2005 under the name of 'Spatial Augmented Reality Merging Real and Virtual Worlds' as a research project in collaboration with academic institutions such as MIT University and Bauhaus University. is the book. This research touched upon the application details of the projection mapping studies to be made on convex and concave surfaces with the

mathematical algorithms on the subjects of the position of objects and projection, as well as the formation of shadows arising from the projection, in single-viewer and multiple-viewer studies (Raskar & Bimber, 2005).

In the latest studies on projection mapping in 2018, new application methods have been expanded by further simplifying the 3D geometric calibration process of physical objects. With the help of new calibration methods that have been fully automatically adapted, the location of the transfers on physical objects has become easier to determine (Grundhöfery & Iwai, 2018).

The journey of the projection mapping which has started with the Disneyland(Table 2), progressed over the years accordingly to the different kind of aspects and viewpoints. In the recent years, the projection mapping method moved to different dimensions with the development of the past years and the rapid development of technology, and it was able to find its place in many different research fields by many academics and artists.

Table 2: Timeline of Projection Mapping (Author)



3.3 Application Fields of Projection Mapping

Projection mapping has begun to come to life in many different areas as a result of the combination of different disciplines and collaboration. The journey, which started with response to busts at Disneyland, is used today in a wide range from festivals to exhibitions, from performing arts to the advertising industry. In this section, contemporary applications under different headings made by the mapping method of projection will be examined.

3.3.1 Festivals

3.3.1.1 Fête des Lumières (Lyon, France)

The history of Lyon Light Festival dates back to 1852. The festival, which started with the candles placed in coloured glasses on the window sills to celebrate the installation of the Virgin Mary statue located on the Fourvière hill of Lyon, has turned the facades of the buildings into a light show with coloured lights with the help of this candle illuminating all parts of the city. In order to commemorate this event, every year on December 8, the people of Lyon celebrate the enlightenment of their cities in order to protect their cultural heritage and take it further. Light symbolizing the renewed identity of the city takes visitors on a magical journey. Throughout the festival, the Renaissance facades and magnificent buildings in the city are painted with colourful works of art by participating artists invited to the festival every year.

According to the information released by the festival organizers, the light festival, which lasted for four days, had the opportunity to experience approximately 1.8 million visitors according to the data received from mobile phone signals.

One of the most eye-catching projection mapping installations of the Fete des Lumières festival in 2019 is the work named Genesis by Theoriz Studio on the facade of Saint-Jean Cathedral (Figure 15). Using the Saint-Jean cathedral as a canvas, the team has been working on this project for several years to reveal the architecture of the cathedral in all its glory. With their work called Genesis, the studio responds dramatically to the global climate crisis, one of the world's biggest problems, with the help of the wonderful harmony of sound and light.

Figure 15: Genesis by Theoriz Studio (URL15)

3.1.1.2 Lumiere Festival (Durham, UK)

Lumiere Festival is the largest light festival in England. The festival, which was first organized by Artichoke in Durham in 2009, has become one of the world's leading light festivals, with an increasing number of visitors and artists over the years. In the first festival that took place in 2009, 22 different light installations were presented to the visitors in various parts of the city. The organization team, which has an expectation of 40,000 visitors, announced the participation rate in the 4-day event as 75,000 people. This festival, where participation is completely free, can be experienced by domestic and foreign tourists with the help of the special routes created in the city.

Celebrating its 10th birthday and over 1 million total visitors in 2019, the festival hosted light installations in 37 different locations, including the main facade of the famous Durham Cathedral, the Rushford Court, Durham Castle West front and Dunham University Dunelm House front. and exhibits light installations by artists from various countries, especially Canada, New Zealand, Portugal and France.

One of the outstanding examples of installations in 2019 is the interactive projection mapping installation called Stones, made by the Barcelona based Tigrelab Art studio on the main facade of Durham Cathedral (Figure 16). When four different pieces of stone, placed on a coffee table positioned to see the main facade of Durham Cathedral, which contain sensors, interact physically by visitors, images also react simultaneously with touch on the facade of the Durham Cathedral, and visual, auditory at the same time between the architectural facade and the human. an interactive relationship and experience are offered. According to the definition of the project team, the work named Stones provides a warm touch to the stones, which is an element of nature, and enables people to forget the technology and at the same time establish a relationship with the architectural facade used as a canvas.

Figure 16: Stones by Tigrelab Art (URL16)

3.3.2 Exhibitions

3.3.2.1 Van Gogh Alive Exhibition

The Van Gogh Alive exhibition is the most visited multi-sensory exhibition experience in museums and art galleries of more than 50 countries worldwide. The Van Gogh Alive exhibition, which was created by projecting the drawings of Van Gogh, painted between 1880 and 1890, on different panels with the help of projections, contains more than 3,000 Van Gogh visuals with audio and visual synchronization (Figure 17). Visitors are given the opportunity to interpret Van Gogh's thoughts, feelings and moods between 1880 and 1890.

In the exhibition, which is accompanied by classical music, portable panels, walls, columns, ceilings and even floors have become a part of the exhibition, and with the help of technology called SENSORY4, it offers a unique experience opportunity with simultaneous reflections made from 40 high resolution projectors.

Figure 17: Van Gogh Alive Exhibition (URL17)

3.3.2.2 Infinity Room

Infinity Room, a 14-minute projection mapping project realized by Refik Anadol Studio, was first presented at the Istanbul Biennial in a 4x4x4 meter cube space, and then travelled to many different countries. Infinity Room is a continuation of the 'Temporary Immersive Environment' experiences that the studio is working on (Figure 18). Three-dimensional visuals created with the help of modern algorithms and machine learning are brought to life with a 4-channel audio / visual installation. The main purpose of the project is to give the experienced individuals a sense of inadequacy and infinity, regardless of place and time, and to experience this experience. The Infinity Room project, described as a depiction of limitlessness, offers visitors a completely different experience with the help of light, sound and projection. Utilizing projections and mirrors to create a virtual environment, the exhibition eliminated the barriers between the physical and virtual world and dragged visitors into a hybrid space.

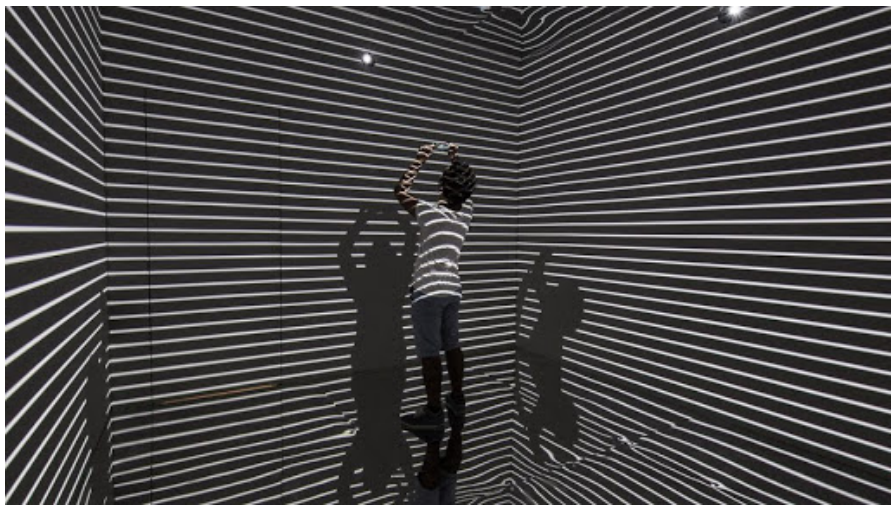


Figure 18: Inside of the Infinity Room (URL18)

Refik Anadol Studio summarizes the story of the word infinity in the name of the project as follows;

In this project ‘infinity’ chosen as a concept, a radical effort to deconstruct the framework of this illusory space and transgress the normal boundaries of the viewing experience to set out to transform the conventional flat cinema projection screen into a three dimensional kinetic and architectonic space of visualization by using contemporary algorithms.

3.3.3 Performing Arts

3.3.3.1 LA Philharmonic’s 100th Anniversary Concert

Real-time video projection mapping performance prepared by the studio named XiteLabs for the 100th Anniversary concert of Los Angeles Philharmonic took place on the stage called The Hollywood Bowl in America in 2018 (Figure 19). The stage featuring 1800 musicians also featured world-renowned names such as Katy Perry and Herbie Hancock and Kali Uchis.

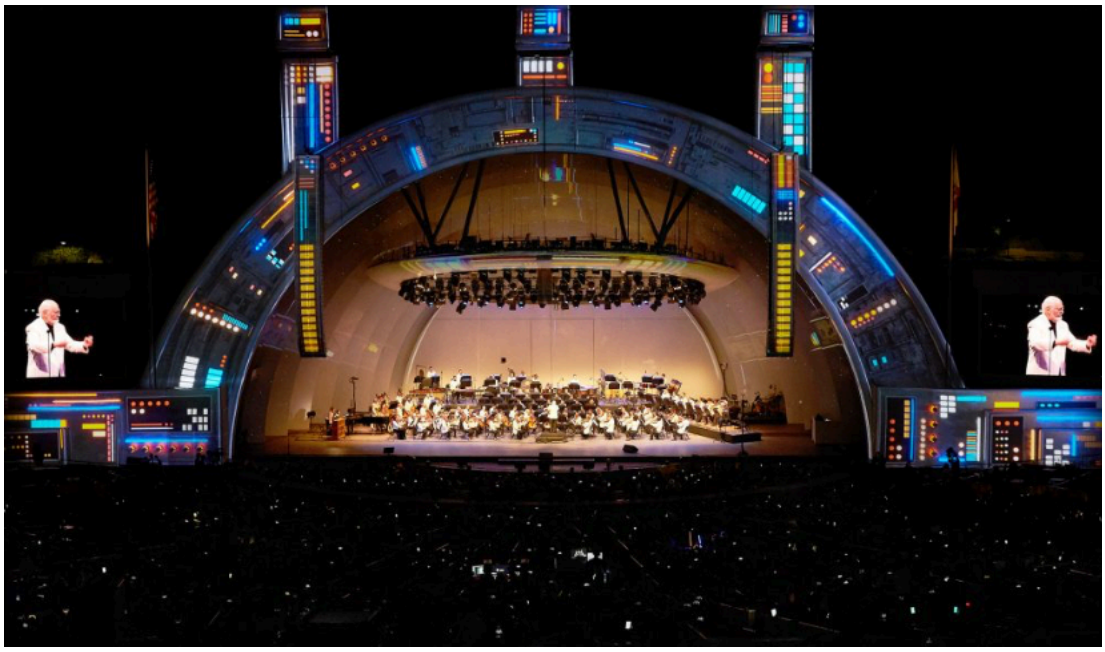


Figure 19: LA Phil Performing Star Wars Theme (URL19)

The visuals and videos created after 3D modelling of the semi-circular Hollywood Bowl scene changed simultaneously according to the works of the Philharmonic orchestra and the performances of the orchestra conductor, and the stage experience realized as a result achieved an extraordinary audio-visual feast. In particular, the Star

Wars piece, played under the supervision of John Williams, has lost the existing perception of the place, transformed it into the venues in the movie, establishing a connection between real and virtual and at the same time, making the audience not only auditory but also visually feel inside the Star Wars movie.

3.3.3.2 cube (Elevenplay x RZM)

The dance and projection mapping performance named cube, prepared by Rhizomatiks for Japanese dance group Elevenplay, known for their inclusion in advanced technologies, is reflected on 5 dancers and 5 cubes on the stage. In this performance where the artists' white clothing and white cubes are used as screens, the costumes and cubes take on different colours and textures with the help of projections at different times of the performance. This project, which especially targets moving objects, was realized with synchronous harmony of dancers and projections (Figure 20).

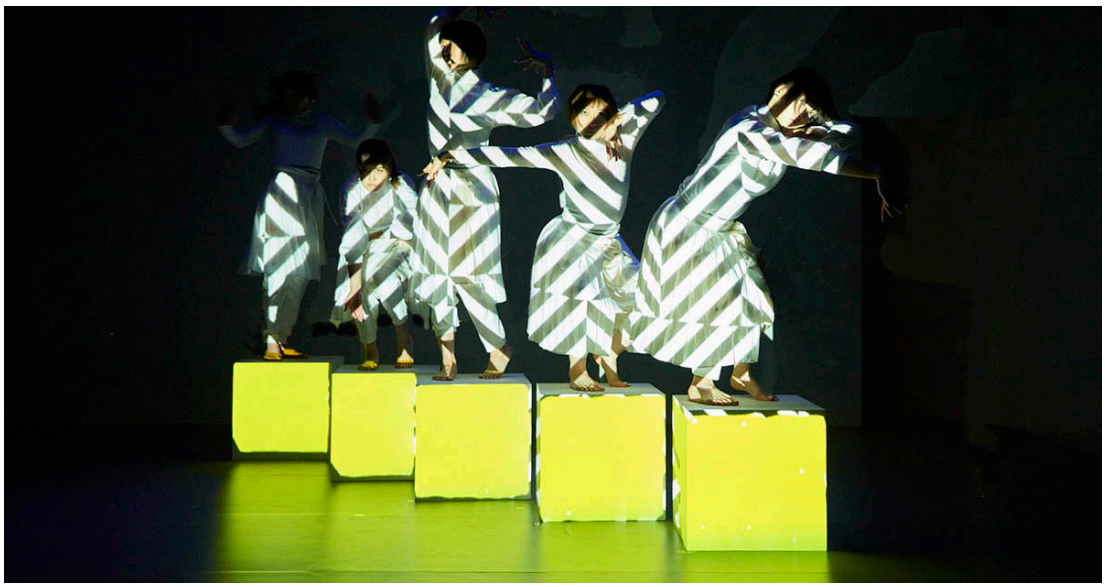


Figure 20: Elevenplay Performing 'cube' (URL20)

Rhizomatiks summarized this performance, which uses the human body and cubes as curtains, as follows;

Dancers bodies are used as the canvas for the bold, simple graphics, along with four cubes that glow neon or radiate geometric patterns and pixelated forms. It's another incredibly accurate display and a stunning marriage of the physical and digital, pioneering the way for how precision projection-mapping could augment and change live theatre and dance.

3.3.4 Advertisements

3.3.4.1 Game of Thrones Season 7 Premiere Event

The collaboration with the famous production company HBO, WorldStage and BARTKRESA, which has many awards in digital art, has signed an eye-catching project for the Game of Thrones 7th season premiere (Figure 21).

Using the facade of the Walt Disney Concert Hall building in Los Angeles designed by Frank Gehry as a screen, the team started its video performance with the dragon figure rising by wrapping the facade with flames and then continued with the reflection of the images and places in the series on the facade. In the imagined spaces created, he took the guests on a journey.

