

**Semester:**

LiD10, Spring 2020

Title:

Light interventions
in disadvantaged areas of Copenhagen

Project Period:

February - May 2020

Semester Theme:

Master Thesis - 30ECTS

Supervisor(s):

Georgios Triantafyllidis & Michael Mullins

Project Group no:

N/A

Members:

Agata Magda Terpińska

Copies: 1**Pages:** 61 (total)**Finished:** 28-May-2020

Aalborg University Copenhagen
Frederikskaj 12,
DK-2450 Copenhagen SV

Semester Coordinator: Georgios Triantafyllidis
Secretary: Lisbeth Nykjær

Abstract:

Disadvantaged areas in Copenhagen are characterised by social and physical challenges, greater than those found in the rest of the city. The areas seen as unsafe and unattractive decrease life satisfaction of their residents and drive away potential visitors. Urban regeneration purpose to increase the growth while decrease social isolation of the collapsing areas in the city. This study aims to determine how can a light intervention in disadvantaged areas of Copenhagen help in urban regeneration and strengthen sense of community identity. By developing this work, the intention has been to create a design approach that can be used in deprived areas to add a new layer of lighting to the nocturnal urban scenario. The research is followed by design development where engaging participants in the process is determined as a key element in the generation of project for communities. The involvement and social connectedness is triggered by providing a multi-user, interactive and playful design. Behind a success of this project stand willingness to participate but more importantly eagerness to share own image for a public display. The test conducted revealed a relation between the interest in urban project and willingness to share private image demonstrating no relation between this eagerness and its public availability online. The design, based on the findings in focus area can be implemented with adjustments in its elements in other locations. The design proposal consists of a platform for a photos upload, furtherly filtered and a physical interactive installation in the space. They form two visual supporting the engagement in the distinctive manner. Due to a country lockdown caused by global pandemia of COVID-19 therefore University's restrictions it was not possible to develop a project fully tested and experimented with and as a result provides a design based on the theoretical knowledge.

Aalborg University Copenhagen

Faculty of Engineering and Science

Department of Architecture, Design and Media Technology

Master Thesis in Lighting Design

Light interventions

in disadvantaged areas of Copenhagen



Author: Agata Terpińska

Supervisors: Georgios Triantafyllidis & Michael Mullins

28/05/2020

Abstract	3
Acknowledgements	4
Introduction	5
Project background – motivation	5
From problem identification to problem statement	6
Methodology	7
Design Model	7
Literature topics	8
Anthropological methods	9
Descriptive observation – Grand tour	9
User analysis	9
Photography autodrive session	9
Online questionnaire	9
Analysis	9
Disadvantaged areas of Copenhagen	10
Social cohesion	11
Focus area	12
Usage of space	14
When the sun goes down	16
Needs in urban space	16
Urban regeneration	17
Art in public space	19
Role of light	20
Community design	21
Interactivity	24
Ludic design, play theory	25
Projection mapping	26
Design	28
Success criteria	28
Concept development	28
Democratic design	28
“Selfie culture”	29
Graffiti	32
Colours	33
Testing	34
Ideation	38
Key design elements	38
The core - people	38
Colour palette	40
Two visual layers	42

Interaction	44
Final proposal	46
Discussion	48
Conclusion	49
Bibliography	51
List of figures	54
Appendix	57
Survey results	57
TouchDesigner video outcome	61

Abstract

Disadvantaged areas in Copenhagen are characterised by social and physical challenges, greater than those found in the rest of the city. The areas seen as unsafe and unattractive decrease life satisfaction of their residents and drive away potential visitors. Urban regeneration purpose to increase the growth while decrease social isolation of the collapsing areas in the city. This study aims to determine how can a light intervention in disadvantaged areas of Copenhagen help in urban regeneration and strengthen sense of community identity. By developing this work, the intention has been to create a design approach that can be used in deprived areas to add a new layer of lighting to the nocturnal urban scenario. The research is followed by design development where engaging participants in the process is determined as a key element in the generation of project for communities. The involvement and social connectedness is triggered by providing a multi-user, interactive and playful design. Behind a success of this project stand willingness to participate but more importantly eagerness to share own image for a public display. The test conducted revealed a relation between the interest in urban project and willingness to share private image demonstrating no relation between this eagerness and its public availability online. The design, based on the findings in focus area can be implemented with adjustments in its elements in other locations. The design proposal consists of a platform for a photos upload, furtherly filtered and a physical interactive installation in the space. They form two visual supporting the engagement in the distinctive manner. Due to a country lockdown caused by global pandemia of COVID-19 therefore University's restrictions it was not possible to develop a project fully tested and experimented with and as a result provides a design based on the theoretical knowledge.

Acknowledgements

I would like to express my gratitude to my supervisors Georgios Triantafyllidis and Michael Mullins for the engagement, help and all the valuable advice through the process of this master thesis. Furthermore I would like to thank my parents for their love and care, especially when due to pandemic situation, in the duration of this thesis I returned under their roof. Also, I am grateful to be surrounded by wonderful friends, supporting me and constantly believing in the success even especially when I had moments of doubt.

1. Introduction

1.1. Project background – motivation

Urban spaces are truly fascinating to me as the variety of different individuals within is high and their behaviour not always predictable. The project suggests a solution based on an analysis of focus area but should be read as a guideline of designing for areas facing similar difficulties. The goal is to propose a design for a chosen areas characterised by social and physical challenges (disadvantaged area of Copenhagen) that would change the perception of space by creating a project serving local community and potential visitors.

Moreover, I would like to explore how tools, usually used for entertainment events, such as projection mapping, interactive installations etc. can become a permanent image of city's landscape.

I came to Copenhagen almost two years ago to study, without having in mind returning to my home country and as an immigrant¹ myself and both with interest in social studies I pointed my direction to tackle problem of a group I might identify with.

We might have came from different reasons but Denmark became home to all of us. Undoubtedly the Danish culture differs from mine, however it does not go beyond a social circle that I find familiar. Disadvantaged areas are characterised by high number of non-Western origin residents to whom I imagine the cultural contrast is higher noticeable. In the next chapters I lead to an answer on how to create a design that regardless of the origin could support sense of community identity. I happened to grow up in the area of former Jewish ghetto in Warsaw that does not differ nowadays from neighbouring districts but the memory of inconceivably dark times will not be soon forgotten. Why I mention this is because 'ghetto' will be always associated in my head to an area of compulsory settlement. In the next pages this word will repeat and I do it reluctantly however it is an officially used name in Denmark for most problematic deprived areas that affects negatively the image of the area. The project aims to change this perception by revitalising these spaces by night and trigger the curiosity for a visit. It serves to provide an answer on how to create a new playful image, suited to the physical and social characteristics of the area.

This research consists of state of art analysis that will target mostly topics from social science and related projects attempting to change their image by regenerating them by art, design installation or light to lead to a design proposal. The research was carried out for four months, most of which spent locked home due to COVID-19 pandemia. The work, initially planned had to change its course, adjusting to the "new reality" we all found ourselves in, therefore providing a development of the design outcome, yet theoretical that ought to be furtherly tested.

¹ "immigrant: a person who has come to a different country in order to live there permanently" [59]

1.2. From problem identification to problem statement

After initial articles' reviews and many brainstormings I could have clustered repetitive topics into 3 categories:

SPACE: both physical as well as social aspects

HUMANS: the world of perception

TECHNOLOGY: connection between people and machines

Identifying problems of these three fields led me to a research question:

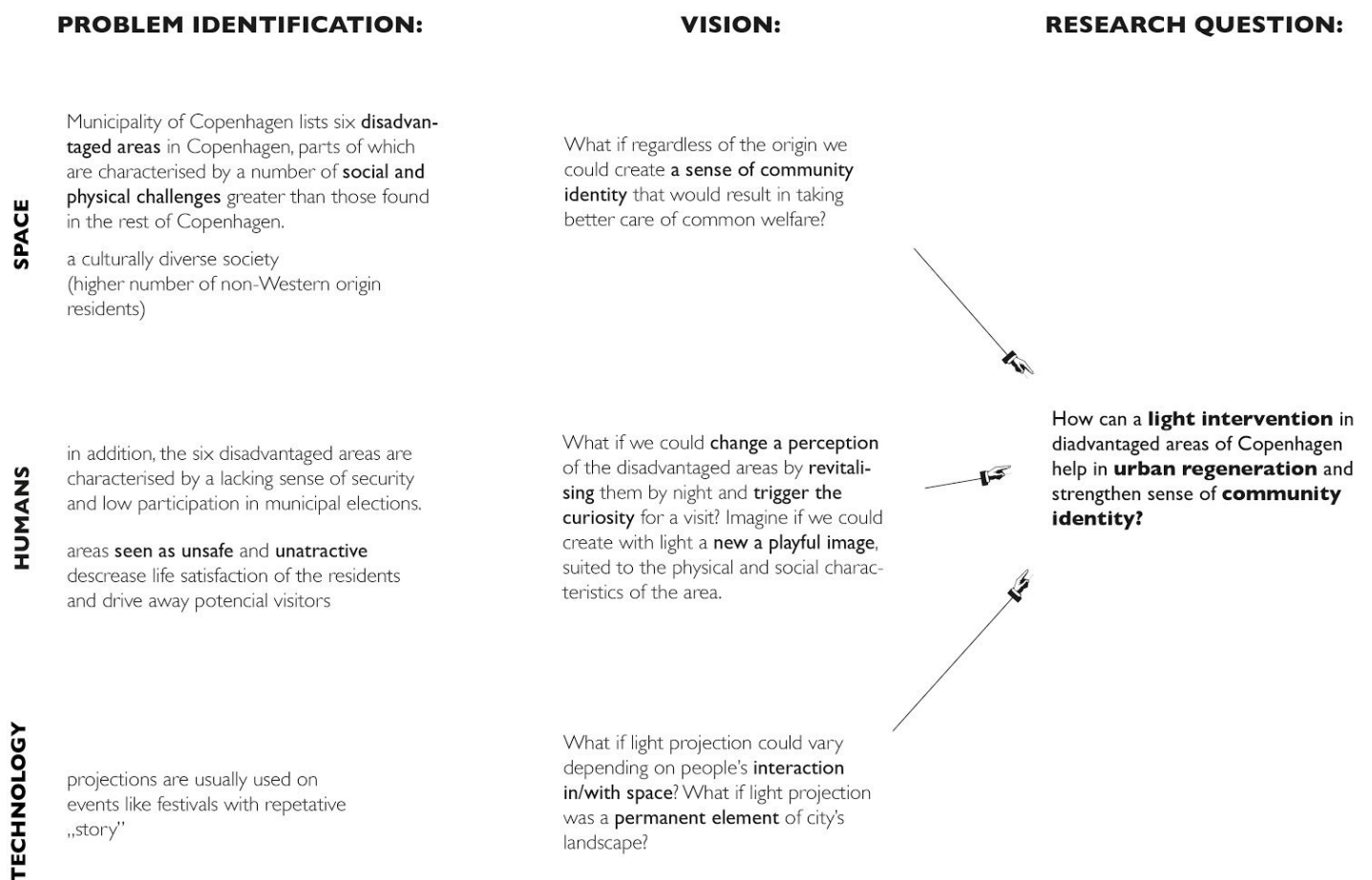


fig. 1 A path leading to research question

2. Methodology

2.1. Design Model

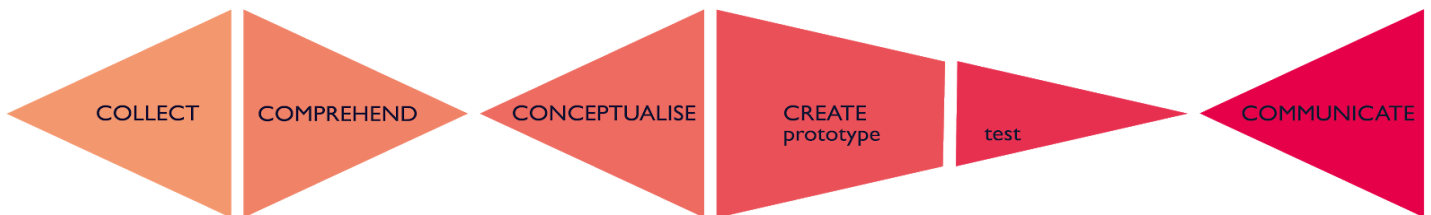


fig. 2 Design model

Master in Lighting Design at Aalborg University is a multi-discipline programme combining knowledge from architecture, media technology and science behind lighting. The scheme presented above is an interpretation of Design Thinking Model originating from Stanford University [1] and 6C Model from Design School Kolding [2] that were combined into one.

The model associated with Design Thinking consists of divergent and convergent phases. It means that the design process has both phases of expanding opportunities and broadening knowledge as well as constricting to find best solutions.

The process starts with collecting data from various fields, diving deeper into the sea of still appearing new questions and moving to analysis and comprehension, in which research is done to find core problems. When the data and informations are understood phase of concept development starts. Here the problems from previous phase find solutions. To discover if the path taken is suitable prototypes and tests are conducted. This enables to evaluate and if proven to be incorrect take a step back. If the tests bring expected result the project can be shared in different ways such as: renderings, pitches, videos, reports, installations, physical prototypes, and animations. 6th C in the 6C model is collaboration, omitted here as my work has an individual character.

2.2. Literature topics

On the basis of initial research three clusters of main interest topics were created to be furtherly investigated.

Keywords from research papers:

Urban spaces:

Urban decline | Area-based interventions | Physical regeneration | 'disadvantaged' areas | engagement in local initiatives | people's needs in urban space

Social studies:

Social regeneration | Community | social decline | reintegration | identity | social cohesion | playfulness

Art, design & technologies:

interactivity | social design | light interventions | public art | participation

2.3. Anthropological methods

Major part of my work has a humanistic approach to the design process, the technology used is a tool in creating certain feeling, simply could be said that wants to solve rather emotional than technical problem. Therefore most of the methods I use come from anthropological studies and are mostly qualitative.

