

PROJECTION MAPPING METHOD IN ADVERTISING DESIGN

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ABSTRACT

Projection mapping is a projection technique used in video or interactive installations to project on irregularly shaped objects, adapting to their unique structure. The projection mapping technique dates back to the late 1960s, where it was mostly used for special film effects and film studio amusement parks. This technique was academically recognized in 1990 by the Office of the Future research experiment. Since then, projection mapping techniques have gained popularity and thus available programs have been created. Over the last decade, it has become extremely widespread around the world, especially in technologically advanced countries, with a tendency to advertise a product in a large format. This is a promising technology that can have a major impact on non-computer technology or design industries. Such as museums, libraries, universities, and various historical sites that want to get modern opportunities to present their specifics, services, and many other informative aspects. In this way, the public is offered to get acquainted with the offers in an attractive and interactive way.

The aim of the article is to determine the evaluation criteria of the developed digital products by studying the essence of the projection mapping method, its use in advertising design.

Research methods: theoretical – research and analysis of literature and Internet resources; empirical – expert interviews, analysis of analogues. Within the framework of the research, the following evaluation criteria were developed for the evaluation of projection mapping installations: Adequacy of the used method; Uniqueness of the content; Adequacy of the use of the programs; Cyclicity; Location of the projection. The criteria can be used by professionals as well as anyone interested in developing an original digital installation design.

Keywords: *Projection mapping, advertising, graphical design, installation, analogues*

Introduction

Projection mapping is a projection technique allowing to transform almost any surface or object into a 3D experience (Vos, 2003). This technique has evolved into an innovative marketing tool, which transforms everyday items and objects into animated works of art. Such objects may be complex industrial landscapes, for example, buildings, small indoor

objects or entertainment stages. This effect is obtained using a specialised software, where a two-dimensional or spatial object is drawn (mapped) spatially in a virtual program mimicking the real environment, on which the chosen graphic and/or animation is to be projected (Maniello, 2018). Although this technique becomes increasingly popular with viewers, the entire process requires substantial efforts by designers, engineers and other qualified professionals in the field of multimedia.

This technology can be seen used more on the facades of buildings or in public spaces using digitised animation of a work of art.

Due to the Covid-19 pandemic, in many parts of the world restrictions were introduced, preventing participation in events that included mass gatherings. This allowed artists to seek for new ways to attract a large audience and not to violate the established laws. Including public entertainment more frequently to promote an event, new approaches to projection mapping are used. Solutions are being sought to create a unique viewer experience. Moreover, this method is becoming popular in the advertising design development, creating a more impressive interaction of audience with the desired product or service. Advertising design can gain multiple benefits from the use of projection mapping, yet a professional approach is required for cooperation with the representatives of various spheres.

Methodology

The aim of the article is to determine the evaluation criteria of the developed digital products by studying the essence of the projection mapping method, its use in advertising design. Research methods: theoretical – research and analysis of literature and Internet resources; empirical – expert interviews, analysis of analogues.

Within the framework of the study, expert interviews were conducted, the professional activity of which is related to the use of projection mapping installations in various advertising and other public events. The research is related to the development of the advertising installation for Rezekne Academy of Technologies for various events, therefore, the opinion of each chosen expert, whose activity is related to the creation and projection of light installations in different environments, is significant.

The survey was carried out from June to August 2021 applying a structured interview method. An invitation to participate in the survey and answer the questions drawn up by the authors was sent by email to five world's leading companies, whose works can be viewed at several international biennials and public events and competitions inviting professional authors of projection mapping installations. The answers to the interview questions were received from two experts. The interview consisted of seven

open-ended questions. The objective pursued by the authors was to clarify the creative process stages and possible complications, as well as the experts' opinion on the use of projection mapping in advertising installations.