Figure 21: Game of Thrones Season 7 Premiere Mapping (URL21)

3.3.4.2 Nike Building Twist

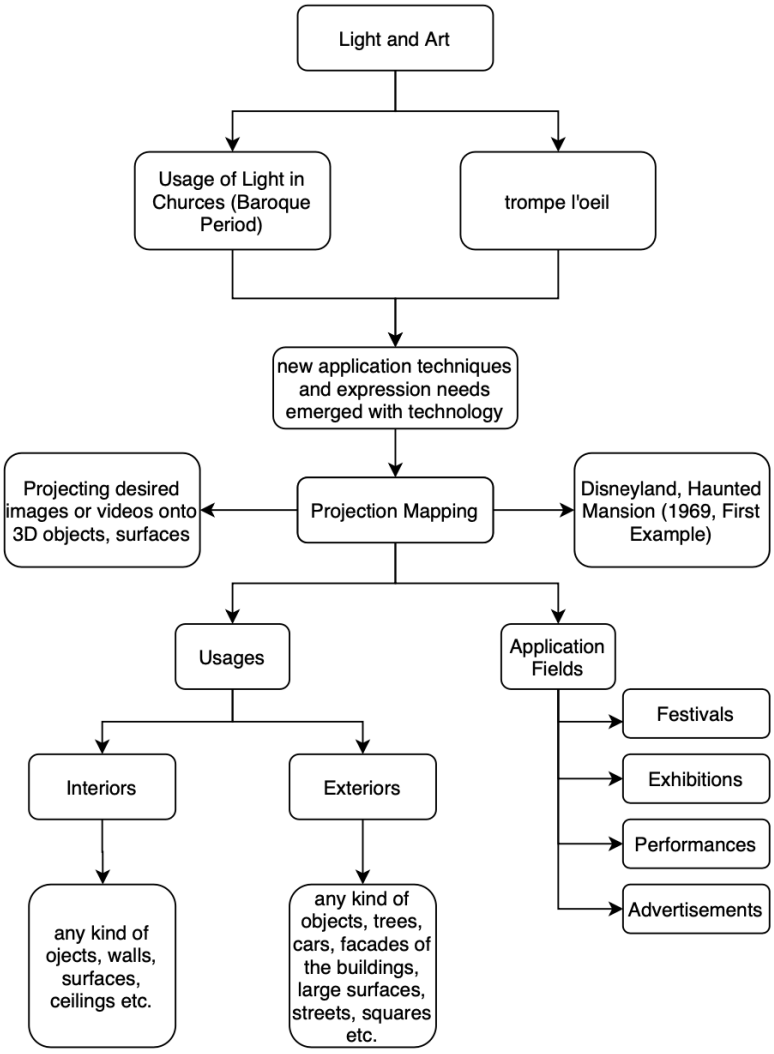
The project titled ‘Nike Building Twist’, prepared by Nike and WK Tokyo, was presented to users for the promotion of Nike's new shoe, Nike Free. This projection mapping work on the facade of the famous Red Brick Warehouse in Yokohama, Japan is also an interactive work (Figure 22).

As the Nike Free shoe, which is placed on a stand and contains various sensors, is deformed by visitors, the image in the projection projected on the building is deformed in the same proportion and direction. This project, which relates to the architectural facade, has been prepared to demonstrate the extraordinary flexibility of the shoe. Nike aimed to create a different perception and bend the building, which is made of red brick, which is impossible to bend under normal conditions, with the help of the flexibility of the shoes. In addition to the visual reflection, the participants have a silent experience with the bending of the shoes.

Figure 22: Illuminated and Distorted Facade of Yokohama Red Brick Warehouse (URL22)

Projection mapping method is a method that emerged as a result of the search for new expression techniques in the field of art with the development of technology. This technique, which was first used in Disneyland, can now be used in many areas for many different purposes (Table 3). For this reason, it is important to have information about the fields where projection mapping is applied to examine the interaction of architecture and projection mapping, as it will make it easier to categorize in the next sections.

Table 3: Understanding Projection Mapping (Author)



Chapter 4

PUBLIC SPACES, PUBLIC ART AND PROJECTION MAPPING

4.1 Public Spaces

The concept of public space contains different definitions according to different countries and geographies, and the limits of the concept of public space vary according to these definitions. The public sphere, which was born in Ancient Greece and has been handled and evaluated by many different disciplines until today, has evolved from a place that allows citizens to express themselves in places called agora in Ancient Greece.

The concept of public space was first discussed conceptually in 1962 in the book 'The Structural Transformation of the Public Sphere' by the political scientist Habernas. Habernas mentions the public sphere as two different categories, physical and symbolic. Physical public space according to categorization; It is the living space that is formed in streets, parks and squares, where individuals think about a common issue that concerns them, enter into a rational dialogue and, as a result of this dialogue, reach a common conclusion about that issue, defined by the means, processes and spaces. Symbolic public sphere, on the other hand, is defined as the areas where personal press freedoms are guaranteed and the necessary information circulates in the formation of individual judgments. Habermas's definition and view of the public sphere is fed by

the argumentative and sharing behaviours that occur in these areas rather than the spaces of the public sphere (Habermas, 1989).

Madanipour (1996) defined public spaces as spaces that are not controlled by private persons or organizations. These spaces should allow different groups of people to be intertwined, regardless of people's class, ethnicity, age group and gender (Madanipour, 1996). According to Arendt (1970), the public space is a world for all of us, which can be seen and heard by everyone and separate from what is privately owned by us (Arendt, 1970).

Richard Sennett (1990) interprets the concept of ‘publicization’ as people having the opportunity to establish intensive social relationships in certain places. According to this definition, the concept of public space includes both space and society and also he argued that the public space is concrete areas such as the square and the street within the societies and mentioned that the society uses a physical and social tool to transform these areas or to transform them into a new form (Sennett, 1990).

On the other hand, Max Weber (1966) defined the public space as the place where people from different social classes, races and ethnicities interact with each other, and where contradictions, dialogue and agreements are made (Weber, 1966).

In the interdisciplinary use of the concept of public space, quite different understandings and definitions are dominant. The fact that the meaning of the word is shifting from one discipline to another, and the public space spoken of by a historian, an architect, and a philosopher does not actually evoke exactly the same, shows that the definition of public space is also derived from numerous incomprehension

(Dacheux, 2012). Perhaps, the different interpretation of the public space and the fact that it has different points of view can survive with the help of the countless incomprehension that defines the public space.

In terms of architecture, it is a system of communication and services arranged for activities such as public space, buildings and roads coming together, working, living, spending time, and meeting. The arrangement of public environments is related to how these city elements are organized in aesthetic and functional terms (Spreiregen, 1965). Public space can be defined as the areas where people living in the environment in which they live, both interact with each other and with the built environment. According to another definition, the public sphere is a scene where the collective life scenario is displayed. The parks, squares, streets of a city shape and direct the change of people who interact with it. They form a large part of sedentary life by providing public spaces, roads for movement to the city, node points for communication, and public places for recreation (Carr, Francis, Rivlin, & Stone, 1992).

The public space can be described as a common ground that hosts functional and ceremonial activities in people's normal daily routines or periodic festivals or ceremonies aiming to connect the society (Kostof & Castillo, 1999). The public space ranges from streets to squares and parks, and the buildings that surround them, and are the most important parts of cities (Madanipour, 1996). For this reason, the identity and quality of public spaces can be defined as a mirror of the cities that host it.

Public spaces are designed for people. Where there are people, there will inevitably be a movement. Regarding the physical environment's influence on outdoor activities, Gehl (2001) examined publicity and outdoor life in three main categories and grouped

them. These groups are; necessary activities, optional activities and social activities. These activities play an important role in shaping public spaces. Necessary activities; Going to school, going to work, waiting for a bus or delivering mail by a working postman is a clear targeted and repetitive activity. Since the level of necessity is high in these activities, the change or evolution of the physical environment does not change the course of the activity. Optional activities, on the other hand, are those that the person or persons deem appropriate in terms of time and space, depending on their desire to participate. It can be exemplified as activities such as walking, getting fresh air, watching the view. In such activities, the quality of the outdoor space is important. Public spaces to spend time should be inviting for those who will do the activity. Social activities; are the activities that occur as a result of people sharing the places. These activities, which have social content such as greeting, chatting, gathering, are realized as a result of people's movement and being in the same places whenever they want in line with their own wishes (Gehl, 2001).

On the other hand, one of the most important features of a public space is accessibility. Any square, courtyard, street or park must be physically accessible in a direct way. Accessibility can be examined in three different categories, physically, socially and visually. Physical accessibility is based on the principle of providing comfortable circulation without physical barriers, doors, walls in front of individuals during access to public space. Social accessibility is defined as the opportunity to use public spaces, different social classes and groups at the same time. The third accessibility is the visual one. Visual accessibility can be defined as the visual relationship of the city dwellers with public spaces and the transparency of the interior of the spaces from the outside. Another characteristic that public spaces should have is their diary. This issue is

effective on the use of public space by individuals belonging to different gender and age groups (Francis, 1989).

In order for public spaces to be classified as successful, Paumier (2004) listed 4 different features that public spaces should have as follows: Locations, size, programming and design. According to Paumier, the location and accessibility of public spaces are very important and public spaces should be supported by pedestrian-designed roads. Public spaces should be designed to host large events in size, but should not be large enough to seem lacking in activity during off-peak periods. According to Paumier, it is possible to capture a more lively atmosphere in smaller spaces. Programming, another element, mentions the importance of functions such as shops, restaurants, and historical buildings surrounding the public space. These spaces, which in a way nourish public spaces, should be included in public spaces designed as a result of good programming. Finally, Paumier, who talks about design, says that public spaces should be legible, a good public space should be supported with a good design, and that elements such as establishing a relationship with the street, comfortable sitting, flexible use, high quality and simplicity should be taken into account in order to create this design (Paumier, 2004).

The Council of Europe (1986) defined the importance of public spaces in city life as follows;

- Public spaces have an important place in city heritage.
- It is a powerful element of a city in terms of architecture and aesthetics.
- Has an important educational role.
- Very important for social interaction.

- Strengthens the development of society.
- It is an important element in balancing people's psycho-social tensions.
- It plays an important role in meeting the leisure and leisure needs of communities.
- It has economic value for environmental development.

According to all these definitions and characteristics, public spaces can be defined as places open to public and hosting social activities, where society meets on a common ground and where social and class segregation should not take place. These places can be diversified such as streets, squares, parks, and various playgrounds.

4.2 Typologies of Public Spaces

Although the way of categorization in public spaces was mostly made according to the physical properties and functions of the spaces, there were different classifications by different academics. Krier (1979), while classifying public spaces, mentioned that streets and squares are the basic elements, and mentioned the unique features of squares (Krier, 1979). Jacobs (1964) focused more on the social interaction of public spaces and emphasized the importance of streets and sidewalks in urban memory (Jacobs, 1964). Moughtin (1992) stated that streets and squares that define the boundaries of public property have an important place in urban planning (Moughtin, 1992). Francis Tibbalds (1988), on the other hand, included alleys in this definition as well as streets and squares when classifying public spaces (Tibbalds, 1988).

Dines & Cattell (2006) discussed the way users interact with the public space, and made a grouping of five items using the users' social interaction with spaces and their perception of space. According to this grouping;

- **Everyday places:** can be defined as streets, paths, parks that make up most of the public spaces and can host daily activities.
- **Places of Meaning:** these are defined places that differ from person to person, have personal memories of people and have a different meaning for each individual.
- **Social Environments:** can be defined as places that strengthen social relationships between individuals, with the help of their design and use.
- **Places of retreat:** places that allow people to be alone with their thoughts or to come together in small groups.
- **Negative Spaces:** racist, antisocial spaces where threatening or destructive activities are frequently seen.

Carr et al. (1992), on the other hand, made a function-based classification of public spaces and examined eleven different items and these are;

- Parks
- Squares and Plazas
- Memorials
- Markets
- Streets
- Playgrounds
- Community open spaces
- Greenways and parkways
- Atrium/indoor marketplaces
- Found Spaces/ Everyday Spaces
- Waterfronts

The remainder of the study will be carried out on the squares and streets, which many academics have accepted as important and at the same time can host more places in terms of the projection mapping method that uses building facades as screens, with the help of the fact that the buildings and facades surround these spaces.

4.2.1 Squares

The square is an open public space whose boundaries are defined by architectural elements, have a public function, and at the same time coexist with other public and private spaces and establish a relationship in terms of function (Zucker, 1959). The concept of the square has continued to exist in the use of urban open space from the early ages until today. The squares, which emerged with the logic of grouping the residences around an open area, facilitate the control of the area inside, and also work as a defence mechanism against external factors. The squares range from the central courtyard housing typology defined by the surrounding rooms to the larger-scale examples of agora and forum (Krier, 1979).

Squares are the most prominent and most visible element of urban building (Norberg-Schulz, 1972). Rob Krier (1979) states that perhaps the first example of human beings' use of urban areas are squares.

According to Kevin Lynch, squares are focal points that host intense activities formed in urban spaces. It has features that will affect human groups and facilitate meetings. Today, squares can be defined as public spaces that often have a hard floor and free pedestrian use. Generally, these areas are used for strolling, eating, sitting and socializing (Marcus & Francis, 1997).

Paul Zucker (1959), based on the general characteristics of the squares, identified and analysed five separate square forms, these are:

- **The closed square:** It is a defined and closed square form with adjacent structures around it. The enclosure is provided by the structures surrounding the square.
- **The dominated square:** in this square form, a certain structure stands out. Direction is made to structures such as church, town hall or government building.
- **The nuclear square:** These are the squares where a strong element in the vertical direction is located in the middle of the square and affects its surroundings. It is a not very rigid square form, but it has a distinctive layout.
- **The grouped square:** It is a square form consisting of two or more nested spaces.
- **The amorphous:** rather than being defined as a square, it can be defined as open spaces that have no restrictions and boundaries due to their characteristics.

The main and most important reason why squares attract people is the human factor. The increase in the number of people using the area enables other people to move towards that region. In addition, the high quality of the visual quality will allow for optional activities such as walking and resting, and environmental arrangements made for such activities will make the space even more attractive for residents (Barnett, 1982).

As a result of the researches, 90% of the usage in today's squares is that individuals do activities such as sitting, strolling, eating and drinking, reading and watching. People perceive eating in the squares as a picnic. Public performances, outdoor activities, entertainment increases the use of the square by individuals. It has been observed that people who live alone use the squares actively at certain times of the day to make friends or to get rid of the stress of daily life (Marcus & Francis, 1997).

4.2.2 Streets

The street is quite wide by definition. Descriptions of streets, highways, boulevards and roads are words and meanings that are highly intertwined with each other in terms of concept (Moughtin, 1992). Given the definition made by Lynch, the road can be thought of as a transport and transit link between two different places (Lynch, 1960). Jane Jacobs (1964) argues that the most important public spaces of a city are streets and sidewalks and emphasizes the importance of the street within the city. She says that when you think of a city, the streets are the first to come to mind, and the quality of the streets is actually parallel to the quality of the city (Jacobs, 1964).

Streets are social spaces and constitute the main structure and framework of every city. Streets are part of the public spaces that keep the city alive and dynamic, and they form an important identity in cities for religious, commercial, political, leisure, communication and other social purposes. Streets are places for social relations and commercial exchanges and there is movement on the street. It is possible to pass by, stand in one place and watch the environment. The streets can be used by everyone. The street contains the ability to see and be seen together. The streets should help build society and take on a supportive role for people to strengthen their social relationships with each other (Jacobs, 1964).

Different academics have made different classifications regarding the typologies of the streets. According to Moughtin (1992), streets are divided into 4 different categories accordingly to their usages:

- **Civic Streets:** These are streets surrounded by structures such as museums, theatres and public buildings. Every day, they host a great deal of circulation, and the main buildings supporting these streets are the area's interaction centre.
- **Residential Streets**: These are the streets located between the residences and neighbourhoods of the region.
- **Commercial Streets:** Streets located in the commercial centres of the region and commercial activities are generally observed.
- **Multi-use streets:** These are streets where more than one of the specified features are combined and mixed use is observed.

Moundon (1987) classified pedestrian activities on the streets and divided them into two categories. These two classes, defined as Pedestrian Movement and Non Pedestrian Movement, were made depending on the movement of pedestrians. Pedestrian Movement is divided into two parts. Dynamic Pedestrian Behaviour are actions actively performed by pedestrians, such as wandering, relocating, walking or shopping. Static Pedestrians Behaviour includes actions such as eating, working or sitting by pedestrians in certain locations without changing their location (Moudon, 1987).

The streets also have a direct relationship with the facades of the buildings that limit them. Facades are visually important for those who experience the streets. The visual aesthetics of the urban environment, the surfaces, textures, materials, decorations, colours and lights of the buildings surrounding the streets change the experience of the

streets both spatially and physically (Carmona, Heath, Oc, & Tiesdell, 2003). For the purpose of the study, projection mapping works on the facades also play an important role in the texture of the urban space, and aim to provide a new experience by putting the streets in front of their installed structures in a different form than those experienced in normal time. Carmona (2003) advocated public works of art on the streets to make the public space different, to increase its visibility and to be accessible to everyone.

4.3 Public Art

Public art is art works performed in venues such as streets, squares, parks, building facades and common areas of public buildings, unlike private galleries, museums or private exhibition spaces. Especially since the second half of the 21st century, it has been a subject that has been interpreted from many different perspectives. Miles (1989) defined public art as landmarks, which serve as a landmark in the landscape but aim to reveal more than sculptural features and Miles explained the importance of public art as follows:

- It gives a sensation of place.
- It engages the people who use this place.
- It gives a model of imaginative work.
- It assists in urban regeneration.