2.3.1. Descriptive observation – Grand tour

This method introduced by Professor of Anthropology, James Spradley [3] enables us to experience socio-cultural dynamics of an investigated place by recording as much information as possible but without much detail. He states we should use as many senses as possible, "approaching the activity in process without any particular orientation in mind, but only the general question, "What is going on here?". It gives us general idea that can be furtherly investigated.

2.3.2. User analysis

To get an insight of human activity in space it will be analysed by characterising activities and people within according to Jan Gehl's categories of outdoor activities [4].

2.3.3. Photography autodrive session

Simply saying it is a method of data collection by taking pictures that has its roots in ethnographic observation. Our memory is unreliable and easy to manipulate and that is why it is important to save the photos still to be able to come back to them later. [5]

2.3.4. Online questionnaire

An online survey as a method of data collection delivers the results in a short time and is convenient for the participants enabling them to choose convenient time. Moreover, the test sample can often be bigger due to smaller effort needed to be taken to partake comparing to physical presence at the test and time limitations of the one conducting it.

3. Analysis

3.1. Disadvantaged² areas of Copenhagen

Denmark, often seen as welfare state, once again placed in top three happiest countries in the world [6], whereas Copenhagen was ranked this year the most livable city for European expats [7]. World Happiness Report [6] links happiness to social equality and feeling of belonging to a community. The city attracts many new people who wish to settle in the city and a forecast predicts the population will grow by 100,000 by 2025 [8].

In the country where everything seems to work, where there is money for education, health care, financial support for the ones in need, relative lack of crime and corruption, there are still areas struggling with social and physical difficulties. [8]

These areas can be found around the country but for this report the focus will be on ones located in the capital city. The Municipality of Copenhagen [8] lists 6 of them: Nørrebro, Amager/Sundby, Bispebjerg, Vesterbro/Sydhavnen, Husum/Tingbjerg and Valby/Vigerslev.

Their placement can be found on the map below:

² “disadvantaged – deprived of a decent standard of living, education, etc. by poverty and a lack of opportunity; underprivileged” [60]

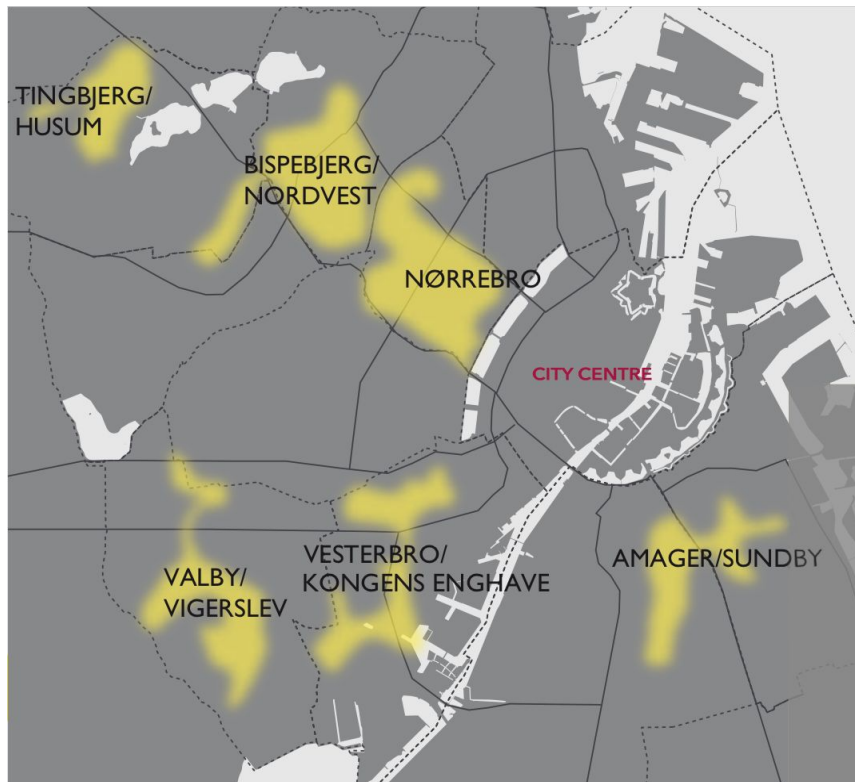


fig. 3 Disadvantaged areas of Copenhagen

Disadvantaged areas are characterised by a combination of these indicators [8]:

- Small flats (under 60 m²)
- flats which lack basic installations
- residents of non-Western origin
- residents outside the labour market
- residents with low/no education
- residents with low income

In Denmark there lives 13.3 percent of people with foreign heritage while in Copenhagen's municipality this number raises to one fourth of the population [9]. The majority is a member of the Lutheran Church of Denmark and Islam is the second largest religion in Copenhagen, accounting for approximately 10% of the population [10].

What brought my attention is cultural diversity of the areas and higher percentage of Eastern origin residents. The most numerous national minorities of non-Western origin in Denmark come from Syria, Turkey, Iraq, Iran, Pakistan and Afghanistan [9].

In 2010 Danish Government introduced a policy of reintegrating so-called 'ghettos' into society [11]. It consists of 32 initiatives divided into five categories. Both "from ghetto to attractive neighbourhood" and "renewals" are programmes supporting transformation of built environment with a place for making infrastructure and public spaces more attractive to expand accessibility and to gain positive transformation [12].

In the list from December 1, 2019, there are 28 areas described as ghettos [13]. By this word they characterise areas with at least 1000 residents where at least two of the below criteria meet:

- 1) high proportion of immigrants from non-Western countries,
- 2) a high number of residents convicted for violation of the Penal Code
- 3) a high level of unemployment among the residents
- 4) a low average income and
- 5) proportion of residents with basic education only

The above mentioned policy [11] assumes that by 2030 there will be no so-called 'ghetto' areas.

3.2. Social cohesion

The municipality's politics assume to level the playing field in disadvantaged areas by number of unified core operations and local initiatives that will result in cohesion with the rest of the city.

Social cohesion is a desirable feature of society and its decay is assumed to occur among others due to global migration movement and increase of cultural and ethnic diversity [14]. For British House of Commons cohesive community is when "[...] the diversity of people's different backgrounds and circumstances are appreciated and positively valued"[15], furthermore that is able to "integrate people from different ethnic backgrounds so that they can relate together [...]" This emphasis on integrating ethnic minorities can be also found in the words of Danish minister warning about the policy toward the segregation stating it "[...] must be adequately addressed, or we may end up with divided societies that lack cohesion instead of societies that profit from diversity." [16] The Schiefer and van der Noll [17] note the relation between feeling attached or identified with the social entity and social cohesion, especially in reference to participation.

Moreover in this research they group three repetitive matters associated with the subject : social relations, sense of belonging, and orientation towards the common good. It is important to develop resolution mechanism for compliance to social rules and feeling of responsibility for the common good [17]. The more people identify with space the more they engage in the local projects [17]. It is important to create a strong narrative to connect people with their neighbourhood. The more diverse society is the greater importance there and bigger challenge it is to integrate it.

3.3. Focus area

Nørrebro, among Copenhagen's residents also called "Nørrebrox", is a vivid, multicultural neighbourhood in a short distance from city centre. Abounds in numerous cafés, bars, design shops and galleries. It differs from most of the city or neighbouring neat

Frederiksberg, it is less unified in a sense of higher diversity. I remember words of my Danish friend when I moved to Copenhagen: “the city is safe, if there is something going on or they open fire it is only in part of Nørrebro so nothing to be worried about”. I was not worried but rather intrigued by the situation of the area.

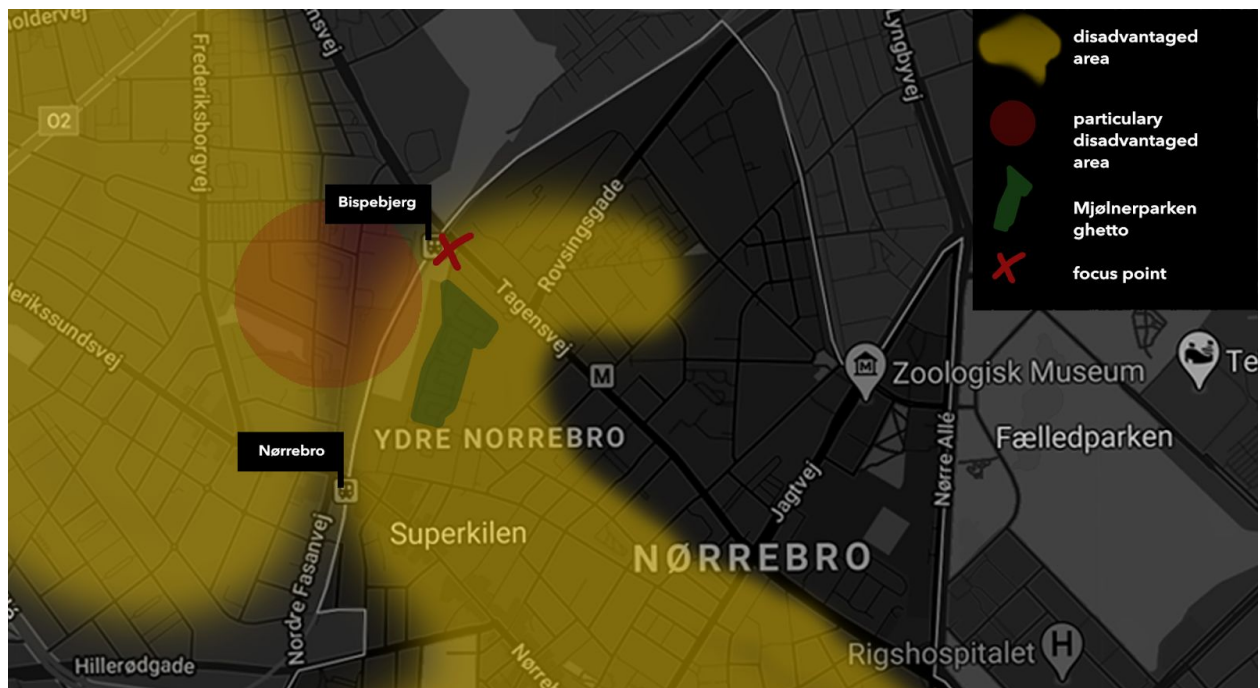


fig. 4 Map with focus area marked

The autodrive session begun in Nørrebro Station. After the opening of the third metro line it became an important transport hub. I planned to roam around the area, expecting to see any disturbing behaviour, destroyed elements of small architecture or simply any indication of a bad reputation. The autodrive session is a powerful tool for experiencing atmosphere of specific area. Especially interesting and worth investigating seemed both ghetto area as well as one described by municipality as “particularly disadvantaged” – marked sequentially red and green on the map.

Entering Mimersparken from the southern part was a bright experience. Blinded by the sports pole luminaires on a football pitch, unnecessary as the field was not being used. The park in the further part was well lit, seamlessly allowing face recognition. Green area, playground and basketball court were empty.

The area brought my attention therefore I returned by day to take a closer look at the passage that was almost completely dark the previous session. I discovered the existence of a skatepark that, as it turned out to be a non-profit project from 2017, entirely built by skaters of Copenhagen to “give life to this dead area” [18]. The contrast to grey walls/columns of the passage create colourful graffiti covering almost the whole surface.



fig. 5 Photoshoots map (note: C shot was taken under the overpass)



fig. 6 (a,b,c,d) Photos of focus area

3.3.1. Usage of space

For a better understanding of what people might be doing in the area and how they got there I will analyse it in line with three types of activities proposed by Jan Gehl [4]. The architect divides them according to the need, therefore frequency of their occurrence. Firstly I will shortly explain what they are to furtherly describe them on the example of my focus area.



fig. 7 Zones and points of focus area

Necessary activities: any compulsory activity eg. going to work, school, for groceries. No matter of the physical appearance of the environment or the weather, they will occur. The focus area is situated nearby residents housing and the park where most of the dog owners in the area would come to walk their pupils. The area next to the overpass seems to be mostly used by locals, however, a city train station and bus stops, situated near may indicate presence of non-residence too.

Optional activities: any activity that may occur then the exterior conditions are favourable. The park not only serves above mentioned activities but is also a place of leisure and play. A skatepark under the pass, baseball court and a playground may be its examples. In the close distance we can also find a football pitch and a gym.

The necessary activities occur regardless of the physical conditions but the second described category is undeniably dependent on the environment and will occur more often when good conditions and accessibility are fulfilled. That is why the improvement of the area is essential and entails willingness to visit and spend time there.

Jan Gehl distinguishes one more category which are social activities (“resultant”). They are related to previously mentioned and come as a consequence of at least two human presence in the space. “(...) social activities are indirectly supported whenever necessary and optional activities are given better conditions in public spaces.” [4]. The interaction can be both active such as talking and passive such as acknowledging closeness by seeing or hearing each other. This presence of people of all ages is an indicator of a success of a specific place [19]. It is important to emphasise that it is not the number of people in the space but rather their engagement should be seen as an accomplishment. “(...) That’s why I would say, do not look at how many people are walking in a city, but look at how many people stopped walking to stay and enjoy what is there.”[20]

3.3.2. When the sun goes down

Urban regeneration projects usually focus on day time activity. What about the part of the year when sun sets before we leave school or work? The shortest day of the year in Copenhagen lasts only 7 hours, it gets dark at twenty to four (15:40) [21]. That is why I believe there is a need of thinking about urban lighting projects not only in the context of a night time but also short winter days. Not only potential do I see in winter time but in summer, on the other hand people spend more time outdoors. However, it is important to indicate there is time of the year in Copenhagen when instead of darkness the twilight is present and therefore it should be tested if light installation is visible due to low contrast of the environment.