Theoretical review

Projection mapping, like video mapping and augmented reality, is a projection technique (Maniello, 2015) used to transform objects of irregular shape into the projection display surface for various animations, videos or interactive installations. Such objects may be complex industrial landscapes, for example, buildings, small indoor objects or theatre stages. These surfaces become canvas when the graphics are projected on them, playing with the surface shape, structure and texture, creating a pleasant experience of light and illusion. Using specialised software, a two-dimensional or three-dimensional object is displayed spatially on a virtual program that mimics the real environment on which the chosen animation or video is to be projected. The object is mapped, structurally marking the edges of each object, creating separate areas where each required element is displayed with special tools, creating active planes in which to place the appropriate media. The software can interact with the projector or projectors to place any desired image, video, or animation on the object surface, covering every area of the object as dense as possible. This technique is used by both artists and advertisers, who can add additional dimensions, optical illusions and motion to previously static objects, creating additional effects.

In recent years, this technique has been widely used in the context of cultural heritage, as it is an excellent entertainment and educational tool due to the combined use of digital drama (Maniello, 2018). These types of advanced technology tools solve the issues of public gathering and contribute to reducing access barriers, allowing a larger audience to be entertained and/or informed.

Projection mapping technologies are increasingly used in:

- **Concerts and public events** – projection mapping allows the organizers to achieve extra power of attraction for gathering and entertaining people, creating unforgettable moments;
- **Museums** – as an auxiliary aid in unique digital and animated traditional art exhibitions, using large-scale objects as screens or entwining specific figures with elements of artwork;
- **Theme parks** – attract visitors with interactive adventures and added exciting experiences;
- **Cities** – projection mapping installations attract tourists. Light installations on iconic objects encourage inhabitants and guests of the city to rediscover the historical and popular objects of the environment.

The growing use of projection mapping technology in media activities around the world is one of the key factors driving the projection mapping market. The increase in demand for the technology is determined by the effectiveness of its use, for example, portability, flexibility, the use of unlimited visual effects and adaptability to any projection surface. The projection mapping market is also affected by the investment growth in product advertising and the availability of various 2-dimensional, 3-dimensional and 4-dimensional options. This technology can be used continuously for hours, so it is widely used in major sports events and in cinemas, which increases their demand. Moreover, the increasing implementation of projection mapping in many sectors and high customer satisfaction with the product has a positive effect on the projection mapping market (Market, 2021).

Recent studies confirm successful merging of real and virtual elements into a single composition. Combining projection mapping with video processing and computer graphics, an extensive supplement to real objects is offered, creating a link between the virtual and the real (Wojciechowski et al. 2004).

Unlike other light show technologies, projection mapping offers a space for more creativity. Using a new, affordable generation of projector and programmes, mapping can fully cover irregular shapes, objects, and even entire building facades. This technology is able to work with light and animation at a completely different level of impact (Shakra, 2021):

- **Immersion:** projection can map the entire venue, engaging the audience in an environment full of images and colours turning usual into unusual.
- **Impact:** visual story, flowing images and animation can have a greater emotional impact than static slideshow images or music.
- **Motivation:** greater emotional impact creates motivation. For instance, it manifests itself in a desire to get up and dance, to consider buying a product or to join a crowd, or to cheer up a sports team.

Tone of setting: the light affects the mood. Using light, projection mapping can affect mood variations to make them more focused and shared.

Projection mapping is a key to a strong story, an innovative marketing strategy and comprehensive entertainment. It has become a powerful urban art technique, using public buildings and iconic spots. In addition, using the right technology and professional skills, it is possible to create an unforgettable environmental performance.

Results

The expert survey study involved designers, the professional activity of which is related to the use of projection mapping installations in various advertising and other public events:

- Nick Lynch – executive producer of Obscura Digital. Obscura Digital is a global company promoting innovative and creative solutions in the field of technical strategy and engaging activities, providing entertaining, informative and educational communication experience on the international market.
- Ryan McCoy – D4, best known among the projection mapping professionals for large-scale digital installations and astounding projections, using them to surprise the audience and showcase his complex creations ranging from progressive social movements to psychedelic art.

The experts were asked the questions related to projection mapping – starting from the generation of ideas to the implementation of projection mapping installations in real situations with different types of settings. The aim of the interviews was to find out the opinion of professionals on the use of this method in the context of modern advertising, considering the use of the latest tools and models, and to form an overall picture of the projection mapping capabilities in promotional events, creating different scenarios. There were also questions asked about the issues and difficulties of using this technology. During the interviews, the experts also expressed their views on the early stages of their professional careers, how did they come up with globally innovative ideas in the field of projection mapping and developed their own systems and mapping algorithms, helping to create ever more innovative solutions for different types of projection mapping effects.