According to Remsar (2005), public art;

> Public art can involve a variety of public places: parks in the city but too natural parks , libraries, hospitals , streets, housing estates, public buildings , shopping centers ...that is to say, anywhere where people live, work or take their leisure. Public art can take so many different forms and shapes. Public art can mean: small sculptures , big sculptures, murals , paintings, street furniture, buildings, tramways or buses, fountains , bridges and arches, communication towers, signaling systems, sports infrastructures ...Some of these artistic features can be considered monuments, not so the other ones. Public art has

> different functions: to commemorate, to improve the visual landscape, to help economic regeneration through tourism and investment, to help artistic and cultural regeneration, to identify a community , to help people to manage public space, to answer to a more general policy on quality of life...

Public art today consists of permanent and temporary practices, including murals, sculptures, monuments, works that work in integration with architecture or landscape architecture, social art, new arts created with the help of digital technologies, performances and festivals. public art is that it does not have a specific art form. It has a wide range of applications from outdoor exhibitions of sculptures to public wall paintings and works specific to the area.

Public art is an art that aims to integrate with the audience and define a new space. This new space is the space that helps people express themselves by creating a renewed reflection on the social structure, the use of public spaces, or their behaviour. So public art doesn't have to be just visual (Sharp, Pollock, & Paddison, 2005). Public art evokes a sense of identity and belonging in the urban space. Montgomery (2001) states that the identity of the city cannot be considered separate from the image of the city, while identity is an objective definition, while the image is a combination of how identity and place are perceived (Montgomery, 2001).

The most important feature that distinguishes public art from art exhibited in private spaces is that public art is accessible to everyone. It is open to the participation of people from all walks of life, rather than a unique audience as in the art exhibited in private spaces. Therefore, the concept of public art is related to the fact that art is physically accessible without any limits and restrictions. Public art, which gains a

meaning with the audience, becomes a part of the daily life of the audience by moving to its own public space (Jacob, 1995).

Today, approaches to public art vary widely. The contribution, effect and aesthetics of a work of art to public spaces are considered multi-dimensional. Accordingly, studies that allow the definition of a desired feature of the space as more emphatic can be effective in shaping public art. Cultural identity studies that symbolize important events in a particular ideology or history strengthen the social structure by supporting social feelings such as having a common history and coexistence (Mitchell, 1992).

Studies carried out with the purpose of visually beautifying the public space highlight the physical relationship of the artwork with the space. Public arts, which are made to support large business centres or public buildings visually, are the most common type today. In addition to all these, it can be seen in important events with a cultural background such as public art and traditional festivals.

4.3.1 Historical Development of Public Art

Since World War II, the issue of reconstruction and beautification of cities in Europe and America by getting rid of the effects of war has increased its importance. In this process, public art started to be advocated not only in terms of aesthetics but also in the thought that it would contribute to urban renewal (Hall & Robertson, 2001). As a result of this, art councils have been established in some countries. The aim of art councils is to support local artists and distribute art awards, to enable them to perform their artistic shows at home and abroad. These councils operate independently of any political view and as non-profit organizations. Besides the art councils, the "Percent for Art" strategy started to be adopted in many countries, especially after the second world war (Hamilton, Forsyth, & De longh, 2001). According to this strategy, public

art has also started to be supported financially. The Percent for Art strategy has received very positive feedback in various European countries, and in 1991 the British Arts Council listed the results of the strategy as follows;

- Creating a richer visual environment
- The result of a better visual environment, the development of the social and economic environment
- A broader environment can reach contemporary art
- Increasing the job opportunities of his artists.

Towards the end of the 1960s, there was an increase in the placement of contemporary arts and crafts in town squares, public buildings, park and garden festivals, schools, hospitals and exteriors of homes (Miles, 1997).

In this period, art works placed in the public space appeared as the reflection of galleries and museums on public spaces. The most important thing that distinguishes these works from the works in the gallery and the museum is that their dimensions are much larger. Some of the works that ignore social and cultural relations were lifted upon the revolt of the society. Perhaps the most controversial example on this subject is the work titled "Titled Arc" that Richard Serra placed in front of Federal Plaza in New York City in 1981.

Titled Arc is a placement study funded within the US program of "Arts in Architecture", which is the transfer of 0.5% of the federal incomes to public art. Serra claimed that with her study, she changed and differentiated people's perception of plaza and spatial perception and caused their awareness. According to him, as the person moves in the space, the meaning and appearance of the statue also changes. The

shrinkage and expansion rates in the sculpture differ with the displacement of the viewer. Thus, there is a change not only in the sculpture but also in the perception of the whole environment.

Later, various objections about the statue emerged, and letter and signature campaigns were launched to lift the statue. Employees of the federal building are among the people who want to be removed. Employees emphasized that the sculpture prevents the use of the plaza and creates the environment for terrorist acts. However, the artist objected to these reactions by claiming that the statue was designed entirely as belonging to its location, that it could not be moved elsewhere, and stated that if it was moved, he wanted it to be destroyed by scratching its name on it. The court decided to destroy the statue and the dismantling of the statue was completed on the night of March 15, 1989.

This work of Serra, which has many works, is important in terms of revealing the dimension of the relationship between 'urban space-city user and artistic fiction'. This work, which interferes with the public space, separates the public space into two different places and makes it difficult to use, had to be removed through the legal means with the pressure of the society. While the work created a strong indicator quality in terms of the urban image in line with the thoughts and purposes of the artist, it also created a negative effect in terms of the use of the space. This dilemma emphasized the importance that public art should be made by considering all physical and social inputs of the city.

4.3.2 Types of Public Art

According to the definitions made in the literature, it has been observed that public art does not depend on a certain form, method or material. Using the public space as a

canvas, the artists can create a wide variety of expressions by using all the physical and social components of the space. Considering this creative power, new methods and approaches in today's art making practices, it will be very difficult to reach a common unity in classifying different types of art in the public sphere.

Today, when we look at the field of public art, it can make its presence felt in many different fields from mural to sculpture, from land-art to urban furniture and furnishings. Public art can contain abstract or tangible elements not only in terms of the types of practice but also as a form of expression. In addition to traditional techniques such as sculpture, painting, painting, and ceramics, public art today includes contemporary practices such as light, projection, video, and sound. All these practices consist of permanent or temporary practices with the general distinction.

Özaltın (2015) stated the types of public art in the table below according to their application types, continuity, expression style and technique.

Table 4: Types of Public Art (Özaltın, 2015)

Application Types	Continuity	Expression Style	Technique
Installation	Permanent	Concrete	Traditional (sculpture, painting…)
Surface Painting			
Urban Furnitures	Temporarily	Abstract	Contemporary (interactive, kinetic, digital…)
Public Exhibitions			
Performances			
Game			

- **Installation**

The installation, which is one of the most common types of public art, is mostly seen in our daily life in the traditional sense of the sculpture type. Sculpture, dating back to ancient times, has found new expression and production techniques with the help of changing industrial, social and technological conditions. However, the inability of these sculptures to integrate with public spaces and their use of public spaces only as a platform for exhibition led to different discussions. Upon discussing the publicity of these works, the concept of site-specific started to be considered together with public art as of the mid-1970s. This concept and the studies conducted under this concept ensure that artworks are addressed with their physical, social and cultural dimensions of public spaces.

In 1995, Christo and Jeanne Claude, who carried out huge outdoor installations, wrapped the German Parliament Building (Figure 23), which has a historical background and is one of the important buildings of the city, with fabric. In this installation, the space has become the object of art and has turned into a giant sculpture wrapped in cloth, becoming the carrier of the work. This action can be interpreted as erasing the traces of past events, and is open to interpretation as embracing a building to protect it. The Reichstag remained packaged for 14 days and was presented to visitors.

Figure 23: Wrapped Reichstag Installation (URL 23)

- **Surface Painting**

It describes the various paintings made on the floor covering, building facades and walls of public spaces, which are classified as surface painting with its general name. Surface painting can be defined as being perceived as a part of the space in the design of the public space, as well as later legal or illegal interventions to the space.

Surface painting has also been used frequently in architectural and space design, with the postmodernism that gained popularity in the 1970's (Jencks, 1988).

On the other hand, unplanned and illegal surface painting works are called graffiti. Graffiti is a rebellious act in character since it was not designed by a city planner, architect or authority. City walls, garbage cans and sidewalks turn into a platform for artists to be painted, written or redefined. Graffiti artists reject the built and standardized layout of the city (Tanglay, 2005).

Some of the projects realized by different artists within the scope of Miami-Dade Art in Public Spaces program for Carnival Centre for Performing Arts in Miami can be regarded as successful examples of surface painting that has become part of a space

design. The work of Gary L. Moore, who painted the plaza floor in front of the opera house, is an example of a site specific and outdoor floor painting project (Figure 24).

Figure 24: The Work of Gary L. Moore on Plaza Floor (URL 24)

- **Urban Furnitures**

With the end of the 1970s, the concept of site-specific, which started to be applied in public art, and the collaboration of disciplines such as architect, urban designer, landscape architect, who organize public spaces, came to the fore. has carried the functional value of the artwork above its aesthetic value (Kwon, 1997).

Artists interpreted meeting physical needs in public spaces as a kind of social responsibility, and found the aesthetic value of art in meeting the physical needs of the space.

The red urban furniture (Figure 25) designed by Shigeru Uchida, located in Roppongi Hills, Tokyo, in addition to its sculptural stances, also acts as a bench.

Figure 25: Urban Furniture designed by Shigeru Uchida (URL25)

- **Public Exhibitions**

It is the public space of the exhibitions organized by the artists to present their works to the wider environment of the city and bring them together with the people of the city. Participation by the public and mutual interaction with the artist plays an important role. Establishing contact and dialogue with the audience is presented in different ways for artists.

One of the examples of public space exhibitions in recent years is the structure designed for the purpose of display, named TIRTIL (caterpillar), located in Konak, Izmir. Designed by Ferhat Hacıalibeyoğlu and Deniz Dokgöz, the TIRTIL was built in 2019 (Figure 26). It aims to bring different works of art, architectural projects or events to the public at different times. Due to its location in a region where urban flow is very intense, it interacts with many people during the day. TIRTIL, which allows the realization of activities such as exhibitions, performances and rest with its current situation, can be defined as a design stop that creates an impact area around it with the help of the cavities and surfaces it creates in the area where it is located and allows user interventions for the urban dwellers.

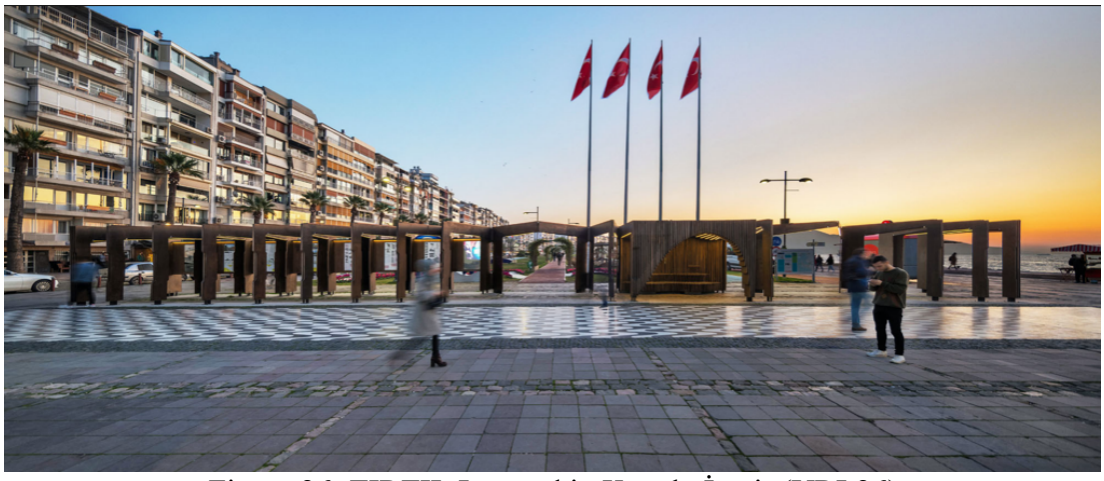


Figure 26: TIRTIL Located in Konak, İzmir (URL26)

- **Performances**

Performance arts, which can be defined as an activity taking place in public open spaces, can be defined as planned, private or formal programs carried out by street artists. Public venues that host concerts, official ceremonies or festivals can be places where street performers also perform throughout the day (Carr, Francis, Rivlin, & Stone, 1992).

Another branch of art that can be encountered in public spaces under performance art is the type known as flash mob, which is formed by a group of people doing a certain activity in the public space at an unexpected moment. Flash mobs usually try to involve the audience in some way. Apart from certain main lines, it is generally improvised and it is a branch of art where different disciplines can work together. It emerged in the late 60's and was frequently used by activist groups and artists, especially for political purposes, in the following periods. These organizations are often described as fun, activist, and destructive (Ryan, 2007).

In 2012, Spanish bank Sabadell performed an unforgettable flash mob performance at Plaça de Sant Roc in Sabadell, Spain. The performance, which started with a little girl tipping a viola street player, continued with 100 musicians playing Ode to Joy by Beethoven, the anthem of the European Union (Figure 27). This flash mob, which contains the transformation of the public space into a stage for performing arts, has a very important place in terms of space and art.

Figure 27: Photo during taken the Flash-Mob of Sabadell (URL27)

- **Game**

Another method frequently used by artists who make public art projects is to bring people together and play various games. With the help of these games the participants sometimes create a product of art, and sometimes they establish a different relationship with public spaces than they establish in their daily lives.

In 2015, the artist named Marta Minujin transformed the public space into a big hopscotch game with the drawings she created on the Place du Paris square in Paris.

This event, which was held to celebrate the 100th birthday of the Argentine writer Julio Cortazar, was displayed in the square for 3 days. The inspiration for the event is Julio Cortazar's novel named Rayuela (hopscotch), set in Paris (Figure 28).

Figure 28: Rayuela Installation Set in Paris (URL28)

Projection mapping performances applied in public spaces, the subject of this thesis study, offer a hybrid performance in interaction with public space, human and building by using the facades of buildings surrounding public spaces as a curtain. According to this categorization, projection mapping performances are included in the type of installation, are generally exhibited temporarily or for short periods, can contain concrete or abstract elements, and are fed by contemporary techniques.

4.4 Installations and Public Spaces

The installations, which establish a relationship with architecture and the built environment and aim to incorporate it formally and semantically, have been seen frequently in public spaces after the birth of 'site-specific' art. In art practices born in the mid-1960s, the integration of the concept of 'site-specific' with public art practices coincides with the mid-1970s. This type of art that comes to the fore as site-specific art; Considering the post-modern criticism of urban theory, the relationship between art and architecture, and the debates on public sphere and public identity politics, he argued that art and its locations are much more than an artistic problem. Site specific art started out based on the principle of non-repeatable and non-replaceable, establishing a relationship between place and identity.

Site specific art during the 1970s and 1980s; established a relationship with many different disciplines such as land art, performance art, conceptual art, installation art and public art. Public art has become a work that can communicate with its surroundings spatially, rather than just a sculpture appearing as an object (Kwon, 1997). With the desire to establish a holistic relationship with public spaces, artists have started to work with people in the architectural discipline.

In contemporary art understanding, another important aspect of expression is participant-audience interaction and communication. Art, which has been affected by social events for centuries, has been affected by cultural intersections and differences in recent years and seeks new suggestions for coexistence (Tan, 2003). The new proposals have started to be realized more in the communication between art and society. Related to this, Spanish artist Alica Framis, with the view that art can be

anywhere, is not the place that makes the event real, but the event that creates the space, reaches the conclusion that the outdoor space, which is deliberately chosen by the artist, gains meaning with the artist's work (De Oliveria, Oxley, & Petry, 2005). In this sense, the examples given in the name of installation art today are quite interesting and diverse.

Monuments, monumental structures, square arrangements, sculptures relating to buildings and squares and installations made in this area are of great importance in creating and keeping the social memory alive. These works are carried out in squares, open areas and sometimes on the streets; Not only did they question the aesthetic understanding of their surroundings, it also caused discussion of its meaning.