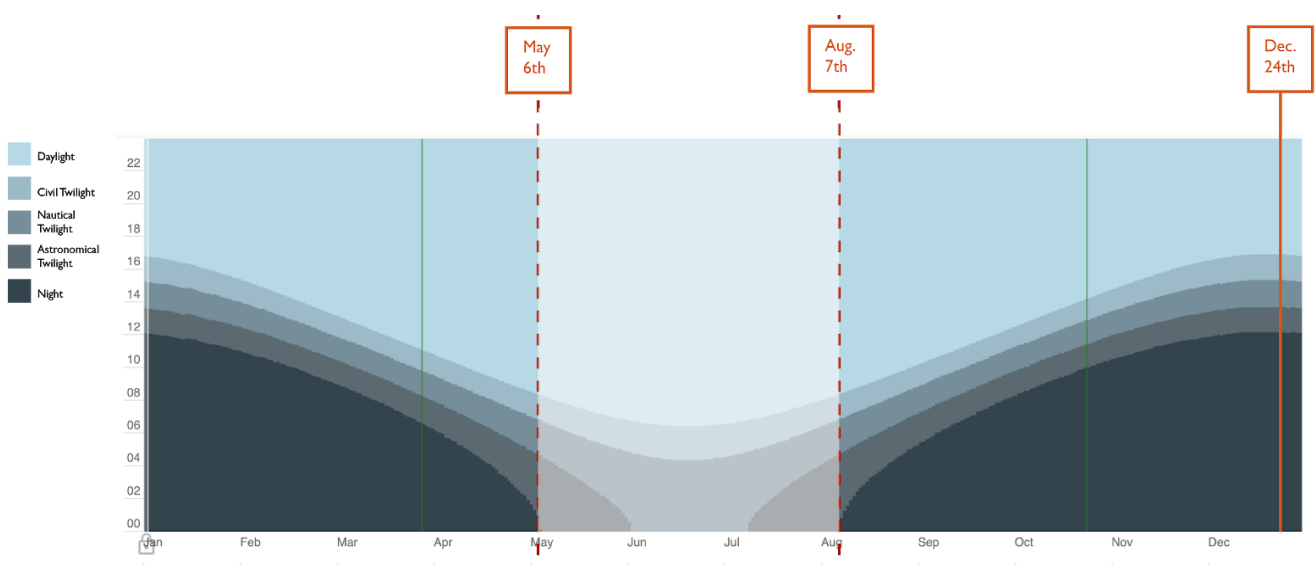


fig. 8 Day/night length

3.3.3. Needs in urban space

Matsuoka, R.H., & Kaplan, R. [22] in their research analysed 90 articles from Landscape and Urban Planning international journal published between 1991 and 2006. They discovered two main human needs in urban space which are interaction with nature and between them. The first category focuses is linked with physical characteristics of the space whereas second is more metaphysical and is not directly connected with the environment. Furthermore, the second group was divided into three subcategories:

- Social interaction and privacy

"[...] appeared most often in the studies—58% of the studies that concerned Human-interaction needs. These studies expressed great optimism that improved social interactions can be promoted through properly designed urban spaces."

- Citizen participation in the design process

"These studies speak to the importance of promoting citizen participation to achieve a superior design and to foster community support for urban landscapes. Public input is seen as leading to a design that takes into account relevant human needs as well as the local culture, religion and history of a particular region."

More about the participation in the design process can be found in section 3.5 and subsection 3.5.1.

- Sense of community identity

"[...]enhancing the place identity of the physical environment can increase the sense of community attachment [23] . Another study [24] revealed that the presence of public or semi-public outdoor gathering places promotes community identity. "

It is important to emphasise that in most of the articles there is talk about more than one of the above categories and a good design is a combination of them.

3.4. Urban regeneration

Urban regeneration, also known as urban renewal is an action directed to collapsing areas in the city with preserving the main characteristics of specific space [25]. Urban redevelopment's purpose is increase economic growth "by attracting external private and public investment and by encouraging business start-ups and survival" [26]. It is believed that these transformations will decrease social isolation of the areas [27]. Another research emphasises that the revitalisation of public space will allow locals to actively use this space that will result in creating a bond with a place and sense of community [28].

Danish approach to urban regeneration [16] tries to resolve the issue by focusing on integration ethnic minorities into society, encouraging residents in participating in the areas where urban development takes places.

In the conference from 2007 [16] questions such as: " [...] what cost benefits collaboration? How to collaborate? How to motivate and involve citizens? How to make it accessible to citizens? How to strengthen social cohesion? And how can we strengthen good practice?" were asked and after more than a decade they are still up-to-date.

J. Lavrinec [29] in her work focuses on answering a question of how to bring life to a dead urban spaces, therefore indicates two ways of giving them sense of place:

"1) Reinterpretation of the existing routine scenarios, proposing alternative ones, which draw attention to the potential of a certain place,

2) reorganization of spatial structures of a public space by installing new objects, which start attracting passers-by and provoke an active interpretation of it. Both tactics imply the idea of building a new experience of a place. "

As an example of successful urban regeneration I will use a park in the close neighbourhood of my focus area. Superkilen – a project developed in 2007 by architects from BIG Bjarke Ingels Group, TOPOTEK 1 and Superflex. The aim of the project was to revitalise the space where conflicts usually appeared, promote community integration and reflect national complexity of the quarter. This space goes beyond the role of transit area and city square, filled with symbols and motifs is the urban representation of the cultural diversity of its residents. [30]



fig.9 (a, b, c) Superkilen park, (a) left one, (b) upper right one, (c) downer right one

3.4.1. Art in public space

Role of art in urban regeneration might not be considered as a major player. However, research show benefits and opportunities in using it in urban redevelopment. Arts work in favour of creating a greater understanding of different cultures, building a stronger sense of identity [31], that as many research state, is a key element for successful urban regeneration[32]. It's all to improve the local image that entails increases in positive residents' feeling of their neighbourhood [33]. Studies on the topic of art in public spaces usually connect it to urban regeneration and emphasise the role of participants in the successful process. Moreover, they differ from other forms of regeneration projects as they involve creativity, "(...)encourage questioning, and the imagination of possible futures, (...) offer self-expression, which is an essential characteristic of the active citizen." [34]

One of the examples of letting art speak in a public space is permitting the artists use raw walls for a creation. Murals can change the perception of a run-down street or a district, add life to abandoned public spaces and facades that tell story create a space identity. It can be also used as a tool of engaging communities that along with artists take part in the renewal [35]. Example close to my heart is district in Warsaw called Prague North (org. Praga Północ), that suffered less during the World War II, comparing to city centre and left bank of Vistula river areas, therefore its reconstruction after war was less urging and

not seen as priority. This politics and situation of post war times resulted in underinvesting there for years, which resulted in gaining the name of a "bad neighborhood" seen as dangerous and unfriendly. It is a shame because it is one of a few districts that remain its historical character. There are many damaged tenement houses that now serve for "canvas" for street-art artists.



fig.10(a,b) Murals, (a) left one, (b) right one

Powerful projects let communities have voice in the creation process. Furthermore, Kay A. research state that "if arts projects are seen as a tool of empowerment – controlled by the beneficiaries and something that belongs to the community – they could have a dramatic effect on regeneration." [33]

3.4.2. Role of light

Regeneration by art is limited to be seen only by day, creating a unique character of a place during limited period of time. That is why using artificial light is crucial in regenerating a nightscape. Deprived areas are seen especially unsafe and unpleasant during nighttime. Interventions can be made with creating light installations or changing existing light situation by eg. different approach to lit existing scenarios. In this section I will show the first approach, whereas projects that involved residents in the design process will be described in community design section (3.5) as they belong both to urban renewal and participatory projects.

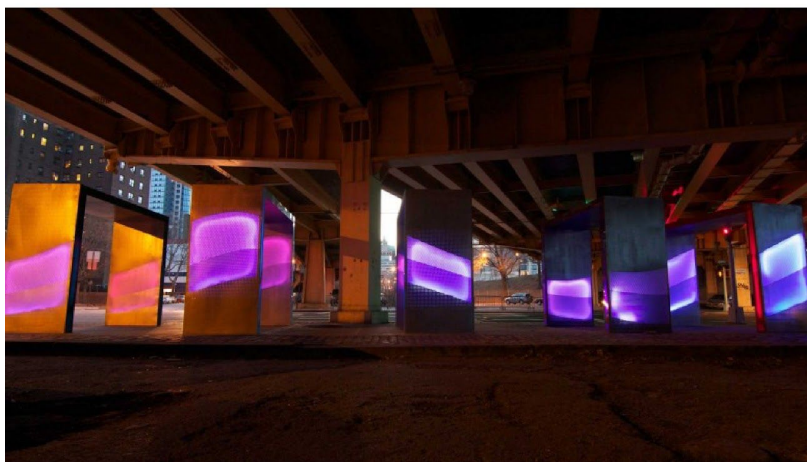
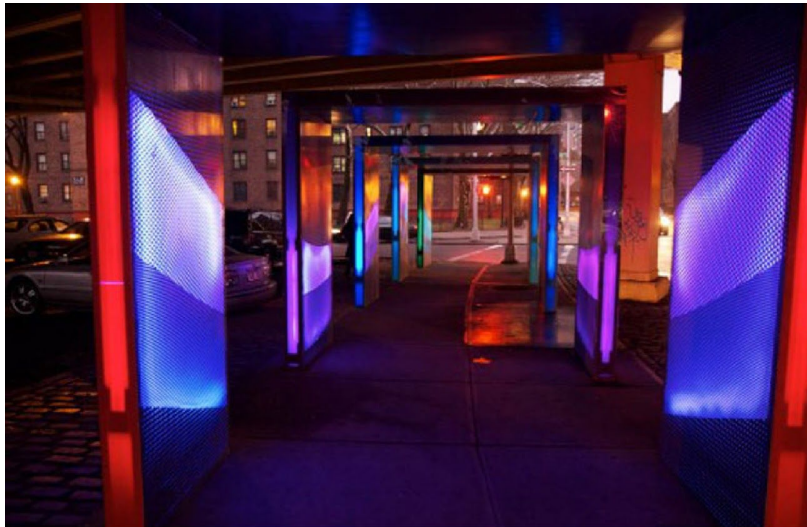


fig. 11(a,b) Silent Lights installation, (a) upper one, (b) downer one

From many light installations that were used for urban renewal I would like to focus on Silent Lights in Red Hook, Brooklyn urban matter (in partnership with the Urban Arts Program of the Department of Transportation and the Brooklyn Arts Council). The project was created in unused urban space – under a highway, next to a crossroad to make it safer, playful and interactive. A noisy surrounding was an inspiration point for designers that aimed to

convert a negative association of a loud environment into something positive by translating sounds of surrounding into light patterns. The installation consists of 6 gates of perforated metal structure with programmed LED strips. Designers worked with local council to educate the teens on the subjects of technology, design thinking programming with possibility to create their pattern of light response [36]. Colourful patterns changed the space perception, furthermore it had a positive impact on respecting the area around the artwork [37].

3.5. Community design

Design creation is not always only connected to a designers and their subjective ideas. Another approach is engaging communities in the development process of their environment, putting emphasis on the involvement of local people [38]. This way of thinking about the design is called a community design and can answer the question on '[...] how to make it possible for people to be involved in shaping and managing their environment' [38]. The studies emphasise need for community design in the disadvantaged areas for '[...]maximising opportunities and range of choices, particularly

for low-and moderate-income people [39]'. It allows to speak citizens usually omitted and forgotten.

According to Torkil Lauersen responsible for the project in Nørrebro Park it proved success because "people don't like taking part in a play where the manuscript is written in advance. [...] the participants themselves helped to develop the neighbourhood plan." [16] The knowledge brought from this project shows that it should be designed precisely but still open for public to decide the details.

Furthermore Jan Vranken states we "[...] must organise participation from people who live in the area where urban development is taking place. This increases the chances of taking initiatives that empower the people." [16]

– light – participation – renewal –

The role of participation in urban projects is especially important and became commonly practiced in low-income populations. This thesis is focused on deprived areas of Copenhagen therefore it is meaningful to investigate what actions, where and using what tools were already made. One of the examples of successful urban participatory project where light was a tool for regeneration is TRANSITION from 2011 in part of Amager – Sundholm [40]. This area-based regeneration was possible with leading role of lighting designers Olsson & Linder and the Social Light Movement. To the design process design students were invited and residents took active role in co-creation. The team found three spots for interventions. In the project Home Sweet Sundholm traditional street lamps were covered with a plastic, translucent, colourful lampshades that remind me the ones found at grandmas' homes. The atmosphere they create is cosy and it is a simple way to fight with stigmatised image of the area. Their second proposition, likewise Silent Lights draws inspiration from a negative aspect to convert it and change its meaning. Satellite dishes that cover buildings in deprived urban areas were repeatedly discussed in Danish medias and suggested that they should be have been got rid of as they ruin the aesthetics [41]. As they are a characteristic element of landscape in the areas the designers decided to emphasise them by lighting them in different colours. This quite simple idea of Satellight shows that we do not need much to change a perception to create "glowing light art pieces aestheticising the street" [42] and by using existing elements in the space they don't fight with its unique identity. The first intervention can be still find in the space whereas the second at the time of writing this thesis does not exist anymore.



fig. 12 Home Sweet Sundholm installation

Another project in the spirit of urban redevelopment is a Nordvest Parken. This space is situated in close neighbourhood with my focus area.

SLA is author of both landscape and lighting design in the above mentioned park and followed different approach then renewal project on Amager. The architects put hope on using many colours, gobo projectors with stars outcome (directly referring to the theme of the park – “The Milky Way”) that light up star-shaped concrete structures (served as benches perhaps). In this park we will not find subdued manner of classic Nordic light use, it reminds me an electronic music festival field rather than a community park. Architects state they aimed to fulfil residents’ wishes after long consultations but in my opinion “light, safety, nature and adventures in an exciting combination”[43] could have been solved differently. To create intimate spaces the architects decided to use spotlights directed on the benches and other meeting spots. However, park users are not willing to use this opportunity as it feels like being on stage and enables to see what is around them making them feel unsafe [42]. I used this example to show how important is the context, in this case a new park arises, with little understanding of the situation and people within the area.