The first question asked to the experts was about the outset of the creative process. The aim of the question was to understand the first steps of the creative idea development process. The whole process starts with the development of the design phase concept, allowing detailed identification of the client's needs. The experts conclude that by identifying the client's needs, it is possible to understand the budget level and be able to achieve the desired effect. After that, there is a transition from conceptual design to schematic design, and the idea is developed graphically. The key finding is that the process from initial to final stages of the installation is standardised much like in the activities of architects.

The first question gives rise to the next question about the tools and programs used. The main applications used by the experts are *Derivative TouchDesigner* and *Lightform*. However, self-developed projection mapping algorithms and programs are used more. Each team has developed its

own projection mapping technology based on certain nuances of needs. However, it is emphasised by the professionals that a growing number of people are now beginning to delve into projection mapping technology and have been able to replicate it and create several easily accessible versions that can be used by anyone.

The next question related to one of the most significant aspects of projection mapping – the process of creation of the installation model. With the development of the program, separate tools have been created to determine the outlines of spatial objects. For instance, portable laser scanner systems allowing to precisely scan and create a 3D model. By creating a precise model before an installation development, it is possible to graphically create a visual narrative with as few errors as possible. The use of such a model is highlighted by the representative of *Obscura Digital*, emphasising that it makes the process easier and helps to successfully highlight the key elements.

As regards the possible difficulties, the experts unanimously state that there may be unexpected technical difficulties or unsuitable weather conditions which could be a nuisance during installation. Nick Lynch added that every little nuance can disrupt the whole installation and damage the company's image. It is important to assess each environmental aspect.

This was followed by a question about their personal attitude towards the use of projection mapping in both public and private events. The experts revealed that human perception is important to society, and video mapping is an extremely powerful tool for drawing attention. Rays of light add life to the graphics to create unforgettable expressions that allow the viewers to see the existing things from a new perspective. Projected images can affect the public awareness of important topics or be used to attract potential clients to the business. Ryan McCoy stated that his favourite quote is from Jim Carrey: "The effect you have on others is the most valuable currency there is." The experts say that mapping projections is significant, as it offers the opportunity to affect strangers without ever talking to them.

The opinion of the referred experts also coincides with the expert opinions expressed in the literature.

The professionals state that projection mapping is able to create illusions that transform reality. That is why it has become a popular technology for organising international events, especially opening and closing ceremonies, amusement and entertainment venues, concerts, music festivals, and high-level advertising campaigns. Projection mapping both draws attention and stimulates imagination in an utterly unique way.

Projection mapping over time has become one of the most frequently selected types of advertisement installation. This technology is also starting to enter the Latvian market of marketing. It is increasingly being acquired and used by light artists at various events. Artists around the world

experiment with patterns, colours and architectural surfaces, applying their creativity and focusing on many significant aspects, such as:

- Surface identification. The chosen surface can be anything to bring the design to life. Some of the most common platforms chosen by artists are buildings, stages, and transparent backgrounds.
- Appropriate lighting. Using professional applications, the video artist calculates the level of brightness, saturation, contrast, pixel density, saturation of light and dark colour that best suits the building. Considering lighting elements, it is important to accurately assess and calculate all the indicators.
- Content development: The content forms the common denominator of the projection mapping installation idea, creating steps to follow during the process. Professionals assess the content of projections, its need for new ideas, using animations and illustrations to strengthen visual stories for a broader vision.
- Installation: The last setup includes customisation of the content with more attention to the details. Experts visit the site to conduct a general test and reserve the last days for assessment of the elements' accuracy.

The expert discussions show that 3D projections are currently considered to be the most unique way to draw the attention of the crowd in public and, respectively, urban private space. Ryan McCoy of D4 is certain that 3D projection changes not only the way movies work, it also changes the way advertising works. Many of the current installations still occur in situations where a city, an institution or an advertising agency seeks to maximize the effect of an event on the audience.