The concepts of time and space, which are as important as the form in the installation works, and the different applications realized without knowing the limits in the material gain meaning when they meet with the audience. As a form of expression that includes all interdisciplinary features, installation attracts attention with its applications by including the media such as light, sound, music, video, performance, computers and internet among the creation techniques in today's world.

Public spaces are frequently preferred by today's artists, as they enable art to meet with the society, are accessible and free to be experienced by everyone, and are spaces where artists can realize their thoughts in any size they want without physical restrictions.

4.4.1 Projection Mapping Installations in Public Spaces

In the digital sense, public art has enormous production and at the same time audiences all over the world with the development of computer graphics, photo art, video and animation, 3D scanning and reflection matching techniques.

As a result of the use of projection mapping, blending digital art with tradition and art, public spaces can be read as an important act of setting up spaces and art. Methods and techniques such as projection mapping have spawned a contemporary virtual aesthetic in cities and public spaces and contributed to the emergence of future artistic expressions. Considering the unity of public space and art, projection mapping, as a contemporary technique, enables the creation of new projects on a sociological basis and in urban culture with quite different methods for architects, designers and artists. This technique, which requires people and experts from more than one discipline, also holds a multidisciplinary working practice.

In the projection mapping installations, where buildings mostly act as a screen in public spaces, the handling of the building surface and different design approaches while establishing a relationship with the building to be applied in the design process of the performances give the performances a formal identity. While examining different applications around the world in the next section, one of the factors to be taken into account will be these formal differences, so it will be useful to classify projection mapping performances in a formal way. Işıkkaya and Çatak (2010) made the format-specific classification of projection mapping projects as follows:

Interpretation 1: protecting the facade, combining the presence of the old facade with the help of colour and light (Figure 29).

Figure 29: St. Jean Cathedral Illuminated during the Lyon Festival of Lights (URL29)

Interpretation 2: the demolition and reconstruction of the facade by interpreting the massive surfaces and contours of the facade and the openings such as doors and windows (Figure 30).

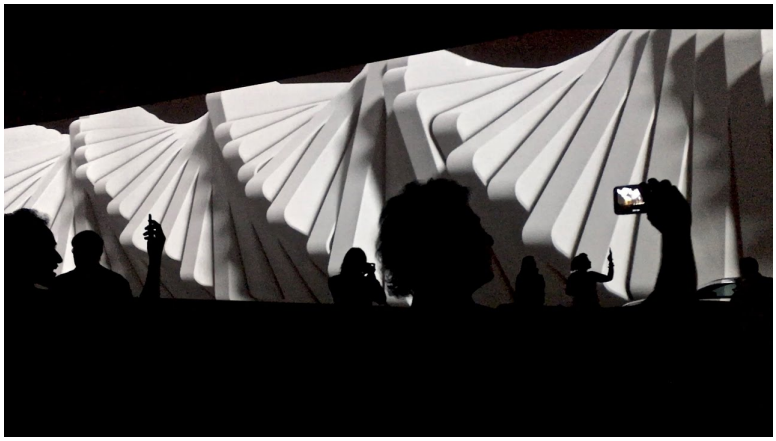


Figure 30: The Infinity Wall Project in Doha, Qatar (URL 30)

Interpretation 3: Hybrid combination of reflection with concrete objects / modules attached to the existing façade (Figure 31).

Figure 31: USC Village Complex Opening Show (URL31)

Interpretation 4: Reflecting information about the interior of the building to the facade / reflecting the building to the building (Figure 32).

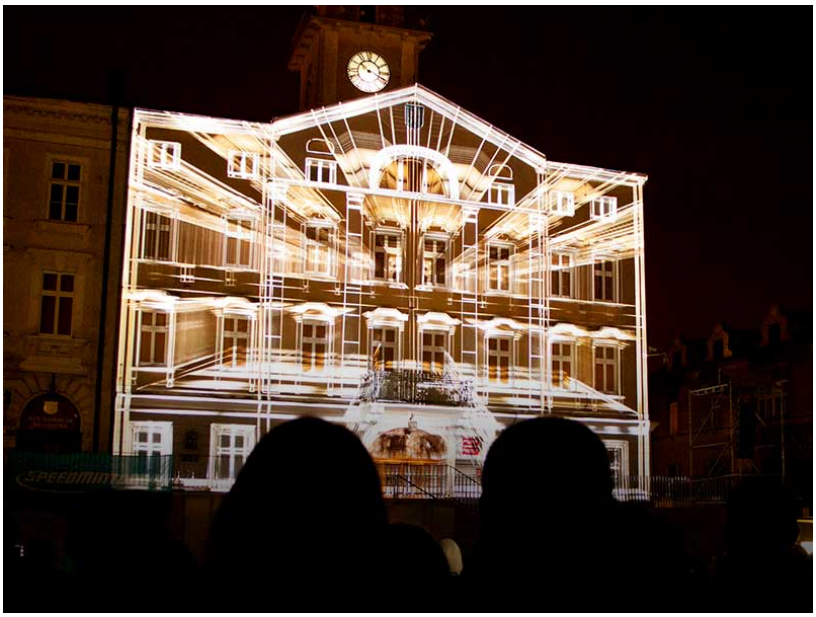


Figure 32: Projection Mapping Project called Bitwa Gorlicka (URL32)

Independent design: a video performance unrelated to the façade (Figure 33).

Figure 33: Independent Design Usage of Projection Mapping (URL33)

Interpretation of perspective: breaking the structure of the street, reconstructing it, reconstructing the urban perspective by reflecting on multiple facades (Figure 34).

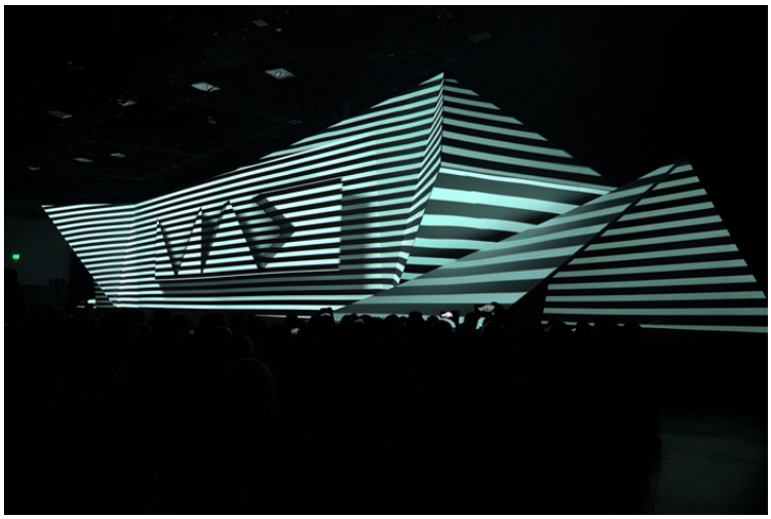


Figure 34: Projection Mapping Applied in AdobeMax 2016, San Diego (URL34)

In addition to the formal classification of application projection mapping performances on facades, it is also possible to classify them in terms of content. These include the shaping of the urban environment, the building history and the situations that are

nourished by the historical content, the supporter of the activities carried out in the public spaces, the situation for advertising and promotion, and again, as in the formal classification, aesthetics and art can be included in the independent framework. The mentioned categories can also be included in a single performance in separate layers. For example, the content of performance can exist both from historical and urban conformation. In such cases, the performance will have mixed content. For this reason, complex system multiple usage can also be included in the classification both in terms of content and form.

4.4.2 Projection Mapping as a Tool for Social Gathering in Public Spaces

Cities have a great impact on people's social life. As Wirth points out, the city is not just a place where houses and workplaces are growing, but a place that gathers people and activities together, transforms them, forms and controls the centre of economic, political and cultural life (Wirth, 1964). These features are only complemented by the experiences and gain meaning. In a similar approach, Lefébvre saw the city as a container that maximizes the work of transmitting human interaction and the meanings of civilization across generations. The city frees people, enables them to make decisions and set new directions (Lefébvre, 1991).

Today, public spaces can be evaluated in terms of the activities that take place within them and their socio-cultural functions. Accordingly, the most appropriate definition was made by Zukin (1995). Zukin interpreted the public sphere as a ‘constantly changing situation in which various public or individual demands that make up and use spaces are perceived.’ It focused on the concepts of public culture and public sphere that are closely related and reinforce each other. Many things that enable the

creation of daily life in places, parks, shops and streets where we experience public life in cities are produced by social encounters.

Gehl's work, given the table of the quality of outdoor spaces and the rate of doing the types of activities (Figure 35), the quality of the places where optional activities (not as a result of need, but voluntary, hiking, airing, watching around) are performed should be high. These activities are carried out by individuals according to their wishes and increase the rate of socializing by spending time in public spaces (Gehl, 2001).

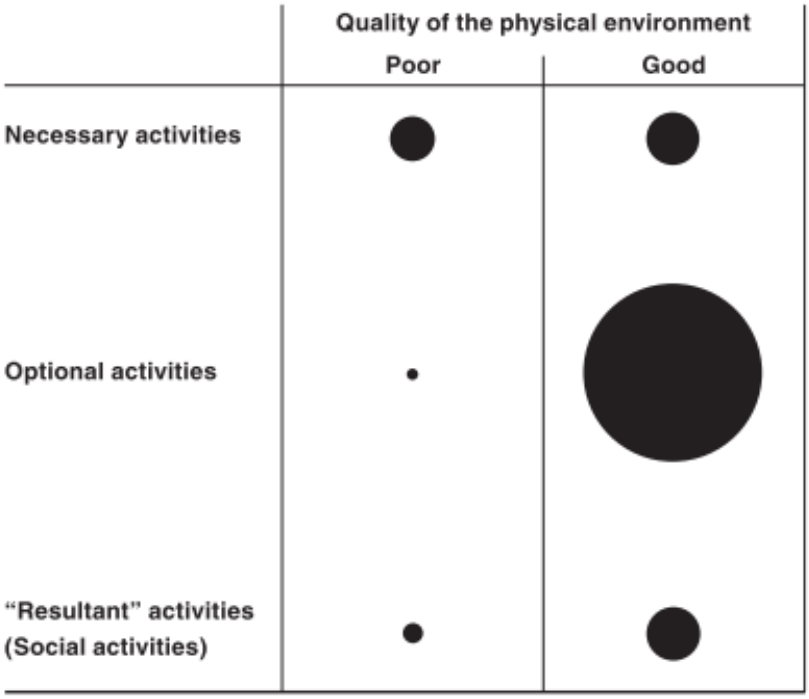


Figure 35: Gehl's Quality of the Physical Environment Table (Gehl,2001)

With the enhancement of the quality of public spaces, optional activities will be carried out by people, enabling people to spend time, places where they can stand, sit, talk or communicate only visually. Many activities are becoming more possible in qualified environments.

Projection mapping studies provide a special and temporary experience by differentiating the existing order in urban spaces. These works, which directly affect the quality and atmosphere of the urban space, change the relationship of people with space and give them a new experience. As a result of this experience, individuals have the opportunity to socialize and spend more time in public places than on a normal day in order to watch their activity.

In addition to the projection mapping made only visually, projection mapping studies that are evaluated interactively are frequently encountered in public spaces. According to a study, it has been realized that interactive urban screens make urban spaces more attractive, people spend more time in urban spaces to experience, and thus social interaction between people increases (Veenstra, 2015).

An important example of interactive projection mapping studies is the project named Climate on the Wall. The Climate on the Wall project is an interactive projection mapping study using the Ridehuset, an important city centre building, as a display during the Beyond Kyoto climate conference (Figure 36). As a result of following the people passing by the sidewalk on the facade of the building with visual tracking devices, individuals were able to interact with different words and phrases related to the climate on the facade of the building. This study aims to give people a voice in the debate on climate change. Projected word groups include climate-related words such as 'less', 'cars', 'people', 'trees', 'ice', 'climate'. Interacting with the facade of the building, people can capture words with their bodies and create meaningful sentences such as 'more trees less cars' (Dalsgaard & Halkskov, 2010).

Figure 36: Climate on the Wall Project, Phrases Reflected on the Facade (URL36)

Another example of interactive projection mapping studies is the project named EGO (Figure 37). Developed by Klaus Obermaier, the project has had the opportunity to be exhibited in many different public areas of the world. In the project, which is formed with the participation of individuals, with the help of the camera tracking system, the body movements of the participants are matched with the stick people in the projected image and performed in synchronization. Supported by sound effects, the project is defined as the conflict between the physical appearance of the people and their emotional moods in their inner world.

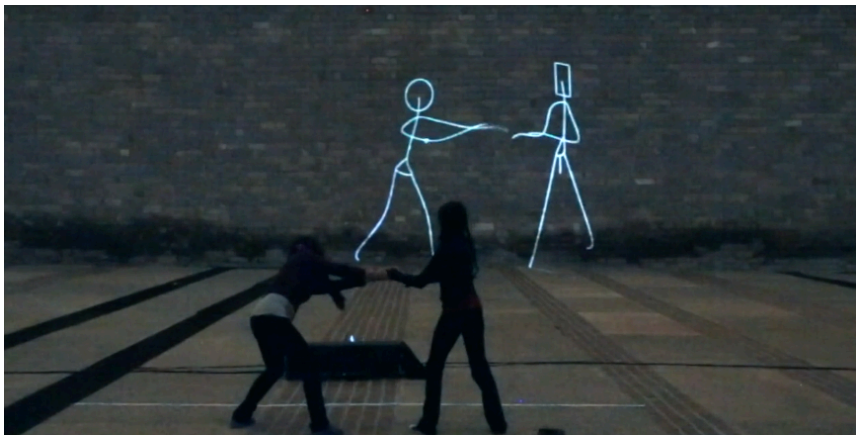


Figure 37: EGO Interactive Projection Mapping Installation (URL37)

In addition to using the facades of the buildings as screens, the floors of the streets and squares also hosted interactive projection mapping performances. An interactive installation called 'Digital Water Lilies' by Miguel Chevalier in the south plaza of Jing An Kerry Centre, Shanghai in 2017 is one such example (Figure 38). Classified as site-specific, this installation is designed to herald the arrival of spring. As the visitors walk on the reflective surface of 600 square meters, the vegetation under them reacts to their movements with the help of sensors. It is one of the examples of plazas and squares interactively equipped with digital art.

Figure 38: Digital Water Lilies Installation (URL38)

Sometimes, for advertising purposes, social studies are frequently encountered in public spaces. The projection mapping project realized in Taksim Square, Istanbul in 2012, is a special project prepared by Coca-Cola for the month of Ramadan (Figure 39). With the interactive projection made to the building in the square, the photographs of the people who are photographed through the kiosk in the square are reflected on the facade of the building. With the help of the private internet addresses given, people can also access their photos on Facebook. Creating an interactive and social environment, this installation was exhibited in Taksim Square during Ramadan.

Figure 39: Coca-Cola Ramadan Advertisement on Taksim, Istanbul (URL39)

Architecture is always a physical reflection of culture; records cultural transformation and makes changing social dynamics visible (Poon, 2008). The facades that host these changing social dynamics are the most important part of the city that is in constant motion, and it transforms and develops with the city. With every new activity of the city, a new perception of façade may arise, because the individuals that make up the city are not one and unchangeable. The spatial layers in cities and the relationships of these layers within themselves are variable and dynamic, just like the conscious and unconscious memories of the human mind (Azimzadeh & Bjur, 2007).

If the buildings are an element of the city, the individual can be defined as an element in the same way and the urban memory is mentioned as a result of these two elements. Rossi argues that the buildings that make up the city became a part of the urban memory through social relations produced through their spaces, and that this network of relations shaped and reproduced the city over time in the city's history (Calak, 2012).

The place of architecture in the daily life of individuals strengthens the relationship between individual and space with projection mapping applications. Throughout their projection mapping performances, people create new memories by establishing a

dialogue about the buildings they have not made before, with the performances made on the facades. In this respect, studies made with the method of projection mapping have a very important place in terms of the space experiences and socialization of individuals, especially in public spaces.