Worth mentioning is winning the Light Prize in 2010 and in the motivation we read: “The light utilizes the park’s architecture and objects and the happy colors and the varied

scenarios make the city space unpretentious and easy to occupy" [44]. Undoubtedly it does meet the expectations to create a colourful nightscape image but unfortunately, spaces like that "are not in fact part of the lived experiences, but rather aesthetic pleasures [42]" that does not comply with designing for communities.

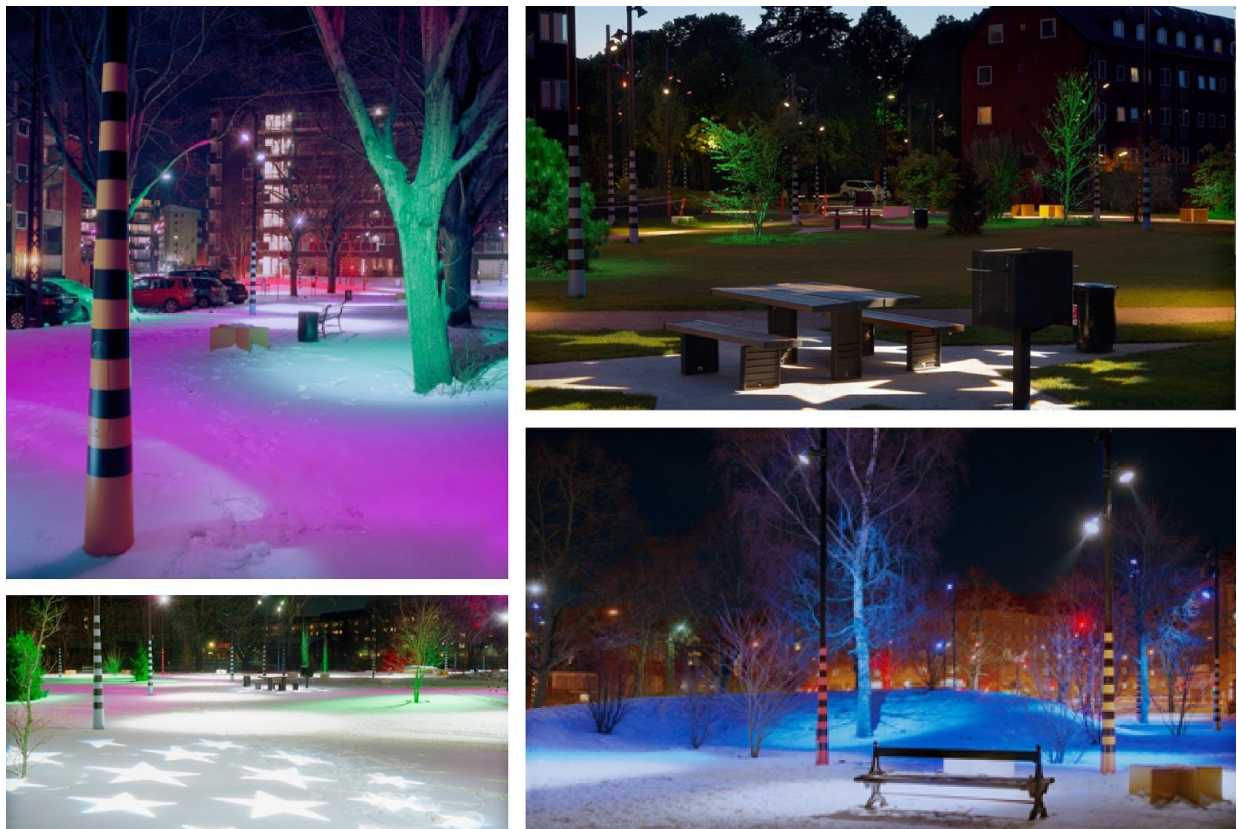


fig. 13 Nordvest Parken, project by SLA Architects

3.5.1. Interactivity

Looking further into the topic of public art we can categorise it according to its interactivity. Wang, Hu and Rauterberg [45] defined them as:

static forms – the content stays unchanged, no interaction occurs

dynamic forms – art piece can change its form according to an impulse from environment eg. sound. However there is no dialog between the viewer and the artifact

interactive forms – human activity influences changes occurring in the dynamic content of the piece of art. It has an active role by eg. motion or any other activity.

The fourth generation of art, characterised by J. Hu et al. [46], is an interactive art platform. In this last category we deal with a content created by online users, eg. blogs, social photos and video services. Creating a content by using this method supposedly we can reach higher number of potential participants. "What the artist creates is not an artifact in its final form, but a platform for social creativity". [46] As an example of using both

interactive art platform and physical interaction can be found in the design proposal for Chinese city of Taicang.[46]

There, the participation was to share to the public a photo for an interactive slide show to connect residents of Taicang that was a and the rest of the world. The local viewers were able to choose a photo by turning a steering wheel and the amount of time they were willing to watch it for was sent as feedback to the ones that shared it.

Van Boheemen [47] conducted an experiment in three different scenarios: with no interaction(content created randomly), content controlled by a single user and multiple user controlled content (all four participants were present in all three cases in front of the screen). The installation consisted of coloured dots on the screen, characteristics such as colour could be controlled in second and third scenario. The aim of the experiment was to investigate the level of social connectedness throughout this study. It results that in neither first nor second case the participants engaged with each other. When all four participants were in power of change, the interaction between them increased. The test shows that to increase the level of social connectedness with public installation we ought to consider multiple people interacting simultaneously with it.

3.5.2. Ludic design, play theory

"We are all basically playful. We were born playful. We live playfully. When we were children we were just brilliant players. (...). But something happens to us when we get older. It's not that we stop being playful, (...) we kind of don't permit ourselves to be playful. We kind of get embarrassed to be seen being playful. We kind of get a feeling that it's illegal to be playful." – Bernard Louis De Koven [48]

Play is deeply rooted in our culture and it is its important element. Lack of rules, playing just for sake of playing, being free makes us the most playful [49], raising creativity and productivity.

Playful interfaces are widely used in UX design encouraging to actively engage to and take action. Playful element of the design is not an essential element of a product but it will make people spend more time with it [50] helping to obtain deeper level of participants' engagement[51]. Playful designs are not limited to any age or origin receiver, it is a universal message that I believe is important in creating design for culturally diverse areas. Playful design does not need to be explained as there is no right or wrong answer. Playful design is an escape to childhood, to careless times and I believe that is what is needed in the installations in deprived areas.

As an example of a playful installation I chose *The Pool* by Jen Lewin. It is a travelling



installation that since 2012 was placed in 30 locations worldwide.[52] It consists of 106 circles that work only when the interaction with them is detected creating patterns of light in a multi-user “conversation”. You can step, jump or dance on the pads and the one you are on will light up, sending a signal for the neighbouring to activate. “With a few participants, the Pool is a ballet of splashes; with many, it’s a symphony — or cacophony — of color.”[53]



fig. 14(a, b) “The Pool”, (a) upper one, (b) downer one

3.6. Projection mapping

Projection mapping is a kind of projection that uses 3D objects as its canvas. Thanks to technology we can map the points on the objects eg. facades to exactly comply with a size and shape of the projected image. It became a fast tool of changing character of buildings converting them often into out of this world imaginary objects. They can use geometry of the building for creating intriguing illusions. Projection mappings are most often a temporary installations, eg. a part of festivals.

The first projectors invented use a lamp as a light source which becomes less powerful over time. Its lifetime is estimated 1,000-4,000 hours of use which gives us 2 years period when being used 4 hours a day. Similarly to replacing incandescent light bulbs to LEDs, the projector manufacturers starting using them in their products. These projectors have

longer lifespan that is 10,000-20,000 hours in average that on the assumption it is on same amount as the previous gives us 7-13 years. Comparable to LED projector lifespan has a laser projector and in addition its lumen output can reach up to 60 000 that is 2-3 times higher than a typical projector. Moreover laser and LED projectors offer better image quality comparing to light bulb projectors.

In my opinion the power of projection mapping is in its simplicity and illusory character.



fig. 15 (a, b,c,d) (a,b) left: "The Infinity Wall: A Modern Mirage" by Megavision Arts, (c,d) right: 'Gridular 3.0' by Afterlight

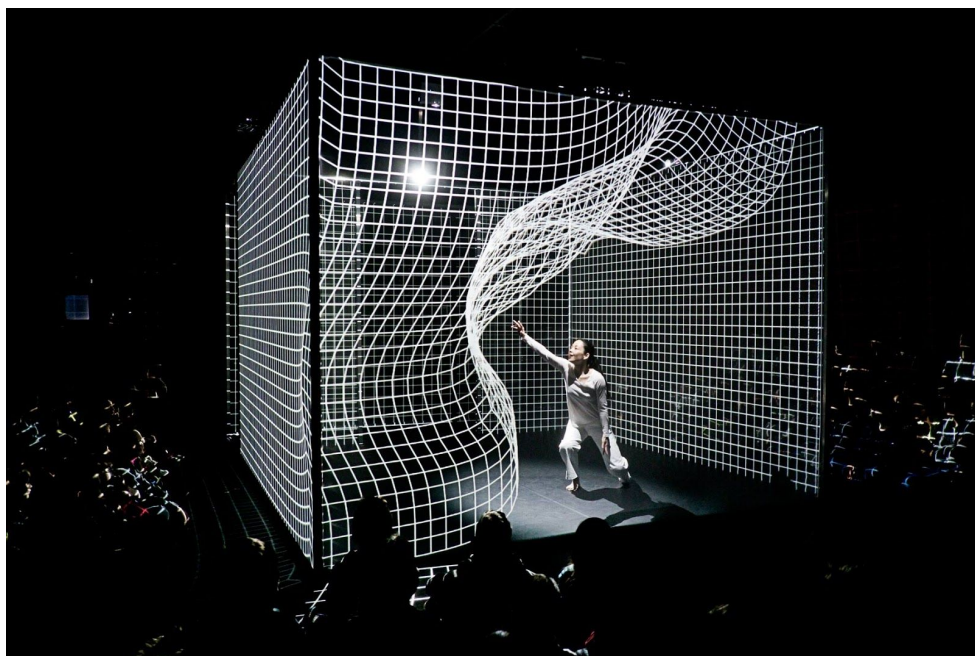


fig. 16 "Hakanai" by Adrien Mondot and Claire Bardainne

4. Design

4.1. Success criteria

In the light of research described in analysis section I was able to characterise main factors that when fulfilled will contribute to the best solution for the design proposal.

- **supporting place identity**
emphasising the uniqueness of the space rather than covering it;
element supporting architecture, not competing with it
- **created by people for people**
crucial element of participation
- **playful**
bringing joy to a deprived areas
encouraging to take action

4.2. Concept development

The project in principle was to be a permanent installation and my big concern was: how can I propose a content that will not get boring and be predictable after couple of times of watching it? I understood it has to “be powered” by an external “force”. Speaking less enigmatically I soon realised that if I give people a chance to have an input in the project I will gain unpredictable dynamism. Its unpredictability had to have limits of course, it needed a frame.

4.2.1. Democratic design

Crowdsourcing seemed to be the right tool to engage people in the project. This tool enables to gather information from individuals for a common goal. This way every voice is heard and the project becomes democratic. Moreover, crowdsourcing connects people on two ends – the ones contributing and receivers.

Anything I propose, anything unfamiliar will not unite people, will not create an identity of the place. And what is its identity? What is identity of the area that diverse? When going deeper into trying to find an answer little did I know the answer was there the whole time. What makes the identity is their diversity and the diversity are people within. From place analysis I found out that disadvantaged areas do not differ much from the rest of the city.

Areas called by municipalities “ghettos” look like any others neighbouring to them. What makes them special is the number of cultures colliding and variety of people. It became clear to me at this point that it is people – residents or anyone willing to participate – that has to be a core of the projection.

4.2.2. “Selfie³ culture”

Along with appearing smartphones, that thanks to front camera enable to take a photo of ourselves we could have observed rising tendency of taking selfies. According to Google Analytics [54] Android users took 93 million selfies back in 2014 and in 2018, other statistics [55] show that 62% of U.S. adults had taken a photo of themselves and uploaded on social media (the percentage raised to 82 in the group age 18-34).

As the phenomenon gained popularity modern psychology is investigating it attentively trying to find a why to this phenomenon.

“The selfie (an arm’s length close-up self-portrait) photograph is a way to control others’ images of us, to get out in front of their judgments, to put an image in their heads with purpose and spunk. Others’ judgments are no longer just their own creation, the selfie objectifies the self, influences others’ thoughts. And, since the selfie is one’s own creation, it also affords plausible deniability; it isn’t me, it’s just one “me” that I created for you.”[56]

“The “me” presented in a selfie is an avatar of the self, a persona, a character created for public consumption. These self-avatars engage narratives. (...)Seldom are selfies ever printed, let alone on archival paper for later conservation and keeping long after current digital file storage formats have been replaced by generations of others. They are meant to be visually consumed immediately. In this manner, the selfie reframes our expectations of the self-portraiture genre to alter any previously held conceptions of its permanence”[57].

The participation in the project should not be complicated, neither for only ones interested in art, design or technologies. I imagined that people needed to have a task easy to fulfil, something familiar. I also count on activating narcissistic nature of humans that would like to see themselves as a part of projection.

There are two projects I found working on the same principal. Both of them were temporary installations but their popularity and people’s will to take photo then projected on big screen in an urban space show that a simple as one click brings joy.