Analysing the expert opinions on the use of projection mapping in advertising installations, it can be concluded that projection mapping is rapidly entering modern advertising trends and becomes an integral part of various activities. There is a growing emphasis on the need to bring the audience together in a safe environment and to promote well-being of every person. It becomes a great social tool in creation of shared viewing experience that draws people together. A successfully developed projection mapping installation can have a positive effect on the audience and achieve the desired goal. However, it is emphasised that this method is complex and has a number of potentially unpredictable technical issues related to synchronization processes, as well as environmental aspects.

As a result of literature review and analysis of expert opinions, the following evaluation criteria for projection mapping installations were set:

- Method used – a set of methods used in the projection mapping process (VJ'ing, theatrical method, static or interactive, video mapping method).

- Content uniqueness – compliance of the content design with the topic of the event. The video and animation used must be unique and innovative, evoking viewers' emotions.
- Use of programs – accurate projection mapping is based on successful synchronization of the projector and the projection program, creating a virtual visuality of the object.
- Cyclicity – a successful installation has an imperceptible cyclicity when the video loop changes without the viewer noticing. Cyclicity indicates the existence of professionally developed video content and successful synchronization of video and projectors.
- Projection location – the primary objective of professional projection mapping is to delve into the structure of a spatial object and supplement it with dynamic video, creating the required emotional effect. The projection cannot fulfil its objective completely if all the offered possibilities are not used.

Each criterion will be assessed according to the following indicators – compliant; partially compliant; non-compliant.

Assessment of projection mapping installations

Three projection mapping installations held in Latvia were selected for review and analysis of analogues – “Dream in Rezekne” (“*Sapnis Rēzeknē*”) by Elita Patmalniece, 2020, VI International Art and Music Festival “Seven Hills” in Rezekne, 2021, *Vincent Van Gogh* – “*Letters to Theo*” by Digital Art House, 2020, and one international installation – “*Borderless*”, created by the team of Japanese artists *TeamLab*. The installations held in Latvia were viewed in person, while the creation of Japanese designers was assessed based on its video recording.

Analogue 1. “Dream in Rezekne”, 2020. Author of the installation works – Elita Patmalniece, author of the storyline – Kārlis Anitens, video artist – Kārlis Ozoliņš, producer – *Untitled Originals*.

The world of colours and images of the artist Elita Patmalniece “Dream in Rezekne” lived through the colour, sound, and light transformations Latgale experiences during four seasons – carefree summer, majestic autumn, contemplative winter, and boisterous spring (Upeniece, 2020).

The compliance of the installations with the assessment criteria for projection mapping is provided in Table 1.

The installation of Elita Patmalniece “Dream in Rezekne” almost fully complies with all the set criteria (see Table 1). The method used for projection mapping is static and is considered to be video mapping, where unique content is used and successfully created cyclically – using elements of artwork animation and graphics of Elita Patmalniece. The main non-compliance is the non-use of a special projection mapping program, which

is evident from the fact that all projections were installed as an area on a plane without tracking individual elements of the buildings – windows, doors and arches. Although the projection mapping program was not used, the location of the installation projection corresponds partially, as it fits into the dimensions of the building, yet it does not separate the elements.

Analogue 2. VI International Art and Music Festival “Seven Hills” in Rezekne, 2021.

Although the restrictions in force in the State prohibited the use of the usual format, it was possible to go on a colourful nightly adventure walk, enjoying the interplay of projections, installations and music of various themes (Poznakov, 2021). Both local and Riga lightning artists collaborated at the “Seven Hills” festival. The lighting artist Kristaps Bunga explained that: “There are several objects. Each is individual, but they are located close enough that people going on a walk may perceive it as a one great whole.” (Lights have shone in Rezekne ..., 2021).

The projections installation on buildings at Seven Hills festival partially complies with the set criteria (see Table 1). The installation meets such criteria as the projection mapping method used – static and video mapping, and content uniqueness – video animation of graphic elements in different styles. The cyclicity criterion is met partially. Similar to the installation of Elita Patmalniece “Dream in Rezekne”, no use of programs and location of projections have been applied. The projection was displayed directly onto the walls of the buildings and the surrounding objects, which in some moments formed non-compliant overview. Also, the projection was displayed directly onto the windows of residential houses, affecting the comfort of the residents.