4.4.3 Projection Mapping as a Tool for Changing the Identity of Public Spaces

In the urban setting, the integration of digital media, digital billboards, screens, media walls and projection mapping studies on building facades have become increasingly popular around the world. Digital art examples, which we frequently encounter, especially in public spaces, have the ability to transform the urban environment from something familiar to something entirely different. This is why digital art content is considered to be the catalyst in transforming physical spaces and presenting something new (Berret, 2018).

As a result of the reflection of technological advances in the art environment in connection with the exhibition, there are changes in the relation established with the exhibition space-art object and space. Accordingly, the public spaces included in the thesis are defined as the spaces of the exhibition area. Nowadays, it is possible to use different spaces for installation with moving-still images that can be reflected on the facades of buildings.

The façade of the Cinema Pathe in Rotterdam, facing the square, was the scene of an interactive projection mapping performance in 2001 by the artist Raphael - Lozano Hemmer. In this project called Body Movies (Figure 40), changing human images are projected at a certain distance with strong lights on the big white screen created on the facade. In this interactive installation, the shadows of people passing through the square with the effect of the night projection light fall on this giant screen and

sometimes presents parallel images with the projected human images. Depending on the light source, there is a difference in the shadow size of the audience. The space is redefined as an area of interaction, with the help of the activity it performs while the audience becomes the subject and object of the installation with their participation. The Body Movies project is explained by the artist as follows;

> "Body Movies" transforms public space with interactive projections measuring between 400 and 1,800 square meters. Thousands of photographic portraits, previously taken on the streets of the host city, are shown using robotically controlled projectors. However the portraits only appear inside the projected shadows of the passers-by, whose silhouettes can measure between two and twenty-five meters depending on how close or far away they are from the powerful light sources positioned on the ground. A video surveillance tracking system triggers new portraits when all the existing ones have been revealed, inviting the public to occupy new narratives of representation.

Figure 40: Body Movies Installation Interacting with Public (URL40)

The transformation of identity with projection mapping in public spaces is seen in the streets as well as in the squares. Augmented Structures v1.1: Acoustic Formations / Istiklal Street, formed as a result of the collaboration of Refik Anadol and Alper

Derinboğaz, is an important example in this regard (Figure 41). The 2012 work on the Galatasaray façade of the Yapi Kredi Cultural Center, which is one of the important landmarks of Istiklal Street, was realized as a result of the collaborative work of disciplines such as sound design, architecture and visual arts. Having an important place in urban memory in Istiklal Street, the building has transformed into a reflective surface and has succeeded in changing the function and identity of the public space and the relationship between people and space. The project aimed to interpret the world visually and aesthetically and to discover how digital media logic can meet with architecture. It seeks answers to what can be revealed as a result of the combination of art and architecture, especially with digital technologies. Beyond being a work of art, this installation can be described as an urban experience.

Figure 41: Augmented Structures V1.1 Projection Mapping Installation (URL41)

The project that witnessed the change and transformation of the space is a projection mapping study designed by San Francisco-based Obscura Digital for the 40th anniversary of the founding of the United Arab Emirates. Illuminated with 44 different

projections for a total brightness of 840,000 lumens, Sheikh Zayed Grand Mosque hosted an unforgettable experience (Figure 42). Since the architecture on which projection mapping is applied is a mosque, it is limited to flat surfaces on the facade. The mosque, which consists of 170 meters high 4 minarets and many domes, has a wide variety of materials such as marble, crystal, semi-precious stones and gold on its facade. Both historical images and artistic styles found in the structure and decoration of the mosque are depicted in the performance. The envisioned depictions include humanity depicted with palm trees, pentagonal geometry, gardens of paradise, qibla wall, mehrab, architectural motifs, lunar cycles, and earth. The project, which can be viewed from the courtyard in front of it, is an important projection mapping study with cultural values on religious buildings.

Figure 42: Sheikh Zayed Grand Mosque Projection Mapping (URL42)

Vivid Sydney light festival, held in Australia, is a festival of lights invited artists and designers from around the world to illuminate and transform Sydney urban spaces with

their creativity. The festival, which transforms the city into an art gallery with large-scale projections, offers its audience a unique visual experience with light installations.

Australian artist Jonathan Zawada used the Sydney Opera House as a canvas for the 10th anniversary of the Vivid Sydney Festival and turned the building into a giant kinetic sculpture (Figure 43). The 15-minute performance met with visitors during the 3-week festival in 2018. The project called Metamathemagical has taken references from the geology of the flora and fauna that Australia has.

Figure 43: Sydney Opera House Illuminated, Project Vivid (URL43)

FIAT LUX: Illuminating Out Common Home project is another important project that has been done in public spaces and changed the identity of the place (Figure 44). Fiat Lux was imagined and brought to life by World Bank Group, Connect4Climate, Paul G. Allen's Vulcan Inc., the Li Ka Shing Foundation, Obscura and Okeanos. It was staged on December 8, 2015, on the west facade of Saint Peter's Basilica. This work is an example of contemporary public art. The large-scale public art installation is

inspired by climate change, human dignity, and living creatures in the world in Pope Francis's Encyclical movie "Laudato Si". The projection met the audience live on global television broadcasts and online. The works of the world's most important nature photographers and filmmakers took part in this cinematic event, which lasted about 1 hour.

Figure 44: FIAT Lux, Illuminating Our Common Home Project (URL44)

Matthias Hank Hauesler (2009) argues that media facades fundamentally change the perception of buildings and cities by allowing them to change their dynamic image. The surface of a building is the most dynamic part of its character. The fact that the facade is open to change constantly creates new interactions between people and the urban environment. Buildings and public spaces are transforming into forms of intelligent technology that can autonomously dialogue and respond to human perception, urban environment and other physical or perceptual parameters. The great flow of urban information is exchanged between the structure and the individual and creates architectural extensions of the urban space.

Digital media is creating an important interaction in public spaces. At the same time;

> ‘The architectural dimension of urban space has played an important role in providing a stage for these interactions. Moreover, the architecture itself functions as a medium, telling narratives about the city, its people, and the represented structure of society. Its inhabitants can read the reoccurring social interactions and the way the space is populated in a participatory process. The whole urban structure is becoming the crystallization of the city's memory over time’ (Struppek, 2006).

Chapter 5

CASE STUDIES

5.1 WDCH Dreams, Walt Disney Concert Hall, Refik Anadol

5.1.1 Walt Disney Concert Hall

The Walt Disney Concert Hall (Figure 45) project began in 1987 when Lillian Disney donated fifty million dollars to the Los Angeles Philharmonic to create a memorial to her husband, Walt Disney, one of Los Angeles' best-known figures. For this purpose, the Los Angeles Philharmonic opened an architectural competition to create both a single-purpose hall devoted to symphonic concerts and a civic monument for the city. The design of an attractive square that will connect with Dorothy Chandler Theatre on the north side of the competition area is also included in the program of the competition. The four finalists of the competition held between 1987 and 88 were the widely recognized architects Goofried Böhm, Hans Hollein, James Stirling and Frank Gehry. Gehry Partners won with a stunning victory around Los Angeles with a large garden atrium design (Bekiroğlu, 2004).

As a result of the competition, the construction of the building has become quite problematic. After the foundation was laid in 1992, the construction started, but afterwards, it entered a five-year pause period due to lack of financial resources. The 1994 earthquake experienced during this period caused the earthquake law to change and the amount of steel required to be used in the building doubled. The construction, which restarted in 1998, was then completed by removing the functions such as the

hotel and ballroom in the project, which won the competition in 2003, due to financial problems (Bekiroğlu, 2004).

Figure 45: Walt Disney Concert Hall (URL45)

Opposite the Walt Disney Concert Hall, Dorothy Chandler Theatre and Arata Isozaki's Museum of Contemporary Art (MOMA) located and WDCH is placed diagonally in the rectangular city parcel surrounded by gardens, plazas and roads. Resembling a flower with irregular petals ready to open, the central location has turned into a popular urban focus on the Los Angeles city centre network. As the building rises gradually upwards, the outer surfaces form balconies where people can walk around. The balconies offer panoramic views of Los Angeles city centre to visitors.

The facade of the building itself finds the opportunity to catch the light differently at different times of the day, and this variable quality always surprises people with a different visual experience. Its curved outer surface creates an interactive effect. The sculptural expressions of the surfaces have succeeded in creating magnificent spaces by extending into the building (Bekiroğlu, 2004).

Metal is a good choice because it will create a huge contrast with the existing hall and the museum across the street. Gehry had the opportunity to refine some of the forms and play with them, with the help of the possibilities brought by the metal material. The use of new materials has made the building more exciting. In addition to stainless steel, white marble was also used as the material (Friedmen, 1999).

Walt Disney Concert Hall has become a landmark representing the city and integrated with the city. People spend time here and use this area as a social space. It has been a structure frequently used in the media in movies, series and even cartoons.

5.1.2 WDCH Dreams

WDCH Dreams (Figure 46) is one of the most impressive projection mapping works done in recent years, created by the collaboration of The Los Angeles Philharmonic and Refik Anadol and using Frank Gehry's Walt Disney Concert Hall Building as the projection surface. The thoughts of Gehry, who dreamed that the orchestral music inside the building should one day be reflected outside, somehow came true with the project named WDCH Dreams (Anadol, 2020).

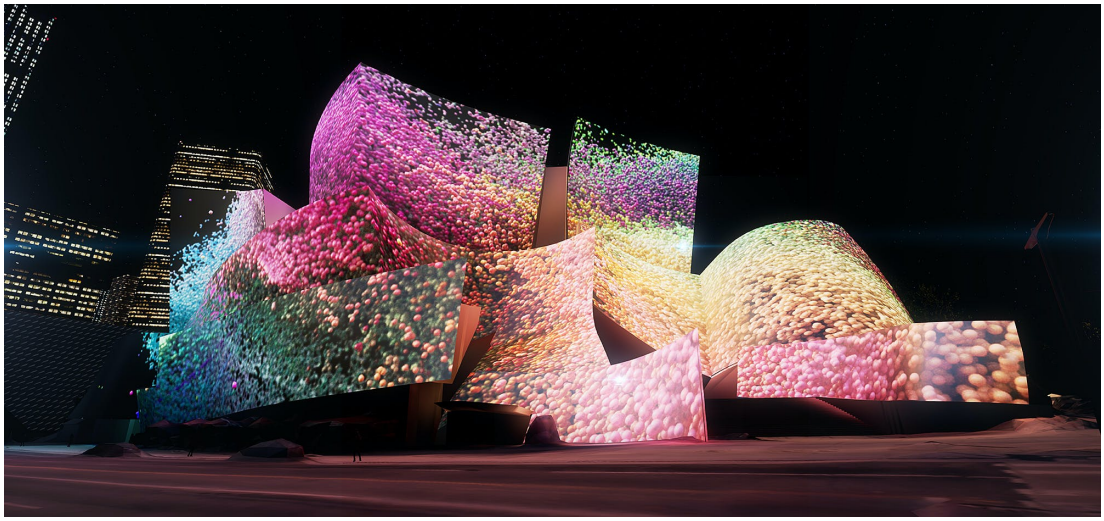


Figure 46: WDCH Dreams by Refik Anadol Studio (URL46)

Refik Anadol is a Turkish media artist who has accomplished many world famous digital art works. Anadol examines the connection between the digital and physical world and makes important works in the field of architecture and media arts. Anadol, the founder of Refik Anadol Studio, teaches at the UCLA Department of Design Media Arts as well as with his digital media works.

The project, Refik Anadol studio carried out a joint work with the Artists and Machine Intelligence (AMI), which is part of Google Art & Culture, to realize the project. The WDCH Dreams project was presented on the exterior of the Walt Disney Concert Hall for a week between September 28 and October 6, 2018.The aim of the project is to make the building dream and this is what gives the project its name. For the concert hall to dream, the studio has done long research into how people dream, how they combine and create photos and pictures of dreams, and how new possibilities arise from all of these (Anadol, 2020).

With the help of machine intelligence, the entire visual and audio digital archive of the orchestra to date was scanned and a total of 45 terabytes of data was obtained. 587,763 images, 1,880 videos, 1,483 metadata files and 17,773 audio files were accessed (Anadol, 2020). All this archive that is accessed will be the subject of the project, the concert hall's connection with the past to dream and create new memories.

For the projection mapping study, 42 large-scale laser projectors with 50K resolution and 8 channel audio inputs were used. For the creation of the visuals, the game engine called Unreal Engine and the programming environment named aVVVV were used (Anadol, 2020).

WDCH Dreams also used special audio files selected one by one from LA Phil's archives as the soundtrack of the project by blending them with their artificial help. This selection, made by sound designer Robert Thomas and Kerim Karaoglu, sheds light on the future, inspired by the orchestra's past using various algorithms.

At the beginning of the show, the images projected onto the facade of the building were about the building's history and memories. Images of the building's construction process, visuals and technical drawings of the first CAD Files were reflected on the facade of the building. The metadata information of the files showed that the files were from years ago, and artificial intelligence interpreted this as subconscious memories. NVIDIA's Progressive Growing of Generative Adversarial Networks (PGAN) technology has hallucinated images of the future and provided visual equivalents of future possibilities, with the help of images from the institute's history (Anadol, 2020). GAN is a working method developed in 2014. It facilitates the production of patterns from the images and sounds that are randomly transferred into it.

Chapter I: Memory, where LA Phil's past takes place, started with images in which the names of files scanned by artificial intelligence flowed on the facade, and continued with WDCH's technical drawings, plans, sections and system details reflected on the facades (Figure 47). This part, allegedly dreaming about WDCH's past, was followed by visual and audio footage of various audio files, followed by video tapes with all of LA Phil's work to date (Figure 48). Afterwards, sections of the important moments of the philharmonic orchestra were reflected in the form of videos and photographs on each facade of the WDCH structure (Figure 49).

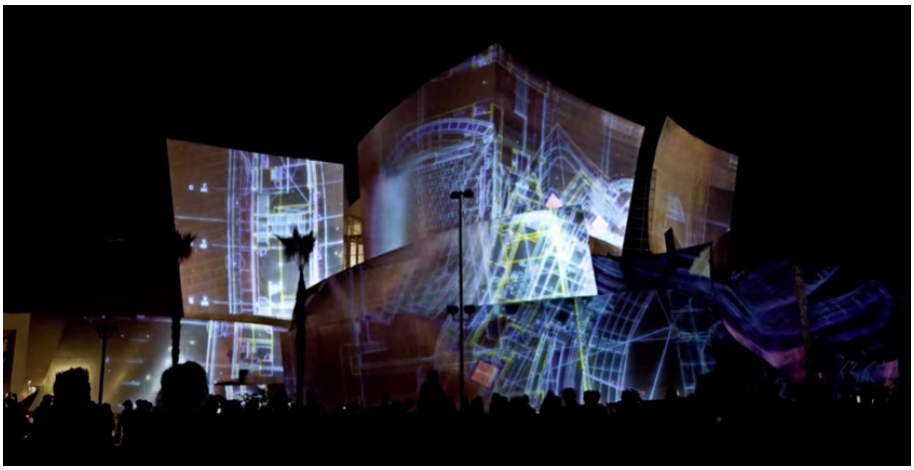


Figure 47: Visuals Based on the Architectural Drawings of the Building (URL47)

Figure 48: Visuals of the Audio Files (URL47)

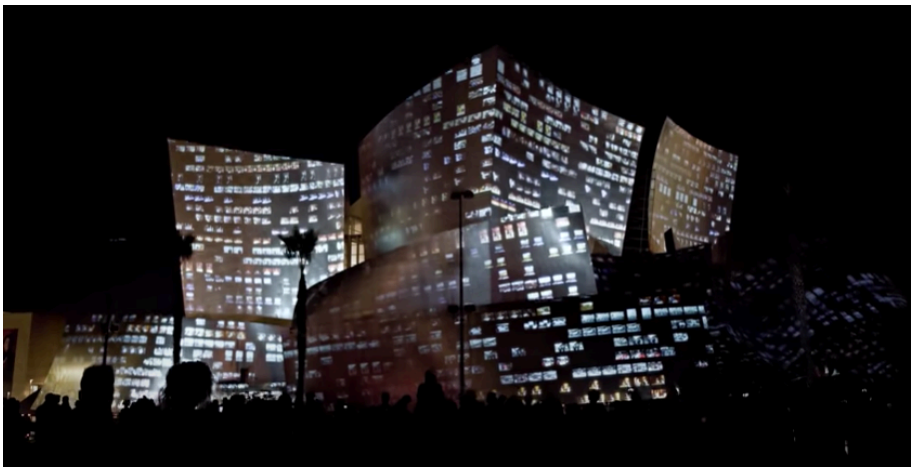


Figure 49: Images from the Archive of LA Phil (URL47)

The second part was screened under the name of consciousness. Illustration of data and mapping of the present is the main theme of the second part. The section that connects with the past and the present began with the projection of images and networks representing various data groups on the façade (Figure 50).