³ “selfie (noun, informal) – A photograph that one has taken of oneself, typically one taken with a smartphone or webcam and uploaded to a social media website”[61]

Gigantomat – Instant fame installation is an idea and design of two light designers: Bertil Göransson from Luxera and Johan Moritz from the City of Malmö. It was created in 2010 and has been a temporary installation in a number of different locations in Sweden. Authors describe the artwork as a reflection of today's society where it is possible to become a well-known face in the public space. It works as a traditional photo booth but instead of pictures printed they are projected on either large canvas or a facade. The next picture can be taken no earlier than 30 seconds and when there is no activity in Gigantomat all previous pictures will be looped, creating a slideshow.



fig.17 (a, b) Gigantomat, (a) upper, (b) down

“Framed” – The PhotoBooth an interactive installation created by The Electric Canvas on the National Portrait Gallery of Australia. It works similarly to Gigantomat but it is slightly more advanced. Photos of people in frames are a part of the projection along with colourful dynamic creation. The pictures were taken on green background that gave the designer possibility to place people on matching to the general theme background (eg. clouds in the first picture vs. single colour in the other).



fig. 18 “Framed” by The Electric Canvas

4.2.3. Graffiti

One of my observations in deprived areas concern physical condition. The reason why they seem neglected is the existence of graffiti, rarely seen in the other parts of Copenhagen. While murals are considered art, graffiti tags (most often used to “decorate” facades) seen as act of vandalism. Graffiti, even artistic is done without a permission of the owner.

However, if we take a closer look at Banksy, one of the best-recognised street artists, answering if what he creates is an act of vandalism or an artistic expression is ambiguous. Worth mentioning is that his artworks are tightly connected to the occurring events in the world (eg. wars, social situation), delivering political messages. Graffiti became a way to comment the world around us. Banksy, among other artists uses a stencil style.



fig.19 Banksy



My inspiration became what surrounded me in the underpass. What if the projection did not fight, trying to cover it but be an integral part. What if layer of light could merge into the existing graffiti and what if the projection served as a temporary graffiti?

fig.20 Focus area graffiti

4.2.4. Colours

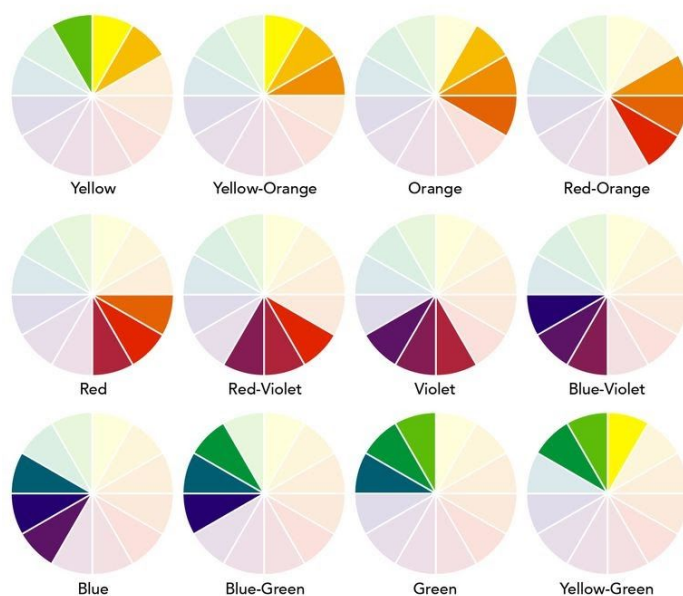
The projection is planned to be a permanent installation, that is why the colours should not remain the same the whole year but rather change. The inspiration were changes observed in nature. Changes that are hardly noticed from one day to another, slightly more when months compared and then in the following season it becomes beyond recognition. I need to emphasise here that significant changes I talk about refer to Denmark and it has to be reconsidered when designing for other places where changes between seasons are not that significant.

Colour theory is a guidance to color mixing and a useful navigation tool for understanding relations between them. It was originally formulated for RYB palette as red, yellow, blue pigments were used in painting as “primary” colours that when mixed can create all other colours. Nowadays more often used colour wheel is a light model RGB(red, green, blue) that responds to three colour receptors in human eyes.

One of the group of harmonious colours are analogous colours that are neighbouring on the wheel. These compilation of colours is the most often appearing in nature.



fig.21 (a,b,c,d) Analogous colours found in nature, (a) left, (b) middle left, (c) middle right, (d) right



I imagine assigning different segment of the circle to every month of the projection. Every month only one segment of three changes making the transition smooth. Neighbouring colours on the wheel give me possibility to reflect slowly changing nature in a year cycle.

fig. 22 Analogous colours

4.3. Testing

Designing for communities with emphasis on participation became a core of this thesis. Both Gigantomat and “Framed” projects revealed participants’ high interest in “lending” their image for showing it in big format. Above mentioned projects used photo booth with immediate effect while my idea is based on sharing an image that might not be seen immediately (or even never) by their authors.

The test I proposed was an online survey to find out if the idea is not an utopian vision.

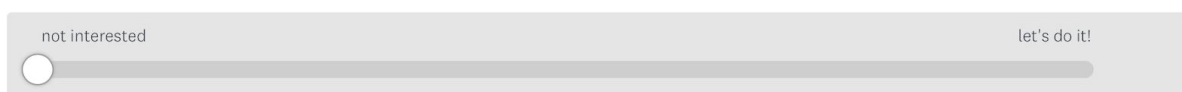
Hypotheses: People are willing to share their image for sake of: supporting social initiative/ improving urban area.

I expect that people are more likely willing to:

- A. share their privacy when they feel it helps others
 - I assume that even one protecting their privacy wouldn’t mind sharing their image for the sake of good cause.
- B. participate if it doesn’t involve much effort
 - I assume that even one not interested in participating in urban projects would share their image as it is as simple as one click.

In addition to 3 demographic questions(gender, age, nationality) three more were asked. I tried to make sure the questionnaire is clear for everyone therefore concepts of participatory urban project and urban regeneration were explained along with a short description of the project idea. The image provided was to demonstrate how the image would be filtered and displayed on the wall. Three last questions were as follows:

1. Is your image publically accessible to the public on social media (eg. public instagram account)?
 - YES
 - NO
2. How would you rate your willingness to take part in a participatory urban project*?
* a project in a public space created with the engagement of its residents



We came to the final question. Before you answer it, please take a look at the picture below. As an urban regeneration* a light intervention in a form of a projection of images was proposed. It is composed of selfies, turned into graffiti-like images. The images are projected which means they are not a permanent element of the wall, they are visible only when it's dark. The images appear and vanish to give place to new ones.



*Urban regeneration, also known as urban renewal is an action directed at collapsing areas of cities to improve their physical and economic situation reversing the decline.

3. How would you rate your willingness to share your selfie to be projected in a public space in the form you saw above? (knowing that your image won't be used for any other purpose)

I would never share it

I would share it for sure

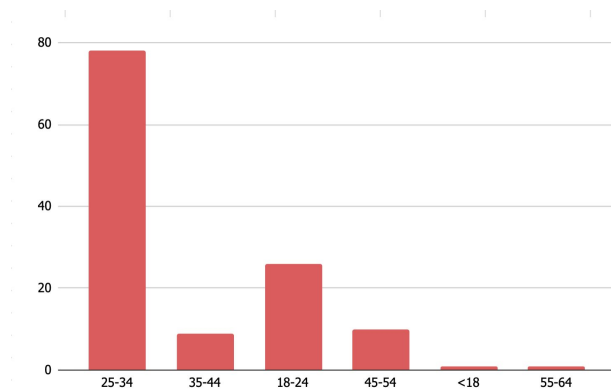


fig. 23 Age of the respondents

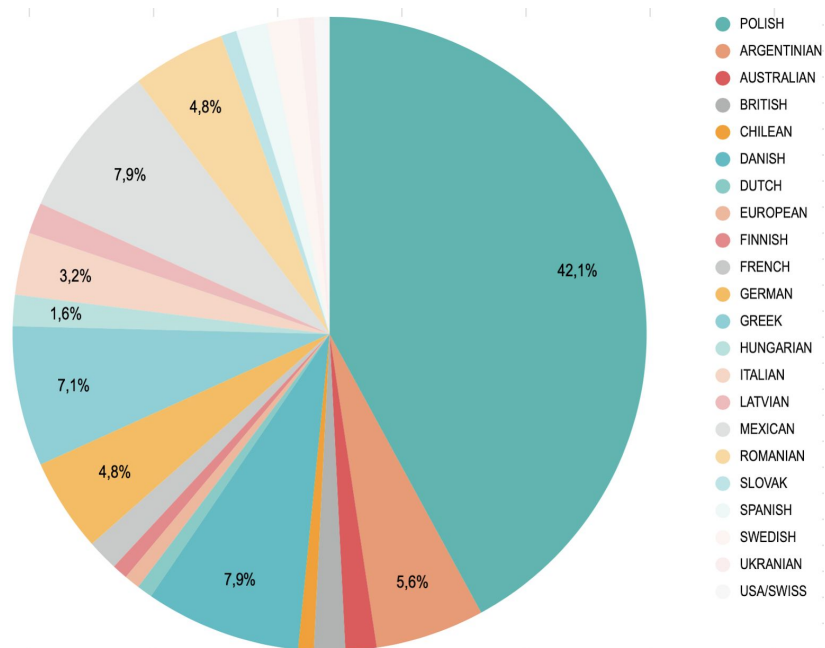
Results:

The questionnaire was filled by 125 people (59% of females) in the age of 18-64. As the project is proposed for culturally diverse area I tried to make sure the answers come from people with different nationalities to furtherly analyse if the country they identify with have influence on the results. The answers come mostly from European and Latin American nationalities

Respondents did not see a percentage when marking their answer through the use of visual analogue scale(VAS) that instead of numbers gave more freedom to the respondents. The results of questions two and three I analysed as if there were only two possibilities – willing to take part and unwillingness. If the the dot on the scale

exceeded 50% (percentage only visible to me) I would mark it as a yes.

fig. 24 Proportion of nationalities



The average from these questions was calculated not as an average of percentages but a proportion of two opposites.

The survey showed that:

- A. 76% of respondents' image is available online
- B. 75% of respondents are willing to take part in participatory urban project
- C. 58% of respondents are willing to share a selfie.

The answers were furtherly analysed according to gathered demographic data (see appendix):

gender: no significant differences

age: in most of the groups there were no significant differences (<18 and 55-64 omitted due to small sample). However, the numbers for second and third questions increased in the group of 18-24 year olds.

nationality: Three largest groups were taken into account – Poles, Nordic (Danish, Swedish, Finnish) and Latin American (Argentinian, Chilean and Mexican). The results showed most interest in participatory projects and sharing a selfie in the last group, that may indicate on relation between social openness and interest in participation.

What has the most influence on the decision then? To understand the relation between the answers for 1st or 2nd question and the third one the comparison was made and shown in numbers for better visual understanding.

The number of people willing to share a selfie was counted in every possible scenario and is given as a percentage in the table below. N/A imply to the entire collected sample, tick for either image available online or where willingness to take part in participatory project exceeded 50% while cross for the opposites.

Image available online \ Willingness to participate in urban projects	N/A	✓	✗
N/A	58%	60%	53%
✓	66%	67%	63%
✗	38%	37%	36%

The analysis of the results show that availability of the image to the public in social media has no significant importance when deciding on sharing it in public space. There is a strong relation between the willingness to participate in urban projects and sharing a selfie that can be its part. The outcome displays that in the group of interested in participatory projects responders willingness to share selfie raises almost double. Only one of my hypothesis(A) proved itself while the other one gives me valuable insight

demonstrating the need for encouragement **fig. 25** Results table regardless of the proposed project.

What could have been done better:

- Gathering responds from non-Western nationalities or perhaps even residents of my areas of interest
- The context of the project should have been more precisely described as some of the comments indicate the background was unknown and questions seemed

abstract:

"If it were for a particular cause I would be more willing to participate. Why do this of portraits? Why here?"

" Sounds interesting. But i don't understand the point of projecting a selfie."

"don't like it without the context"

"My agreement would depend on the context of the presented projection. A presentation of a local community, institution etc."

4.4. Ideation

4.4.1. key design elements

- 2x participatory
 - interactive
- triggers curiosity
 - never the same outcome
 - creating dynamic illusion
- inspired by existing elements of space
 - graffiti
- easy to engage

4.4.2. The core - people

The test showed possibility of success in terms of interest and therefore engaging people with use of selfies and in this section I will describe how I imagine solving the process of their creation. The design assumes a dynamic content therefore pictures in continuous change. Developing a platform, ideally an easy app where photos could be uploaded and then gathered in database. The images in database are coloured according to the month they appear in the projection. They will not disappear from database but rather be used when new selfies are not uploaded.

To create the graffiti-like outcome I used Adobe Photoshop producing every image separately. This method served only for the experimenting purpose but in the final outcome should be switched to a programming language eg. using Processing⁴ so it can be generated automatically when uploaded without human (designer's) interference. To

⁴ programming environment, based on Java, for creating visually oriented applications, popular among the designers who do not need to have experts knowledge about programming languages.

assure the design intent and to prevent from inadequate content upload (eg. inappropriate parts of the body) face detection ought to be included in the sketch⁵.



fig. 26 Schematic representation of filtering

To achieve the effect of stencil image threshold filtering and colour filter were used. Threshold is a function that converts images into high-contrast, black-and-white images. It groups and converts pixels lighter than the threshold to white and darker to black. Experimenting in Photoshop revealed an issue with the threshold and it proved that its level cannot be the same for every picture.

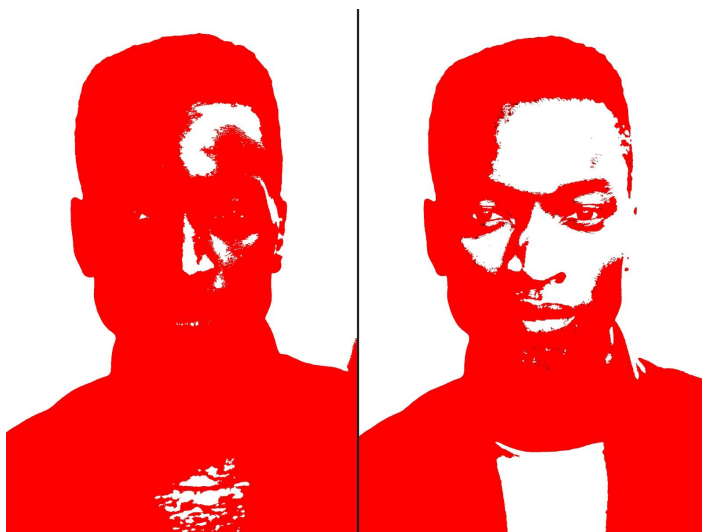


fig. 27 Comparison between threshold in value 127(left) and 60(right).