Analogue 3. Vincent Van Gogh – “Letters to Theo” by Digital Art House, 2020

The exhibition offered to view not only more than 400 masterpieces of the outstanding master created at different stages of his life in the Netherlands, Paris, Arles and Auvergne, but also to feel his world through the prism of letters that reveal the master’s soul and emotions (Morozov, 2020). At the exhibition, works of art and letters were inspirited using a number of large format displays on which animations were projected, creating a 360° multimedia show. By enlivening the colour strokes and the elements of the works, a dimension of depth was created, leading into a parallel world. Everything was complemented by the adapted sound effects.

The installation *Vincent Van Gogh – “The Letters to Theo”* created by Digital Art House is fully compliant with all the projected mapping criteria (see Table 1). Several methods are used in the projection – static, video mapping and theatrical method, the content is created in a unique way – animating more than 400 Vincent Van Gogh’s artworks and written

letters, creating a cyclical narrative. In creation of the projection mapping installation, the specific mapping programs were used and the projection was divided in segments, covering all surfaces of the room – walls, floors and ceilings.

Analogue 4. “Borderless” by *TeamLab – MORI Building DIGITAL ART MUSEUM*, 2021.

The Japanese art team *TeamLab* used projection mapping technology to create a magical dream world at the Digital Art Museum in Odaiba, Tokyo. The installation held in a spacious 10 000 m² room is enlivened using 520 computers and 470 projectors.

Borderless by *TeamLab* is a world of artworks without any borders. This world changes, depending on the human presence, by immersing itself and merging in this unified world. Everything exists in the fragile, but miraculous and boundless continuity of life.

The interactive exhibits of *Team Lab* meet all the set criteria (see Table 1).

Table 1. Analogue evaluation according to criteria

No.	Projection mapping installation	Used method			Content uniqueness			Use of applications			Cyclicity			Projection location		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1.	“Dream in Rezekne” Exhibition of works by E.Patmalniece	x			x				x		x					x
2.	“Seven Hills”	x			x				x		x					x
3.	“Vincent Van Gogh – Letters to Theo” (Digital Art House)	x			x			x			x					x
4.	“Borderless” (Team Lab)	x			x			x			x					x

Note. 1 – corresponds to; 2 – corresponds in part; 3 – does not correspond

Several methods are used in the projection – static, video mapping and theatrical method, the content is created in a unique way, covering the whole space and engaging the visitors in the projected animations. The concept of content has been developed including several nuances, allowing people to be immersed in the existing environment, thus adapting the location of projectors covering all the space around (360°).

Analysing the analogues, an insight was gained into the projection mapping installations and their application, as well as how accessible and

popular these installations are. The authors concluded that the most successful projection mapping installation is *Borderless* by *TeamLab*, which meets all the criteria and has gained its popularity with an advanced technical solutions and outstanding artistic performance. The analysis of advantages and disadvantages of analogues will be used for the successful creation of the advertising installation for the Rezekne Academy of Technologies.

Conclusions

Research of the topic confirms the actuality of the projection mapping method in the digital society, where visual communication creates a new form of cognition, where the attitude and perception of an individual is important. Technologies are being used in new forms of entertainment, where public contact and collaboration with technology is promoted.

Based on the expert survey results, it can be concluded that the projection mapping is rapidly taking over modern entertainment and advertising trends, becoming a visually-interactive presentation of events. A successfully designed projection mapping installation can have a beneficial effect on the audience and achieve the desired goal. The experts emphasize that with the growing popularity this technique is becoming more available to anyone who wants to create an innovative installation for a certain purpose.

As a result of theoretical and empirical research, the following criteria for evaluation of the analogues were set: method used; content uniqueness; use of programs; cyclicality; projection location. The criteria were applied for the evaluation of four analogues, determining the indicators – compliant, partially compliant or non-compliant. The criteria can be used by professionals as well as anyone interested in developing an original digital installation design.

The research is a part of the design project feasibility phase, where it is planned to develop an advertisement for the Rezekne Academy of Technologies applying the projection mapping method.

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