Figure 50: Consciousness Part of WDCH Dreams (URL47)

The third part is called Dream. In this section, which is defined as Imagination, Envisioning the Future, the structural system of the facade is reflected on the building (Figure 51) and the fluid visuals surrounding the structure have begun to form the facades of the building (Figure 52). With the transformation of the images analysed by various algorithms into image clouds, the facade has turned into a huge screen and a dreamlike transition has been achieved between LA Phil's work throughout its history (Figure 53). The flowing visuals with a time-travel-like history strip and flowing LA Phil on the facade changed in sync with the music and the performance ended.

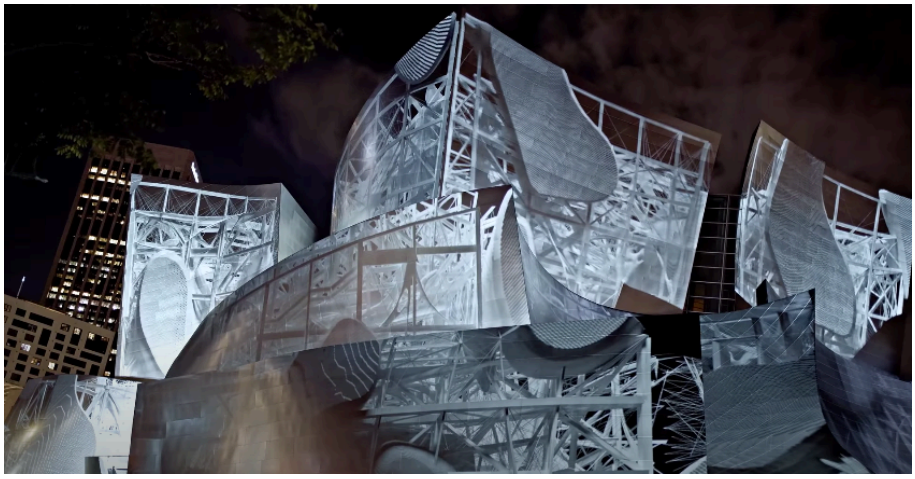


Figure 51: Visualization of the Structural System of WDCH (URL47)

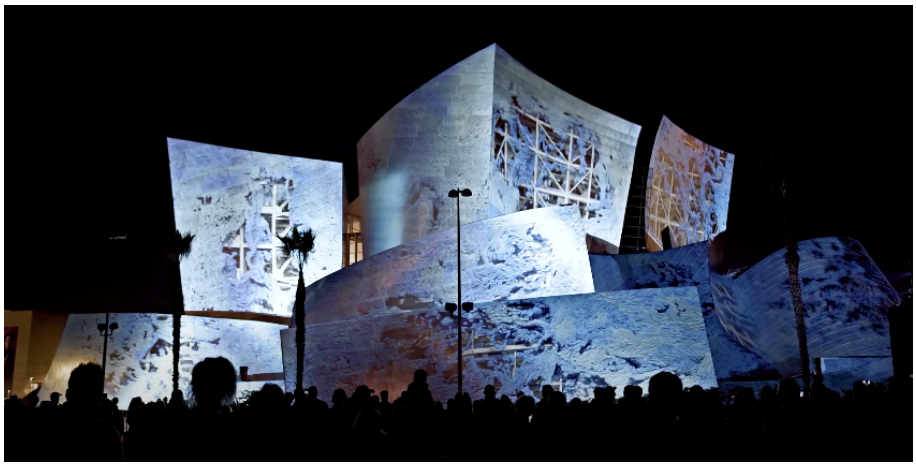


Figure 52: Fluids creates the Facade of the WDCH (URL47)

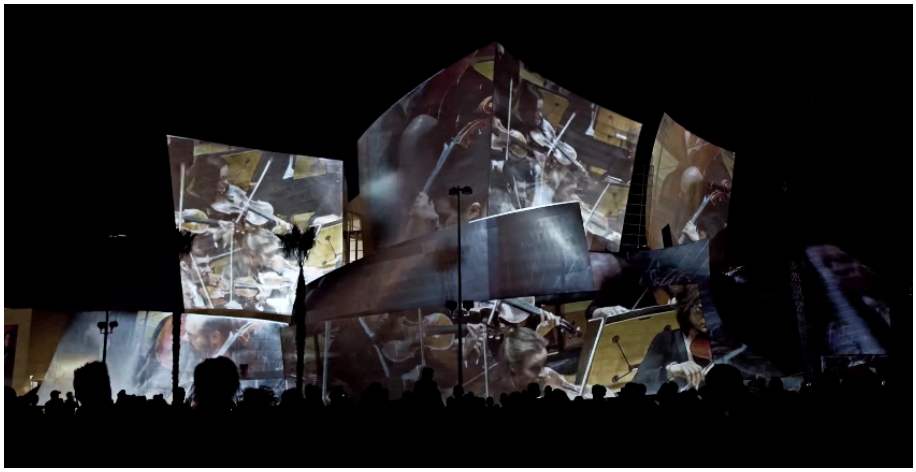


Figure 53: WDCH Dreams with the Algorithms (URL47)

In addition to the relationship established between architecture and digital arts, a connection has also been established between the performance art made and the architectural and institutional memory.

The form of the Walt Disney Concert Hall building is physically quite rigid, but the sculptural walls and the reflection on its surface help reshape the building. WDCH Dreams has transformed the building's surface into an area of both insignificance and uncertainty by offering temporal experiences through machine intelligence (Anadol, 2020).

In an interview, Anadol stated that public spaces are a very important space for him, answering the question asked Refik Anadol about the places he likes to work in with his digital art works. He stated that public spaces do not have a door or ceiling, have no beginning and no end, and at the same time being open and accessible to everyone at all times is effective in giving this answer.

In addition to the project realized on the façade of the building, a parallel interactive installation was created in the interior. This interactive installation at the Ira Gershwin Gallery inside the building offered one-to-one interaction between visitors and the philharmonic orchestra. In the virtual exhibition, all digital archives of LA Phil were brought to light in a nonlinear time frame. With the help of the interactive touch screens, visitors could interact with the archive and observe the important milestones, development and change in the 100-year-old story of the orchestra.

The one-week outdoor installation, and the digital installation that took place within the Ira Gershwin Gallery for a season, enabled LA Phil to be experienced by tens of thousands of new people and was an important step in moving the culture forward.

The integration of digital media arts with architecture creates the basis for the realization of many communicative functions in the change of the facade and in public spaces. Social contacts and identities have started to gain a new meaning with the newly formed "virtual public spaces". Architects and city planners have an important place in emphasizing the importance of combining this new concept of virtuality with the public interface (Anadol, 2020).

For the WDCH Dreams project, the intersection between the concepts of urban space, social media culture, technology and virtual public space plays an important role. This performance, experienced by hundreds of Los Angeles residents and visitors, has transformed the concept of gathering space into a social dimension that is not limited to physical limits. Considering the hundreds of shares shared with the #WDCHDreams tag on social media, it is questioned whether the structure can access and extract something from this data. It is a very important fact that social media gather individuals in a public virtual space and witness that they share their architectural experiences. The media and the public sphere, both of which can be considered virtual and physical today, contain different inputs for machine intelligence applied to architecture to understand and explain human behaviour and the ongoing social and technological changes in contemporary society.

To examine its relationship with public spaces, its needed to understand the point where the Walt Disney Concert Hall is located and where the project relates to public

spaces. Walt Disney Concert Hall is located on The Grand Avenue in Los Angeles, USA. (Figure 54). The Grand Avenue is one of the main thoroughfares linking north-south in Los Angeles. Museums, concert halls and theatres on The Grand Avenue attract millions of people every year. The Grand Avenue project, an initiative to restructure the Civic Centre district in downtown Los Angeles, was first officially funded by the Grand Avenue Committee in 2000, a 'public / private' partnership chaired by billionaire developer Eli Broad, with a $ 1.8 billion budget. The presented project consists of high-rise office buildings and apartments, boutique hotel, supermarket, cinema, bookstores and city park (Cowett, 2006).

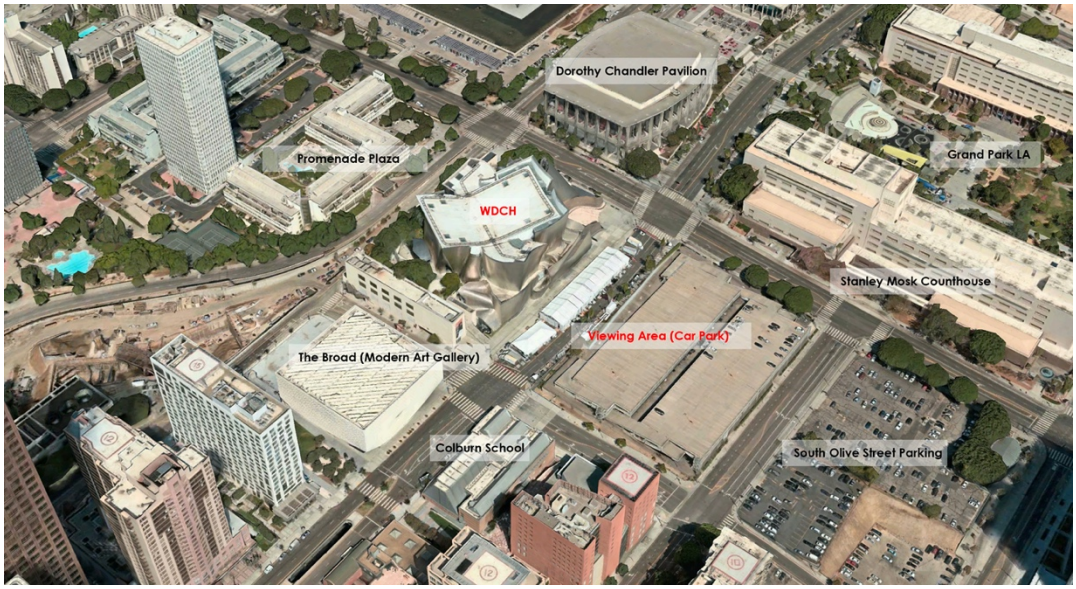


Figure 54: Location of Walt Disney Concert Hall (Author)

The projection mapping show was experienced by the visitors from the street where Walt Disney Concert Hall communicated and the car park located opposite (Figure 55). The performance, which took the relationship between the street and the building to another dimension, created an environment for the interaction of people who were not aware of the event and turned the street, which is defined as a public space, into a place of performance.

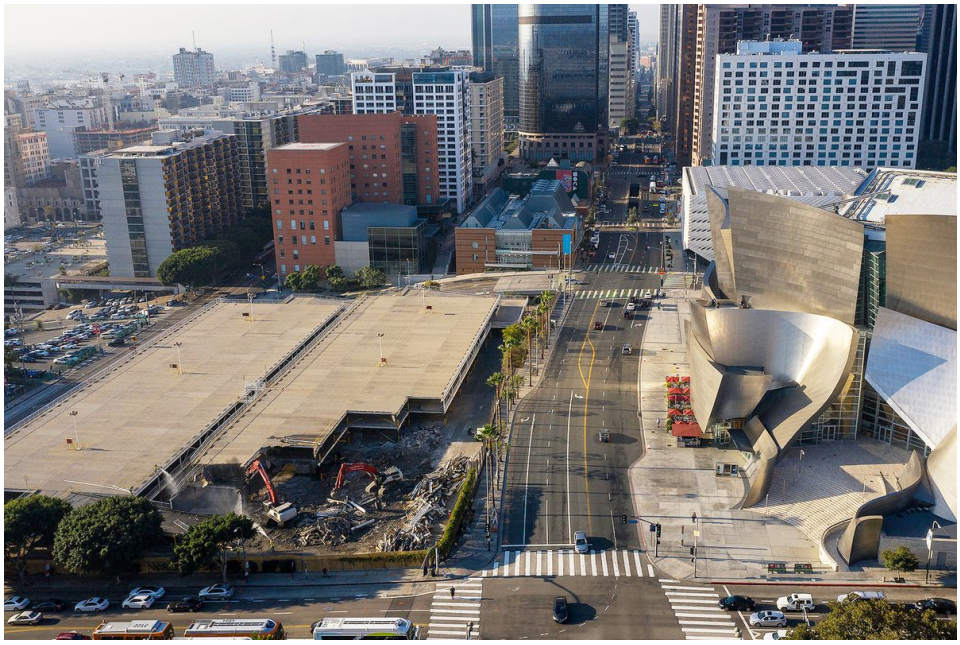


Figure 55: Walt Disney Concert Hall's Interaction with Street (URL48)

Figure 56: Street-Projection Mapping Interaction (URL49)

On this street, which we can consider as civic street due to the museum, concert halls and such functions it hosts, it has been observed that the relationship between visitors and public spaces and buildings can be differentiated by the method of projection mapping (Figure 56). Walt Disney Concert Hall, which has a sculptural structure, shared its performance experiences in its interior and a brief summary of its centuries-old works with its sculptural facades as a display. The projection mapping method, which allows different applications of the relationship between indoor and outdoor spaces, turns public spaces into a show centre, especially with such exhibitions, and adds an extra function to the spaces, and as a result of this function, provides the opportunity to interact between individuals.

5.2 Yekpare, Haydarpaşa Train Station, Nerdworking

5.2.1 Haydarpaşa Train Station

Haydarpasa Train Station located in Istanbul's Kadıköy district in Turkey, is the starting point of the Anatolian railways (Figure 57).

The construction process was started in September 1900 by the German firm Philip Holzman & Co. It was especially stated that those who will work in construction can only be engineers and science officers, and they must be of Ottoman nationality.

The building was designed by two German architects, Otto Ritter and Helmut Cuno. It was originally established on a 2525 m2 plot and today it is spread over an area of 3836 m2 with its closed parts (Erkan, 2004).

Figure 57: Haydarpaşa Train Station Facade (URL50)

In 1917, as the ammunition transported to the freight trains caught fire, a large part of the station was burned as a result of the fire in the station.

Although the sea front of the building is in Neo-Renaissance order, it also contains the formal elements of the baroque architectural style. With this setting, it is a typical 19th century station building with an eclectic style building on its facade overlooking the city and a platform section behind it. The building has an 'u' plan scheme with two branches of different lengths. On each floor of the five-storey building, there are rooms with high ceilings arranged around a corridor (Salman, 1994). There are plain rectangular windows on the north facade facing the courtyard where the platforms are located. On the roof, roof rooms opening to the facade are designed. A clock and an eagle crest can be seen on the area in the middle. The eagle, which is the symbol of German railways, was also used as a symbol of Turkish railways (Koçer, 1995).

As a result of the fire on 28 November 2010, the roof of the station collapsed and the 4th floor became unusable. Within the scope of the Ankara-Istanbul High Speed Train

project, the station, which was partially closed on February 1, 2012 due to railway works, was completely closed on 19 June 2013.

5.2.2 Yekpare

The Yekpare project is a digital exhibition of the city of Istanbul with its rich history, geography, aesthetics, social and political structures. Project has done for the European Capital of Culture in 2010, and project also known as the largest projection mapping show held in Turkey. Yekpare is a visual storytelling of Istanbul's 8500-year history.

The project titled "Spring at Haydarpaşa Train Station" is one of the main projects of Istanbul 2010 European Capital of Culture Agency Stage and Performing Arts Directorate which includes the Yekpare project. Yekpare was designed for this purpose by the studio called Nerdworking. Nerdworking is a studio founded in 2009 that carries out artistic, commercial, experimental and interactive digital media works in public spaces. There are architects, designers, computer artists, software developers and engineers within Nerdworking, where an interdisciplinary working style is exhibited.