When filtering images of people with a light skin tone with threshold on 127 value (in the middle of scale; 0 – black, 255 – white) gave satisfactory effect but it did not test itself for darker skin colours. A useful tool for adjusting the threshold was a histogram panel that displays the distribution of brightness levels in an image. My subject of interest were faces

⁵ sketch – a processing program, that is where “coding” takes place.

and making sure the threshold is adjusted to them therefore a histogram created focused on the face area that was primarily marked (rectangular frame in fig. 27). If the filtering was to be programmed it is crucial to adjust the threshold to the average pixel value of a face uploaded.

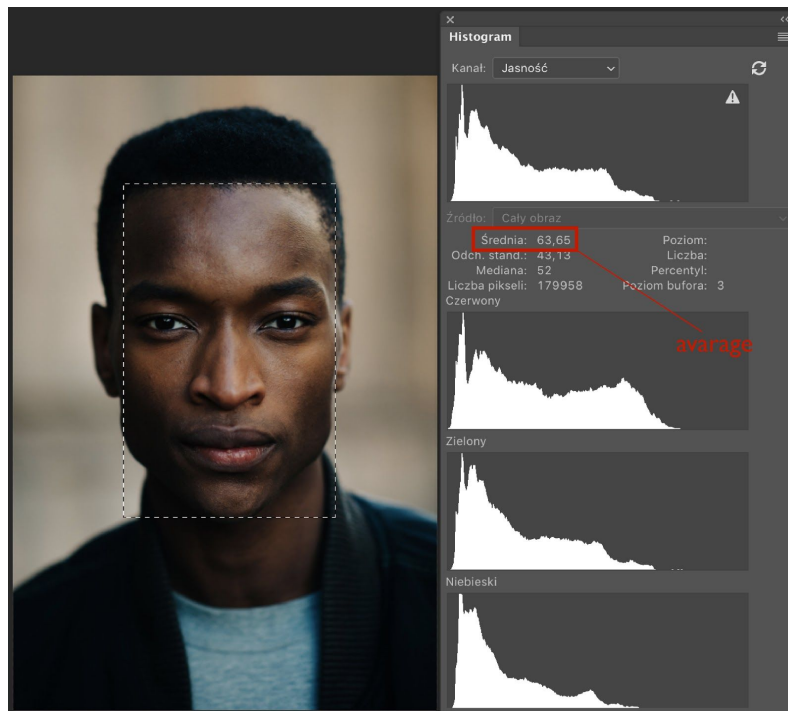


fig. 28 A histogram in Photoshop

Projection mappings are usually used in bigger scale projects, lighting up whole facades, ideally in bright colours. Projecting on brick wall, full of intense colour graffiti is demanding. However, where the obstacle appears new challenges raise along. One of my success criterion is to support place identity and therefore existing scenario. Creating a design that matches with graffiti is one way of the reinforcement and acknowledging existing street art there and emphasising it is the second level of fulfilling the criterion. Adding white light in “gaps” of monochromatic processed images would reveal graffiti on the background making them an integral part of the projection.

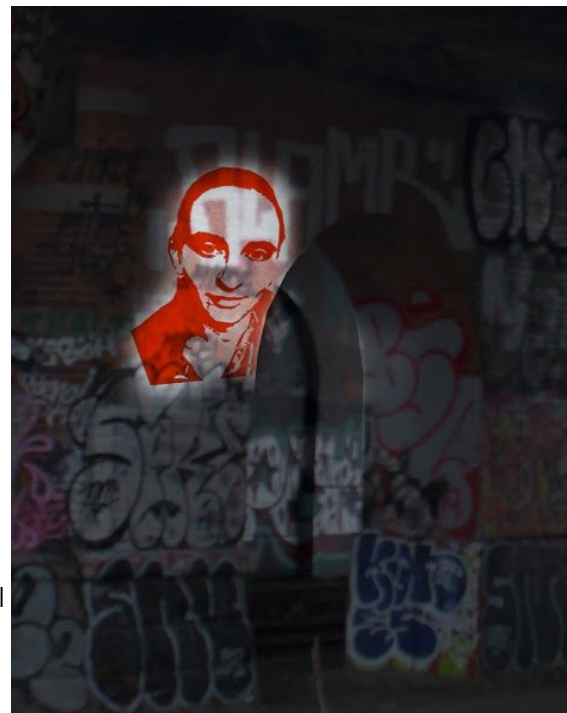


fig.29 Representation of the projection of the image

4.4.3. Colour palette

Colours change as the months pass by. The transition is smooth, perhaps unnoticeable comparing two following months but difference perceptible when visiting a place different season. As explained in 4.2.4 section the palette for every month consists of three segments of the wheel and every month only one colour of three shifts creating a hard to notice change.

Colour wheel presented below is my interpretation of HSB and RGB models. HSB (hue, saturation, brightness)⁶ is an alternative representation of RGB wheel.

Both saturation and brightness in the projection will be set on maximum value therefore the wheel illustrates only Hues. While RGB model uses values (0-255) for every of the three channels, the hue in HSB model is expressed in degree angles.

The months increase clockwise starting with January on the top while the angle increases counterclockwise starting from the bottom. July is the warmest month in Denmark therefore I picked red (0°) on the colour wheel to indicate my starting point.

A colour wheel was divided into 12 pieces representing 12 months of the year which gives 30 possible hues within every segment (month).

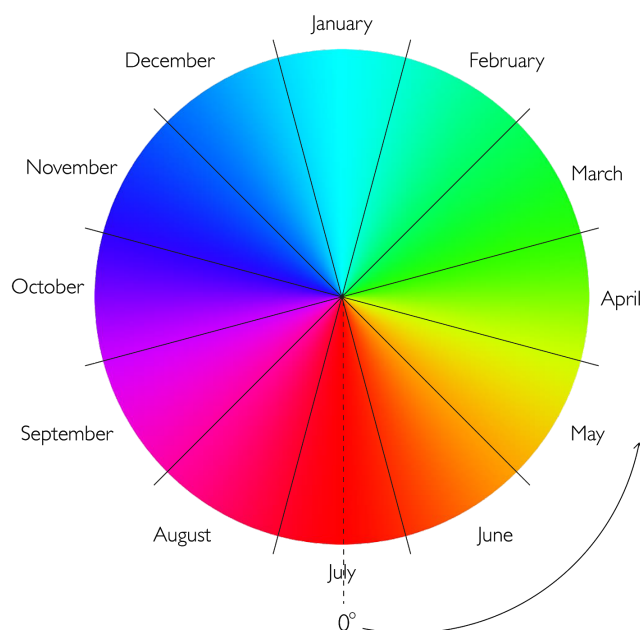


fig. 30 Yearly colour wheel

I will use colour palette of July as an example. Every image (selfie) before projecting will be assigned randomly to a hue value of one of the three months – current, previous and following:

⅓ photos will appear with hues range between 346° - 15° (July)

⅓ photos will appear with hues range between 16° - 45° (June)

⅓ photos will appear with hues range between 316° - 345° (August)

⁶ also called: HSL (hue, saturation, lightness) and HSV (hue, saturation, value)

The coloured squares depict possible colours of them that were randomly picked within given above ranges.

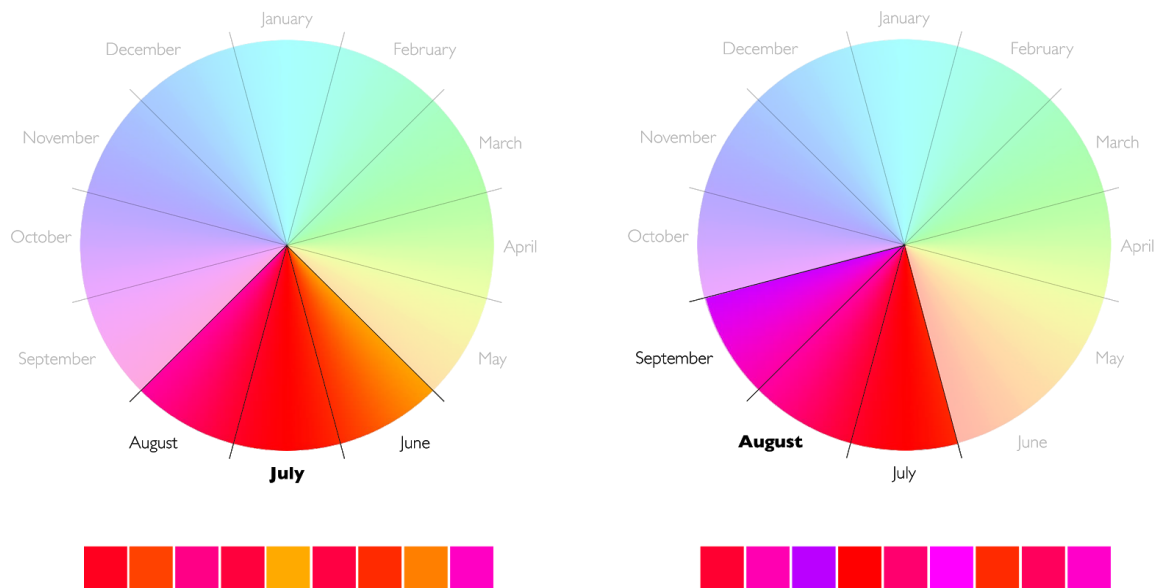


fig. 31 Colours of July and August

4.4.4. Two visual layers

When I talk about visual layers what I have in mind is the sensation of something hidden below the top one. The projection is in fact one but after interacting with it, it will uncover what was invisible before. On what principles the “hidden” one appears will be explained in the next subsection, here I would like to focus on explaining what the “top layer” is. What the observer sees at the beginning is the projection consisted of bricks arranged the way real bricks appear on the wall. The projection reacts on the movement of people in the space, creating faster activity similar to floating along with faster activity eg. running. Projection mapping gives a possibility of creating illusion that is not fulfilled with only faces projected and goes against of the idea of mapping as the geometry of existing architecture is not taken into consideration. The inspiration again was the space itself, trying to recreate what is already known to residents but resigning from static character. The change of dynamics indicates interactivity, encourages to “take an action” and check furtherly how other motions work on it. It serves to trigger interest, to attract, to metaphorically say “play with me”.

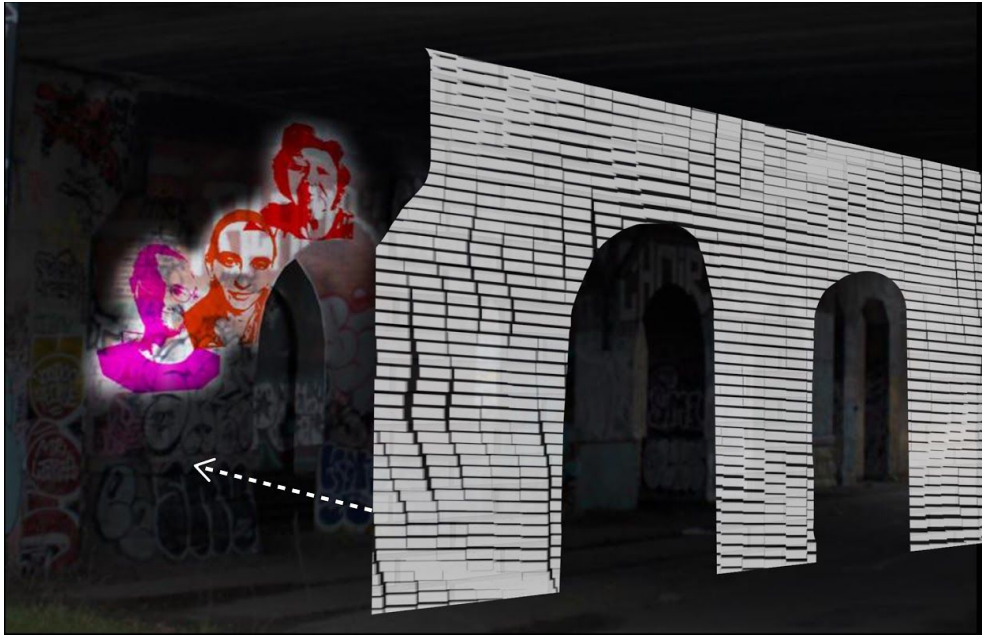


fig. 32 Two visual layers

To create a “brick layer” I experimented with Touchdesigner 009. The outcome of the experimentation is available as links in the appendix.