Haydarpaşa Train Station, one of the most important structures of the Istanbul skyline, has been the main subject of many stories and novels. Station has always been a source of inspiration in various fields such as theatre, cinema and other visual arts branches, as it is a mirror of Istanbul's social structure that has changed with intense immigration (Figure 58) (Ekim, 2011).

Figure 58: People Watching Yekpare Performance(URL51)

The Yekpare project, which centres the multiculturalism, history, religion, art and immigration of Istanbul as a theme, takes its name from the monolithic stance of Istanbul among all these diversities. With Yekpare, Haydarpaşa Station has hosted a dramatic visual Istanbul journey that can be watched from the Kadıköy coastline (Figure 59).

At the beginning of the installation, which was shown on the same day with the 47th anniversary of the famous Turkish poet Nazım Hikmet Ran's death, the poet's verses referring to Haydarpaşa in his work titled 'Human Scenes from My Country' are heard (Ekim, 2011).

“At Haydarpaşa Train Station, in the spring of 1941, it is three o’clock. Sun, exhaustion and rush lay on the stairs.”

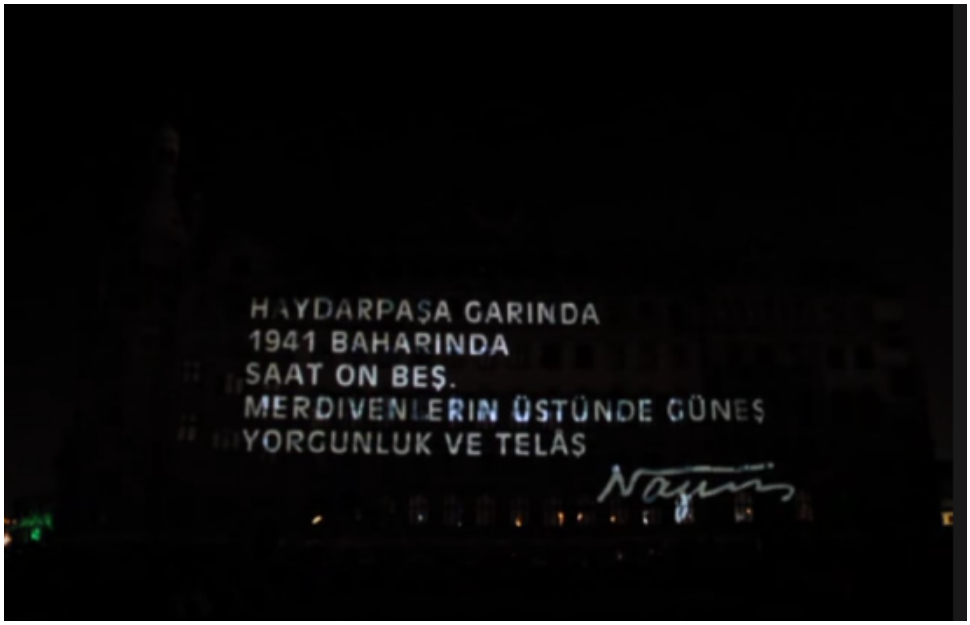


Figure 59: Quote from Nazım Hikmet Reflected on the Facade (URL52)

The opening sequence, which begins with Nazım Hikmet's lines, is followed by the visual sequence that depicts the sunrise and highlights the architectural features of Haydarpaşa Station (Figure 60). The sun represents the proximity of east and west. Istanbul is the only city where east and west meet on the Bosphorus. In a sense, this is depicted as a reflection of the sun rising in Anatolia. The sun rising from the east set in the west The opening sequence, accompanied by a mystical background music, was supported by light and shadow plays (Ekim, 2011).


Figure 60: Sun reflections on the Facade (URL52)

The opening scene was followed by images depicting the diverse cultural structure of Istanbul, which has hosted different cultures throughout the ages. The windows and openings on the facade of Haydarpaşa station have transformed into coloured glasses with stained glass (Figure 61). Religious diversity in Istanbul has also been at the forefront (Figure 62). The stage, supported by sounds that reflect the diversity of religions, continued with the reflection of the art of calligraphy on the façade and the sound of Turkish traditional instruments is heard as the background music (Figure 63).

Figure 61: Transformation of Windows into Colored Glasses (URL52)

Figure 62: Stained Glasses on the Facade (URL52)

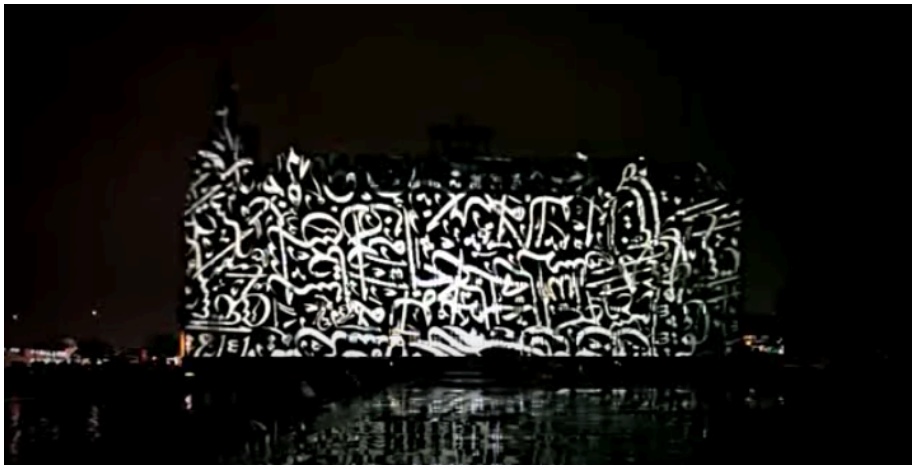


Figure 63: Calligraphy Figures on the Facade (URL52)

In the third scene, a virtual demonstration of the art of marbling, which has an important place in the Ottoman Empire, is reflected on the facade, independent of the Haydarpaşa Train Station façade (Figure 64). The colours reflected in the sea in front of it as well as the building, which is the reflection surface, can be interpreted as a digital application of marbling art (Ekim, 2011).

Figure 64: Marbling Art Reflected on the Facade (URL52)

Later on, the façade of the Haydarpaşa train station took the form of a railroad in order to establish a relationship with its existing function, and the train passing through the top floor of the building greeted the people (Figure 65). The openings on the façade

turned into moving trains, and the train started to move with the sound effect. The façade of the building was illuminated in parts and various deformations were observed in the building with an emphasis on migration.

Figure 65: Railroad Interpretation on the Facade (URL52)

In the 1950s, the increase of immigration from various countries and cities to Istanbul continued to be emphasized by reflecting the silhouettes of different people on the openings in the following scenes (Figure 66). In this scene, Istanbul's street sounds, traffic sounds and human voices are used as background (Ekim, 2011).

Figure 66: Human Silhouettes on the Windows of Haydarpaşa Train Station (URL52)

In the following scenes, the information networks created by technology and communication and the networks established between the windows on the façade were harmonized. Throughout this stage, the voices of modems connecting to the Internet and the digital voices of other technological equipment were used as infrastructure (Figure 67).

Figure 67: Interpretation of Communication Networks (URL52)

In the last scene, the solid facade of the Haydarpaşa train station gradually erased itself, only the white reflections on the windows remained constant. Then the tower on the left side of the façade started to rotate with ethnic music, referring to the whirling dervish. While the rotation movement started, all the lights on the facade were extinguished, only the lighting was applied to the tower (Figure 68).

Figure 68: Final Scene of Yekpare (URL52)

Yekpare performance includes several different styles in classification according to the form of projection mapping studies. The first is to protecting the facade and to illuminating the main lines and architectural elements. This style was used especially in scenes which includes the formation of stained glass and in the appearance of human silhouettes on the windows. Elements of the architectural facade are the main elements of the projection mapping scene, and a bridge between virtual and reality has been established.

Another noteworthy element is the demolition of architectural elements and their reshaping with different functions. Especially, the train scene and the rotation of the tower like whirling dervishes show that the architecture is broken virtually and has a new form and function.

Yekpare also includes the reflection of the building and independent designs on the building. Especially the scenes with marbling art and calligraphy are examples of

independent design. Although they interact with the city geographically, it is difficult to say a relationship with the structure.

Discussed with all this data, the Yekpare projection mapping study has a mixed use, given the format-specific categorization.

When we consider them as public spaces with whom there is a relationship; Haydarpaşa Train Station, where the Yekpare project was projected, met with the audience on the Kadıköy coastline on the opposite side (Figure 69).

Figure 69: Haydarpaşa Train Station's Interaction with Kadıköy Coastline (Author)

The square and the shoreline defined by the Kadıköy Pier, which is one of the important points for sea transportation in Istanbul, have been the points to monitor the exhibited performance throughout the projection mapping performance. Kadıköy Square has a heavy duty as a square due to its central location in terms of trade and

transportation of the Anatolian Side of Istanbul. Due to the relation of Kadıköy Pier with the square, it is called the pier square. It is not only a city square, but also a transit place for people who want to go to different parts of the city, due to the fact that many main transportation axes are knotted, it has transfer centers belonging to both land and sea transportation types, and its proximity to the railway terminal point.

Due to its use for transportation and various functions around it, the area is used intensely during the day and the social, cultural and recreational functions that should be in urban squares are pushed to the background (Kılıç A. , 2001).

When the Kadıköy Square is evaluated in terms of form, although it is a natural limiter like the sea, it does not have a sense of closedness due to the irregular layout of its surroundings. Although there are structures that are both functional and physically valuable, such as the Haldun Taner Theater, the State Conservatory, the Town Hall and the old pier building, neither the square nor the spatial elements could be gathered around a specific centre and could not be associated with its surroundings. Kadıköy Square is an amorphous square in terms of form, with square features that are not completely surrounded or formed under the rule of a building (Kılıç A. , 2001).

Since the Kadıköy square lost its characteristic of being a public place where people come together and communicate, it has become difficult for the individuals who come to the place to perceive their environment as a whole. While the buildings rich in architectural and aesthetic value such as the town hall in the square and its surroundings, the old pier building, the theater building and the train station building in Haydarpaşa provide a visual harmony among themselves, they are shadowed and disrupted the visual harmony due to the functions integrated into the square (Kılıç A.

, 2001). In this sense, the projection mapping study carried out on Haydarpaşa Train Station is an example of the use of public spaces in terms of social and cultural activities, as it transforms the Kadıköy square into a platform to monitor the activity.

Yekpare has an important place for the public space-projection mapping relationship. Establishing a relationship with an overseas square, Yekpare is a proof that public spaces can host the projection mapping method as long as the structures around them are visually perceptible without being far or near.

5.3 Interconnection, Palace of the Parliament, Limelight

5.3.1 Palace of the Parliament

Palace of the Parliament (The House of the People) is one of the most important examples that architecture is used as a political power and can be given as an answer to the relationship between architecture and politics.

In 1977, after the earthquake that caused a significant destruction in Bucharest, Nicolae Ceauşescu started to reconstruct the city. For the president, it is of great importance that the restructuring of the city is monumental. For the structure intended to be the harbinger of the new leadership, Ceauşescu (1992) said the following words; “I am looking for a symbolic representation of the two decades of enlightenment we have just lived through”. Bucharest's opportunity for reconstruction provided the opportunity to create a truly socialist city with an imposing architectural backdrop designed to impress visitors. The modernization of Bucharest was of great importance in shaping cities and spaces and shaping society (Light, 2001).

Palace of the Parliament is known as the second largest building in the world after the Pentagon. The construction of the building started in 1984 and a team of 700 architects

took part in the design, accompanied by 28 years old chief architect Anca Petrescu. Ceauşescu's tendency was to gather all the main organs of the state in a single building on the one hand, and on the other to want a structure that could withstand a seismic risk and even a nuclear attack. The first part of the building, which consists of 3 main categories, are main halls, galleries and cabinets. In the second part, there are offices and the third part - the belvedere, has 3 rooms on each floor. It entered the Guinness Book of Records as the world's largest administrative building with a surface area of 365,000 square meters. Considering its size, it is the heaviest and most expensive building in the world

During the revolution that started in 1989, only 60% of the building was completed. The construction works, which continued between 1992-1996, have continued until today. Materials found in Romania were used in its construction. Palace of the Parliament (Figure 70) is now known as one of Bucharest's most tourist attractions (Stancioiu & Teodorescu, 2011).

Figure 70: Main Facade of the Palace of the Parliament (URL53)

5.3.2 Interconnection

The projection mapping installation called Interconnection is a performance that won the Jury's Choice and People's Choice awards of the projection mapping competition named iMapp, which was held in Bucharest, Romania in 2016 and used Palace of the Parliament as a projection surface.

iMapp, Bucharest is known as one of the largest projection mapping competitions in the world. The projection works made on the facade of the Palace of the Parliament building of 23,000 square meters welcomes over 300,000 visitors every year. The iMapp competitions, which are like a festival, are open to the participation of local and foreign artists, and during the competition, public concerts, art performances and shows are held in various squares of the city. Organized by Bucharest City Hall, the event is one of the most important events in Bucharest. At the 2016 event, the group named Limelight from Hungary won both awards for the projection matching study called Interconnection.

Interconnection is a project that focuses on interconnected concepts such as the outer and inner universe at micro and macro scale. The connection of logic and emotion, the connection of the individual and society, the connection of art and the audience, the connection of the planet and the galaxy, as well as the connection of architecture and animation are among the main themes of Interconnection. It argues that even when individuals generally lose their connection with the big picture, all individuals are cosmically connected to the existing network.

The installation work was done by the studio Limelight in Budapest, Hungary. Limelight is a studio that carries out world-famous projection mapping and light

installations. Its installations have been exhibited in many world famous light festivals, and has been dealing with projection mapping, light shows, 3D and 2D animation works for more than 20 years. And at the same time, it trains future digital media designers with the Limelight Academy they created.

The project is defined as a cinematic journey of dialogue with internal and external. The aim of the projection mapping study utilizing physics, chemistry, geometry, architecture and art is to transform the Palace of Parliament into a digital art scene with infinite beauty. The integration of the architectural structures of the facade into the project has been defined as the most important element for the artists. With the help of this relationship, the performance was able to establish a relationship with the audience.

The opening scene of the performance, which is exhibited in 5 minutes, is the demonstration of the connection to the brain located at the centre of the building, where the architectural elements of the building are emphasized and a network is established between the facades.

The opening scene of the performance, which is exhibited in 5 minutes, is the demonstration of the connection to the brain located at the center of the building, where the architectural elements of the building are emphasized and a network is established between the facades (Figure 71).

Figure 71: Opening Scene of the Performance (URL54)

Later, the physical properties of the building deteriorate and different parts turn into modules. In order to create a single-point perspective perception, the lines and inward extensions of the building are highlighted with white lines (Figure 72).

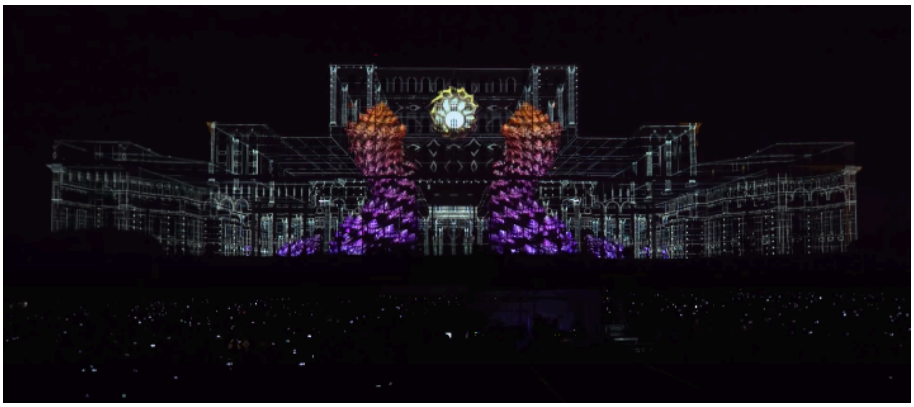


Figure 72: Outlines of the Building are Highlighted (URL54)

The organic forms located in the upper centre of the facade represent micro and macro level connections. Human heads that appear at the same point and are divided into two, open to the right and left, forming flowers and wheels. The visual reference made can be interpreted as different people in artistic and mathematical consciousness (Figure 73).