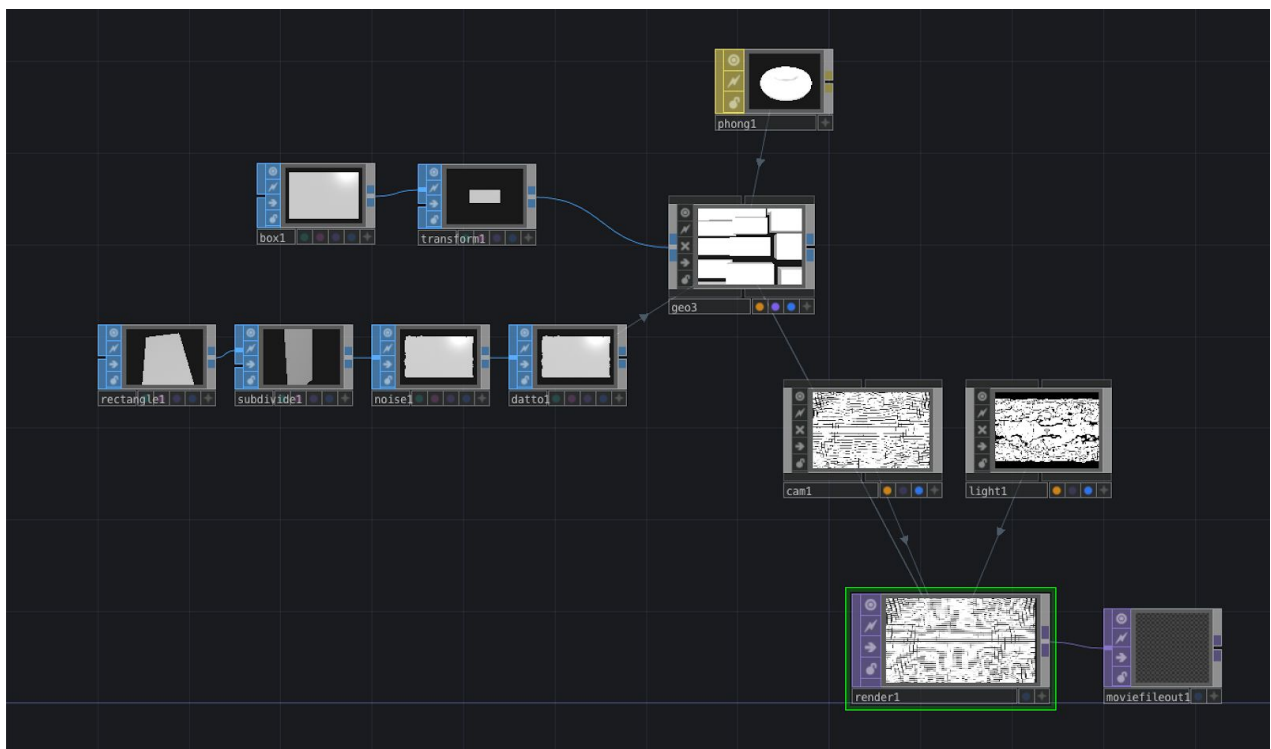


fig. 33 TouchDesigner

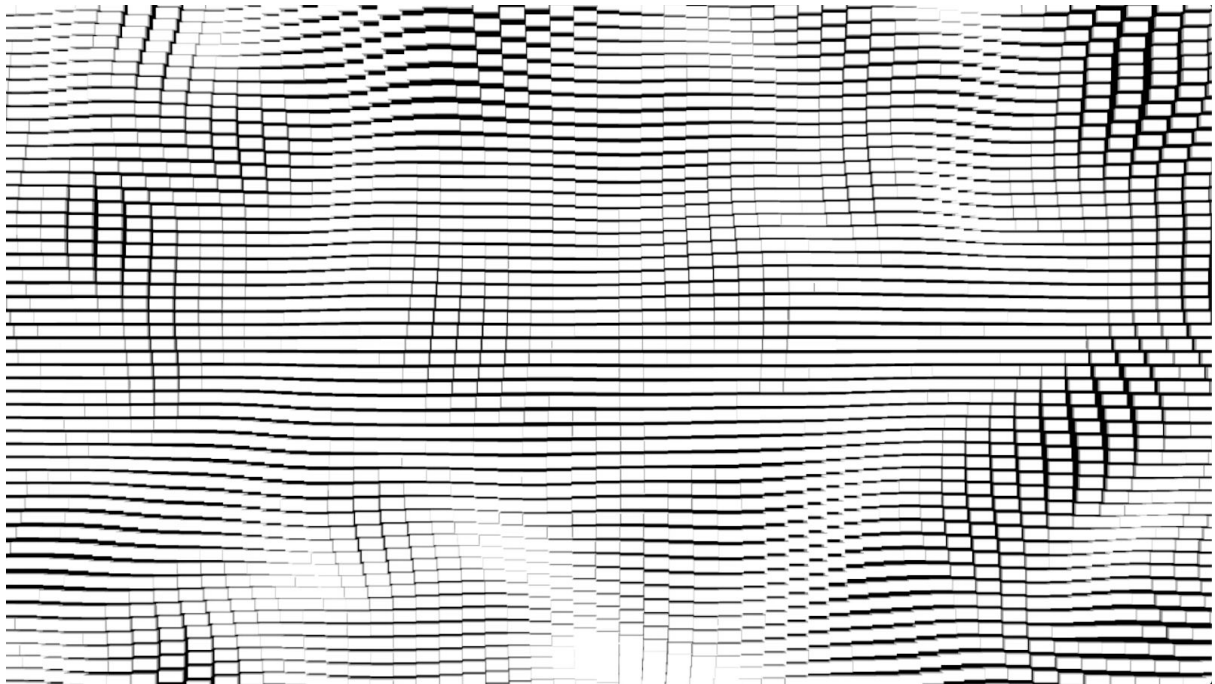


fig.34 The brick wall projection example

4.4.5. Interaction

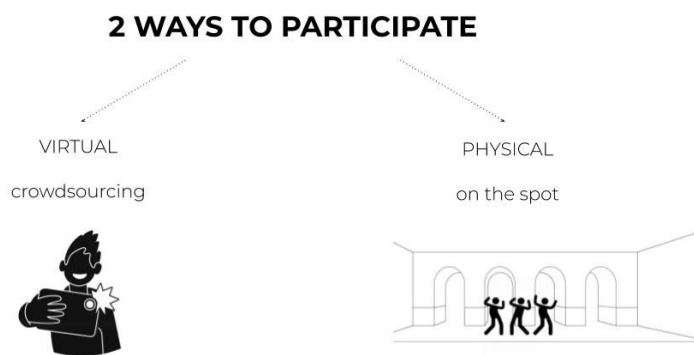


fig. 35 Two ways of participation scheme

Neither faces nor the brick projection alone fulfil the success criteria and have to be seen as one. Motion detection sensors are another integral element of the design that will enable to adjust the speed of the flow and after interacting with the projection by eg.

hand gestures let the bricks flow revealing the images. To engage people in play the faces should remain “hidden” to give chance to explore what is below/under the top layer. If there are no new photos uploaded they come from a database. Analysis on interaction showed a potential of multi-user experience in increasing social connectedness. The bricks return on their initial place after a person moves to thus interacting simultaneously is the only way to see the wall “uncovered”.

Both kinds of participation affect each other in an indirect way. Sending a selfie, I hope, will encourage to a visit in person to see own image and the physical participation, on the other hand increases the willingness to share own image to “search” for it in the future. For a better explanation the sketch with phases of interactions was prepared. Firstly a database has to be fed with selfies and they wait there until an interaction on the spot is

taken. The bricks projected give the sensation of falling when the limb movement such as waving is detected. The empty space after exploded bricks reveals an image. After everything comes to the starting position same photo can appear again in a different place and with different colour assigned.

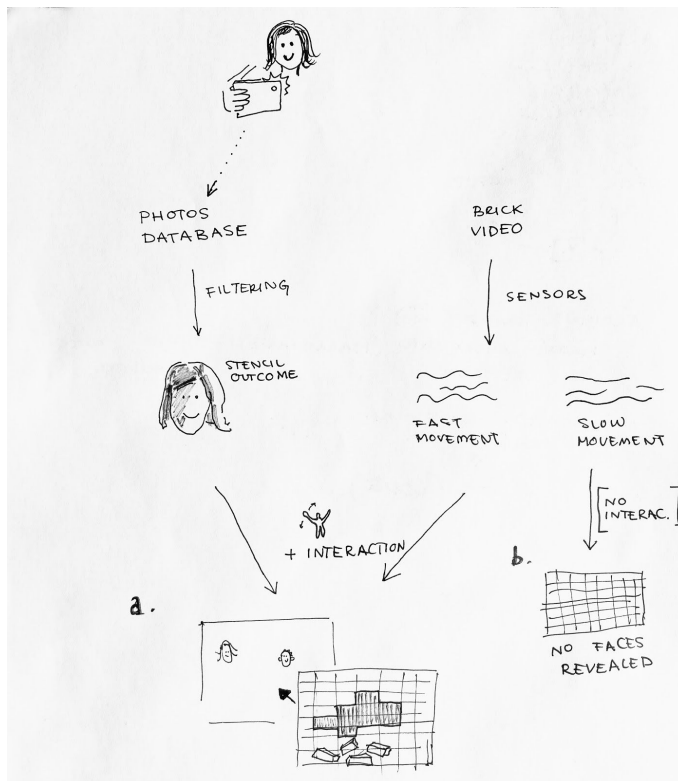


fig. 36 Scheme of the activity

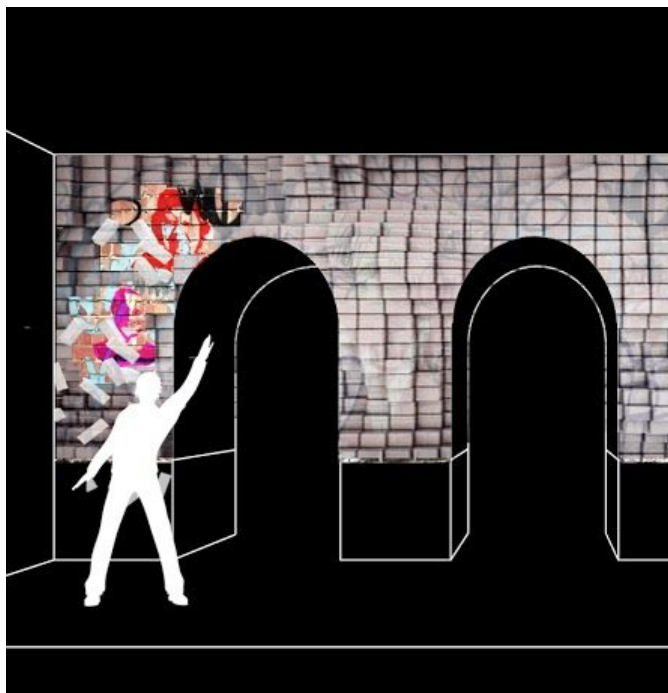


fig. 37 Physical participation

Shadows

The obstacle that may appear then working with projections are shadows casted on the wall. The place of the projection is rather small, comparing to mappings on the facades, which means the projector is situated close to the surface it is projected on, therefore human silhouettes shadows will shield significant part of the projected image. Moreover, as an interactive design shadows casted effects the experience of a playful, boundless space. To eliminate this issue the common practice is using multiple projectors with edge blending to create one display. One of the research [58] suggests using a depth camera in addition to multiple projectors, moreover it “(...) utilizes a human skeleton obtained from a depth camera to track the posture of the person which changes over time”. This method should be furtherly analysed but it proves that shadow casting should not be a subject of concern.

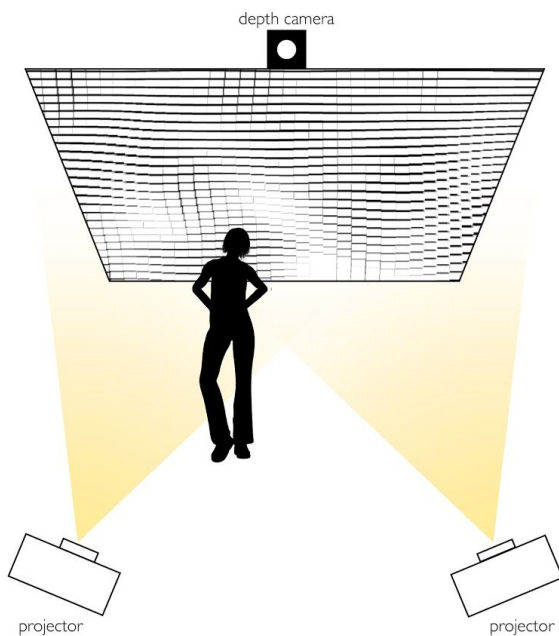
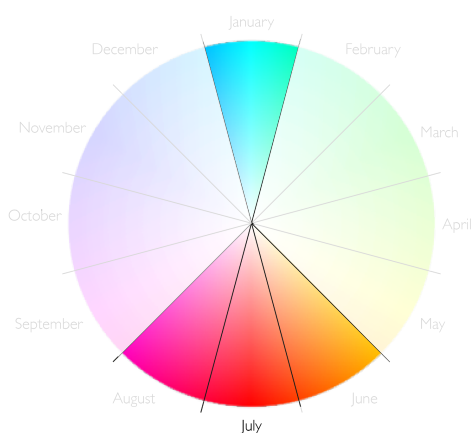


fig. 38 Shadow removal setup

4.5. Final proposal



The final proposal consists of all elements mentioned in the previous sections. The colour of the bottom part of the column is lit by a complementary colour to the colour of the month (see fig. 38).

fig. 39 Complementary colour wheel



fig. 40 Final design

5. Discussion

The analysis results indicate that disadvantaged areas, often physically neglected are not forgotten by municipalities that desire to provide aid with number of projects in the spirit of urban regeneration. They consist of both physical improvements such as construction or revitalisation of urban spaces such as parks or local squares and also directed towards difficult social situation by educating and increasing social awareness. A significant role in development of these areas is assigned to a social cohesion seen as a desirable characteristic of society. A successful approach to urban projects is based on a participation of local individuals or groups. The analysis confirms lack of interest in residents of deprived areas in active participation in public life that is why the challenge of creating a design that would attract and engage them is big. The literature review and an insight into other related projects show a close link between place identification, involvement in urban projects and favourable outcome of urban renewal. If the residents do not find themselves as part of the community it is hard to assume they would stay with contact with the rest of members of local society. One of the directions in designing for increasing social connectedness are interactive designs but the condition to be fulfilled they need to be developed for a multi-user. take into account the state of art in the field good results in engaging into participation can be achieved by playfulness that will characterise the design.

Insight into existing theories allowed me to propose a design suitable for the focus area I chose in the beginning. The process despite the fact it was directed to priory determined place has partly a universal character. The focus area served as an example of the approach that can be adjusted to be implemented into other locations.

The online questionnaire provided answers to the hypothesis, consequently giving new light to potential relation between sharing own image in public, participation willingness in urban projects and a potential success in participation in the design of proposed project.

The conducted survey had also flaws that should be mentioned. The sample of 125 gives credible result although the group could have been more diverse culturally and therefore larger for a bigger sample from every nationality I received answers from. The comments at the end of the questionnaire might indicate the purpose of the project should have been explained more detailed as the intention of the project was not entirely understood by a few individuals.