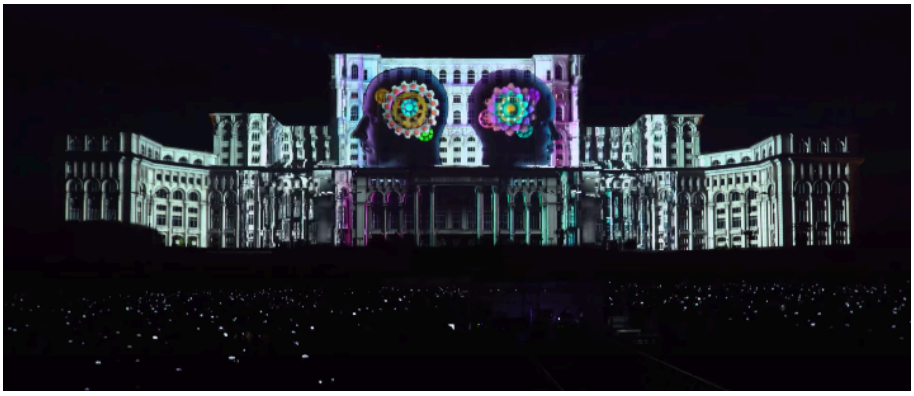


Figure 73: Appearance of Human Figures (URL54)

Continuing with the positioning of people on the right and left ends of the facade, the performance continues with sequences in which architectural features come to the fore.

The brain appearing in the upper centre has been replaced by the heart, and the wings on the right and left arms of the front are depicted as lungs. With the help of the images that connect the heart, a relationship with the heart was established, heartbeat and circulatory system were imitated (Figure 74).

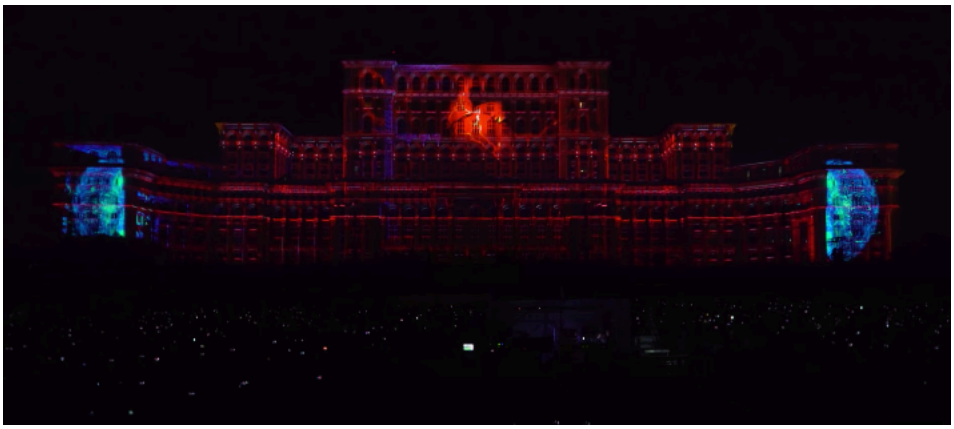


Figure 74: Representation of Heart and Lungs Connected to the Building (URL54)

The performance ended with the changing of the human figure and the architectural identity and colours of the facade that appeared at the end of the performance (Figure 75).

Figure 75: Closing Scene of the Interconnection (URL54)

When the relationship between projection mapping and façade is examined, several different styles are seen. Especially the approach that emphasizes the contours and architectural elements of the building, manifested itself in the opening of many scenes. Especially highlighting the architectural lines that make up the main structure of each scene helped to read the perspective perception of the façade by the audience at night.

At the same time, independent designs have been reflected on different parts of the façade, providing a visual consistency among themselves, even if it is not related to the context. Independent designs have found a position on the building according to the functions they carry, considering the architectural facade setup. For example, in the heart and lung scene, the human body is associated with the architectural structure and the location of the heart and lungs according to the system in the body is located on the structure.

Projection mapping performances made to the Palace of the Parliament can be viewed from Constitution Square, one of the largest squares in Bucharest, right across the building. Constitution square is one of the biggest squares in Bucharest. Square designed with the reconstruction of the city (Figure 76). The square is connected via

Unity Boulevard to Unification Square which is another square of the city. Constitution Square, which has an important place for city activities, has hosted various cultural and social activities such as concerts, street arts, performances, festivals over the years.

Figure 76: Location of Palace of the Parliament (Author)

In terms of classification, Constitution Square defined as a dominated square due to the relationship of the Palace of the Parliament with the square and the direction of the square to this building. Rather than being an undefined square like in the example of Yekpare, this square, which is defined with precise lines and given its direction to the building, has become a place where the performance can be watched by using the facade as a screen and transforming it into a display area. At the same time, with the linear form of Unirii Boulevard and its feature of connecting the two squares, visual communication was established on the main axis, and the event was reflected in the Unification Square which is located away from the building. The square, which accommodates a large number of people due to its large surface area, strengthens the

relationship that individuals establish with the building and the square with the feeling of closure (Figure 77).

Figure 77: People at the iMapp Festival (URL55)

Projection mapping method enables social interactions and gatherings in squares. Events such as The iMapp festival, which has an important place in the recognition of the city and in terms of tourism, is a successful example to ensure the active use of the square. With the projection mapping performances made especially in buildings close to public squares, an alternative scenario for night use of the spaces is produced and implemented. These kinds of studies, which succeed in keeping the city alive at night, will be realized on a larger scale with the advancement of digital technologies.

5.4 Results and Findings

When the projection mapping studies exhibited at different points around the world were examined, it was seen that the projects emerged as a result of a multidisciplinary

understanding. This contemporary approach, which includes more than one of the digital arts branches, can come out as a result of the collaboration of experts in every field. Especially, in the project named WDCH Dreams, the creation of the visuals through artificial intelligence and machine learning reveals the relationship between software art and visual arts. The classification of the analysed projection mapping performances in terms of digital art categories is as follows (Table 3).

Table 5: Classification of Examples Accordingly to the Digital Art Categories (Author)

Projection Mapping Name	Digital Installation	Film, Video and Animation	Internet and Network Art	Software Art	Virtual Reality	Sound and Music
WDCH Dreams	x	x	x	x		x
Yekpare	x	x				x
Interconnection	x	x				x

Performances can be in many different areas. WDCH Dreams, one of the performances examined, is a specially prepared work for the 100th show of the LA Phillarmonic Orchestra, and the installation titled Yekpare is a project designed to promote the history of the city within the scope of Istanbul's Culture Capital. Interconnection is designed to be shown at the projection mapping festival called iMapp. Studies for three different purposes are actually based on one main logic. To interact with the audience in public spaces by using the physical environment, especially the architectural facade, as a reflection surface. All categories aim to communicate with the city and individuals

on an urban scale. The classification of the analyzed performances in terms of type is as follows (Table 4).

Table 6: Classification of Examples Accordingly to the Types (Author)

Projection Mapping Name	Festival	Exhibition	Performing Arts	Advertisement
WDCH Dreams				x
Yekpare		x		
Interconnection	x			

When examined studies are evaluated in terms of public art, their continuity, expression styles, techniques and types of public art they contain come to the fore.

The examined performances are designed for temporarily in terms of continuity. WDCH Dreams met with the audience for a period of one week. Yekpare was staged for 3 days. Interconnection work met with the audience during the festival as it is within the scope of the festival and competition. In terms of expression, performances generally have abstract contents. Although WDCH Dreams feeds on concrete data (the orchestra's photo, video and sound archive), the final product created is more abstract than the original form of the data. Yekpare project made the whirling dervish figure by abstracting the architectural element rather than using a real whirling dervish. At the same time, instead of using a real train, Yekpare project wanted to capture this effect with the movements created by the different floors of the building in the horizontal plane. At the other hand, Interconnection installation is made by abstracting

micro- and macro-scale organisms. When evaluated technically, the use of modern techniques can be seen, as they are studies conducted with the help of digital technologies (Table 5).

Table 7: Classification of Examples Accordingly to the Public Art Features (Author)

Projection Mapping Name	Continuity		Expression Style		Technique	
	Permanent	Temporarily	Concrete	Abstract	Traditional	Contemporary
WDCH Dreams		x		x		x
Yekpare		x		x		x
Interconnection		x		x		x

When compared in terms of the types of public art they contain, a multidisciplinary approach is seen, as in the first comparison. All three works virtually paint the facades of buildings using the art of installation. As a result of this digital painting process, public space exhibitions are produced where physical space and virtual space are together, accessible from public spaces, free to participate and experience. And all of these works are actually a performance in itself. Table 6 shows the all the examples they have similar sub branches as public art categories such as installation, surface painting, public exhibition and performance.

Table 8: Classification of Examples Accordingly to the Public Art Categories (Author)

Projection Mapping Name	Installation	Surface Painting	Urban Furnitures	Public Exhibitions	Performances	Game
WDCH Dreams	x	x		x	x	
Yekpare	x	x		x	x	
Interconnection	x	x		x	x	

When viewed in terms of the public spaces interacted with, the performances can be watched by the individuals in the squares and streets around them (Table 7).

WDCH Dreams has been reflected in the WDCH Building, which has a location with many museums, galleries, theatres, and a Civic Street feature. In the immediate vicinity of the building, people watched the show from the area currently used as a parking lot and from the surrounding sidewalks. Yekpare was watched by people from Kadıköy Square, which is located on the opposite side of Haydarpaşa Train Station, which is not fully defined and has an amorphous form. The Yekpare project, which is a very different example, has succeeded to include individuals in the performance even the projected building is distant. There is a completely different situation with interconnection performance. Interconnection established a relationship with the well-defined Constitution Square located in front of the Palace of the Parliament. The fact that the square hosts social and cultural events enabled the event to reach large audiences. The square is described as a dominated square.

Table 9: Projection Mapping and Public Space Relation (Author)

Projection Mapping Name	Location	Building Function	Interacting Public Spaces	Public Space Types
WDCH Dreams	Walt Disney Concert Hall, Los Angeles, USA	Concert Hall	The Grand Avenue Streets	Civic Street
Yekpare	Haydarpaşa Train Station, Istanbul, Turkey	Train Station	Kadıköy Square & Coastline	Amorphous Square
Interconnection	The Palace of the Parliament, Bucharest, Romania	Governmental Building	Constitution Square	Dominated Square

The contents of the works can be a historical narrative of the structure and the context in which the building is located, as well as in a narrative that is directly related to the building, reflecting the interior space to the exterior, and giving clues about the architecture of the building. At the same time, we come across narratives independent of structure and context. Projection mapping examples, which have three different contents, take place in three different locations and are related to three different architectural structures, will continue to appear with very different purposes and contents in the future, with the imagination of the artists who are the main point of creation. In this context, the innovations brought by architecture and digital arts will be a source of inspiration for artists working on projection mapping, and the spatial transformations of public spaces will be taken to different dimensions.

Chapter 6

CONCLUSION

Architecture and art have always been intertwined. Digital Art, which can be considered as a result of the recent technological developments, has brought many new application branches together. With the effect of the digital revolution and developing computer technologies, designers and artists aim to make the work a striking and interactive contemporary art type by including not only known materials but also elements such as sound, light and movement in the production of art. Projection Mapping, which is accepted as one of these branches, has been an indicator of what architecture and digital art can offer us, especially if it is done on architectural facades in public spaces. Public spaces are places that enable individuals to socialize in the city and must be supported by cultural and social activities. Projection mapping prepares an environment where individuals can interact without the need for extra physical placements by presenting an identity different from the existing identity of the public space, especially in front of the facade it uses as a reflection surface.

Starting with the historical process and definition of the projection mapping technique, the study gives clues about the past, present and future of projection mapping. The journey, which started with the illumination of human busts in Disneyland, has now reached the point where structures allowed to dream by using artificial intelligence, with projects such as WDCH Dreams.

Projection mapping method offers users a new perspective and experience with its use in the architectural field. As seen in the examples in the architectural field, it can be used to emphasize the structural system of an architectural project or to give information about its history. Projection mapping method, besides being used for information purposes, can also be used to make a difference in the city skyline at different times of the day by making architectural projects a part of light and sound shows. The projection mapping method will continue to be used as an element that improves the virtual reality and augmented reality phenomenon in architecture and will open up new areas of use.

The new themes created by projection mapping applications in architecture and public spaces and their contributions to architecture can be explained as follows:

1) The use of projections, which we usually encounter in offices, schools, cinema or staged arts, for a wide variety of purposes in public spaces such as streets and squares as a result of their relationship with architecture.

2) To present a new hybrid space experience to the audience by combining the physical and virtual environment with new methods created by the advancement of technology, which were difficult to do in the past.

3) Underlining that architectural elements can serve as screens by themselves, by moving the interior to the exterior, providing information about the building and its immediate surroundings, and sometimes acting as screens for displays consisting of completely independent content.

In this study, it is envisaged to examine the possibilities that emerge as a result of the original interpretation, source and new information in the field of digital art, which is a very new understanding, overlapping with architecture. In this study, the contents of

current projection mapping examples as artworks in the relevant field and their relations with architecture and public spaces are examined. It is true that projection mapping works can be performed with expensive productions in a commercial sector such as advertising and entertainment. However, as can be seen from the works of many artists in today's art environment, art and science festivals, tools and software offer a platform ready to transform the public space and create the necessary infrastructures in terms of functionality.

Projection mapping studies go beyond the exhibition methods of art gallery or classical museum understanding. In this way, new spaces are emerging where individuals can interact with this virtual environment. The concepts of house, architecture, architecture and virtual reality, which are among the most emphasized topics in academic studies, offer us the conclusion that space as a work can be transformed into art and that the audience can not only watch but also interact. These results show us that art has evolved into an interdisciplinary nature and is more intertwined with other sciences than ever before, rather than being considered as a classical movement based solely on art history. Because the way digital art is formed has been shaped by theories, information and theories coming from more than one discipline, not individually.

With projection mapping which includes interactive and impressive visual narratives, individuals find themselves in these narratives and establish a relationship that feeds from virtuality with the physical world during their interaction. The important thing in this interaction is that, in terms of public space, architecture and art, art can be taken out of museums and galleries and be included in the society more. The sudden appearance of artistic productions in front of individuals is very important in urban dynamics, as art can be carried to streets, streets, squares and parks within the city.

This importance is an element of consciousness and an interactive dialogue beyond the one-sided dialogues created in spaces limited to the audience of public art. The identity of a city cannot be considered or evaluated separately from the images that make up the city. As a public space, the fact that squares and streets are a part of the social fiction offers an understanding that eliminates public borders in a sense. The aesthetic spaces created in public urban areas not only offer a quality life to the city user, but also assume a unifying function for individuals.

Technologies that will carry public spaces to different dimensions in the future are emerging day by day. Projection mapping is just one of these examples that interact with public space, architecture and digital art. It is a matter of curiosity what kind of innovations digital art will bring to our lives in the future as a result of working with different disciplines. Therefore, architects, urban designers, urban planners should consider and debate the existence of digital arts as a new input in the design of future public spaces.

Since the world is struggling with the COVID-19 pandemic crisis at the moment and physical distancing and regulated usages of public spaces to protect public health are the new global reality, projection mapping could be a possible tool to allow social interactions. As projection mapping enables indoor activities to be carried out visually, many indoor activities will be transferred to outdoor spaces in the future, besides remaining behind closed spaces. These events, which can be experienced from public spaces, will meet with the audience from different parts of the cities, even if they are not physically close to the building and space where the event is held, as in the case of Haydarpaşa. Furthermore, in the post-covid era projection mapping will be an important means to reduce the risk of contamination of similar outbreaks by spreading

the activities to be carried out indoors while maintaining the social distance.The use of public and open spaces by individuals, by taking appropriate precautions, will allow the activities to go beyond the boundaries of the building and will allow the buildings not only to be built as a definition of the interior, but also the immediate surroundings.

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