The global situation with pandemia of COVID-19 enabled to follow work as initially planned. In connection with the circumstances the work remains theoretical and based mostly on research analysis. The conditions we found ourselves were not only mentally challenging but it also become impossible to experiment with any equipment usually provided by university or the Light LAB where it would have been potentially easier to

tackle problems when physically appearing. The success of the project cannot be announced as the final evaluation was not possible to take place. I did not consider an online surveys meaningful course to take in evaluation of final design. However, it does consist of elements that present answers to the analysis of existing knowledge and my vision.

As stated earlier the present thesis provides a theoretical knowledge that should be furtherly tested.

As the future work see developing a platform or/and an app for selfies upload.

Another issue to resolve is adjusting movement of the projection image to the speed of people in the space. For this purpose I would observe people on the location to get an insight of the speed limitations so it is both pleasant to the eye and corresponding to the velocity. The change should be smooth but recognisable. Another question that comes to mind is what happens when there are multiple people in space. I would recommend analysing scenarios with the average speed but also considering the direction of human movement.

The existing scenario assume revealing “second layer” – faces when a voluntary interaction is detected. The test I would like to run would concern if any indication of existence of the hidden layer is needed. In other words if people are willing to take action to explore or should be suggested.

6. Conclusion

The aim of this thesis was finding an answer on **how can a light intervention in disadvantaged areas of Copenhagen help in urban regeneration and strengthen sense of community identity?** By developing this work, the intention has been to create a design approach than can be used in deprived areas to add a new layer of lighting to the nocturnal urban scenario.

The thesis should be read as a guideline, developing a framework to be able to implement the design in other places in need of urban intervention. The most important elements in successful urban regeneration are participation, both with placing a design in the right architectural and urban context. Reviewed projects such as Silent Lights and Satellight show that converting elements that build a negative image by changing their meaning is beneficial practice. The proposed light intervention is based on the elements characteristic for the space often having negative connotations such as graffiti. The projection not only reveals them but is built on this characteristics. Engaging participants in the process is another key element in the generation of project for communities. The involvement and social connectedness is triggered by providing a multi-user, interactive

and playful design. It supports universality meaning it is suitable for people in all ages and culturally diverse.

Moreover, an outdoor place promoting gatherings reinforces a community identity and its unrepeatable content can be discovered all over again every day.

Behind a success of this project stand willingness to participate but more importantly eagerness to share own image for a public display. The test conducted revealed a relation between the interest in urban project and willingness to share private image demonstrating no relation between this eagerness and its public availability online.

Due to a country lockdown caused by global pandemia of COVID-19 therefore University's restrictions it was not possible to develop a project fully tested and experimented with and as a result provides a design based on the theoretical knowledge.

As mentioned before, the design, based on the findings in focus area can be implemented with adjustments in its elements in other locations.

The project consists of a platform for a photos upload, furtherly filtered and a physical interactive installation in the space. They form two visual layers and this dualism has to stay constant. The top layer, bricks in my case, serves as an attention trigger and a form of a "curtain" to be pulled aside by interaction with space, revealing what is underneath. However, I do recommend an analysis such as careful observation to define a key elements of the place.

The proposed design colours are based on the existence of distinct seasons of the year where it is meant to be implemented and that should be taken into account when introduced to a deprived area in a region of distinct geographic situation.

Even though further experimentation and testing phase are required in order to develop the design and understand its implementation, this master thesis aims at contributing with light interventions in disadvantaged areas of Copenhagen to the field of lighting design for urban regeneration.

7. Bibliography

1. Ramunas B. 5 Stages in the Design Thinking Process [Internet]. The Interaction Design Foundation. 2020 [cited 25 May 2020]. Available from: <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>
2. Friis S. The 6C Model: The Contribution of Design to Open, Complex, Problem Solving. *The International Journal of Design in Society*. 2016;10(3):13-30.
3. Tannenbaum N, Spradley J. Participant Observation. *Anthropological Quarterly*. 1980;53(4):260.
4. Gehl J, Koch J. *Life Between Buildings*. Washington, DC: island Press; 1987.
5. Close H. The use of photography as a qualitative research tool. *Nurse Researcher*. 2007;15(1):27-36.
6. Sustainable Development Solutions Network. *World Happiness Report 2020* [Internet]. 2020.[cited 28 March 2020] Available from: <https://worldhappiness.report>
7. Global liveability report reveals which cities offer the best quality of life for Europeans abroad [Internet]. *Eca-international.com*. 2020 [cited 28 March 2020]. Available from: <https://www.eca-international.com/news/february-2020/global-liveability-report-reveals-which-cities-off>
8. Copenhagen Municipality. Policy for disadvantaged areas of Copenhagen [Internet]. Copenhagen Municipality; 2010 [cited 28 March 2020]. Available from: https://kk.sites.itera.dk/apps/kk_pub2/pdf/869_yNq8vh4bJF.pdf
9. Statistics Denmark [Internet]. *Dst.dk*. 2020 [cited 28 March 2020]. Available from: <https://www.dst.dk/en>
10. Farmer B. *Radical Islam in the West*. Jefferson, N.C.: McFarland & Co.; 2011.
11. Regeringen. *Ghettoen tilbage til samfundet. Et opgør med parallel samfund i Danmark* (Eng.: *The ghetto back into society. A revolt against parallel society*). København: Social ministeriet; 2010 [cited 28 March 2020]. Available from: https://www.stm.dk/multimedia/Ghettoen_tilbage_til_samfundet.pdf
12. Mechlenborg M. Reintegrating ghettos into society: Lessons learned from the Danish ghetto strategy. *Nordic Journal of Architectural Research* . 2019 Apr 25;31(1):59-87. 3.
13. [Internet]. *Trm.dk*. 2020 [cited 24 May 2020]. Available from: <https://www.trm.dk/media/4363/udsatte-boligomraader-2019-007.pdf>
14. Ariely G. Does Diversity Erode Social Cohesion? Conceptual and Methodological Issues. *Political Studies*. 2013;62(3):573-595.
15. House of Commons. (2004). *Social cohesion. Sixth report of session 2003-04*. London: The Stationary Office.

- <http://www.publications.parliament.uk/pa/cm200304/cmselect/cmodpm/45/45.pdf>.
16. kvarterloeft. ten years of urban regeneration. 11-12 October 2007 [Internet]. Vive.dk. 2007 [cited 28 March 2020]. Available from:
<https://www.vive.dk/media/pure/3783/370207>
 17. Schiefer D, van der Noll J. The Essentials of Social Cohesion: A Literature Review. *Social Indicators Research*. 2016;132(2):579-603
 18. DIY Under BROEN, NEEDS YOUR SUPPORT [Internet]. ShreddersLodge.com. 2017 [cited 2 April 2020]. Available from:
<http://shredderslodge.com/2017/07/diy-broen-copy/>
 19. Carmona M, Heath T, Oc T. *Public places - urban spaces*. Burlington, MA: Architectural Press; 2003.
 20. Gary H. *Urbanized*. Gary Hustwit; 2011.
 21. Sunrise and sunset times in Copenhagen [Internet]. Timeanddate.com. [cited 24 March 2020]. Available from:
<https://www.timeanddate.com/sun/denmark/copenhagen>
 22. Matsuoka R, Kaplan R. People needs in the urban landscape: Analysis of Landscape And Urban Planning contributions. *Landscape and Urban Planning*. 2008;84(1):7-19
 23. Hull R, Lam M, Vigo G. Place identity: symbols of self in the urban fabric. *Landscape and Urban Planning*. 1994;28(2-3):109-120.
 24. Stewart W, Liebert D, Larkin K. Community identities as visions for landscape change. *Landscape and Urban Planning*. 2004;69(2-3):315-334.
 25. Roberts P. *Urban regeneration*. Los Angeles [etc.]: Sage; 2017.
 26. Caves R. *Encyclopedia of the city*. Routledge; 2004.
 27. Stender M, Bech-Danielsen C. Bridging social gaps: Transforming disadvantaged areas by linking them to the city . *Nordic Journal of Architectural Research*. 2019;31(1).
 28. Ramlee M, Omar D, Yunus R, Samadi Z. Revitalization of Urban Public Spaces: An Overview. *Procedia - Social and Behavioral Sciences*. 2015;201:360-367.
 29. Lavrinec J. Revitalization of Public Space: From "Non-Places" to Creative Playgrounds. *Santalka: filosofija, komunikacija*. 2011;19(2):70-75.
 30. Superkilen - współczesna urbanistyka w Daniii - Superkilen [Internet]. *Architektura.info*. 2013 [cited 28 April 2020]. Available from:
https://architektura.info/architektura/polska_i_swiat/superkilen
 31. Williams D. *How the arts measure up*. Stroud: Comedia; 1997.
 32. Landry C, Greene L, Matarasso F. *The art of regeneration*. 1996.
 33. Kay A. Art and community development: the role the arts have in regenerating communities. *Community Development Journal*. 2000;35(4):414-424.
 34. Deru Simic L. What is Specific about Art/Cultural Projects?. *SSRN Electronic Journal*. 2003

35. Street art murals for urban renewal [Internet]. URBACT. [cited 28 April 2020]. Available from: <https://urbact.eu/street-art-murals-urban-renewal>
36. Silent Lights [Internet]. Kickstarter. 2012 [cited 3 May 2020]. Available from: <https://www.kickstarter.com/projects/artistbuild/silent-lights/posts>
37. Silent Lights - Urban Matter Inc [Internet]. Urban Matter Inc. 2013 [cited 4 May 2020]. Available from: <http://urbanmatterinc.com/silent-lights/>
38. Sanoff, H., Community participation methods in design and planning John Wiley and Sons, Inc, New York, Chichester, Weinheim, Brisbane, Singapore, Toronto; 2000.
39. Toker Z. Recent trends in community design: the eminence of participation. *Design Studies*. 2007;28(3):309-323.
40. Social Light Movement forces Copenhagen into TRANSITION | Light Research @ MMU | Manchester Metropolitan University (MMU) [Internet]. [Lightresearch.mmu.ac.uk](http://www.lightresearch.mmu.ac.uk). 2013 [cited 24 April 2020]. Available from: <http://www.lightresearch.mmu.ac.uk/social-light-movement-forces-copenhagen-into-transition/>
41. Danish Radio D.R Pia K: Parabol er grimme [Pia K: Satellites are ugly]. [Internet]. 2010 [cited 25 May 2020]. Available from: <http://www.youtube.com/watch?v=PsdAEhAlwDo>
42. Ebbensgaard C. Illuminights. *Space and Culture*. 2014;18(2):112-131.
43. SLA :: North West Park [Internet]. Sla.dk. [cited 4 May 2020]. Available from: <https://www.sla.dk/en/projects/kvarterparknv/>
44. Nordvest Parken - Dansk Arkitektur Center - DAC [Internet]. Dansk Arkitektur Center - DAC. [cited 6 May 2020]. Available from: <https://dac.dk/viden/arkitektur/nordvest-parken/>
45. Wang, F., J. Hu, and M. Rauterberg, New Carriers, Media and Forms of Public Digital Arts, Conference: Culture and Computing, Hangzhou, China, January 2012
46. Hu J, Wang F, Funk M, Frens JW, Zhang Y, van Boheemen T et al. Participatory public media arts for social creativity. In *Proceedings of the 4th International Conference on Culture and Computing-ICCC 2013*, 16-18 September 2013, Kyoto, Japan. 2013. p. 179-180 <https://doi.org/10.1109/CultureComputing.2013.54>
47. Boheemen, T.V., Rich experience design through public installations, Departement of Industrial Design Technical University of Eindhoven, Eindhoven, 2013
48. The politics of public playfulness [Internet]. 2015 [cited 19 April 2020]. Available from: <https://www.youtube.com/watch?v=FnG3-k5phUM>
49. Johnson J. Inside the failed, utopian New Games Movement - Kill Screen [Internet]. Kill Screen. 2013 [cited 20 May 2020]. Available from: <https://killscreen.com/previous/articles/inside-failed-utopian-new-games-movement/>
50. Experience E. Engaging User Creativity: The Playful Experience :: UXmatters [Internet]. [Uxmatters.com](http://uxmatters.com). 2007 [cited 13 May 2020]. Available from:

<https://www.uxmatters.com/mt/archives/2007/12/engaging-user-creativity-the-pleasant-experience.php>

51. Costello B, Edmonds E. A study in play, pleasure and interaction design. Proceedings of the 2007 conference on Designing pleasurable products and interfaces - DPPI '07. 2007;.
52. The Pool, by Jen Lewin | BreckCreate [Internet]. BreckCreate. [cited 19 May 2020]. Available from: <https://www.breckcreate.org/event/the-pool-02/>
53. @vicky_gan F. Dive into Jen Lewin's Interactive Light Pool [Internet]. Smithsonian Magazine. 2013 [cited 15 May 2020]. Available from: <https://www.smithsonianmag.com/arts-culture/dive-into-jen-lewins-interactive-light-pool-180947763/>
54. Brandt R. [Internet]. Bizjournals.com. 2014 [cited 20 May 2020]. Available from: <https://www.bizjournals.com/sanjose/news/2014/06/25/google-divulges-numbers-about-20-billion-texts-93.html>
55. Clement J. U.S. adults who have shared a selfie by age group 2018 | Statista [Internet]. Statista. 2018 [cited 22 May 2020]. Available from: <https://www.statista.com/statistics/304861/us-adults-shared-selfie-generation/>
56. Arkin R. Scholarly Reflections on the Selfie [Internet]. OUPblog. 2013 [cited 25 May 2020]. Available from: <http://blog.oup.com/2013/11/>
57. Belden-Adams K. Locating the Selfie within Photography's History—and Beyond. Exploring the Selfie. 2018;:83-94.
58. Kim J, Seo H, Cha S, Noh J. Real-Time Human Shadow Removal in a Front Projection System. Computer Graphics Forum. 2018;38(1):443-454
59. IMMIGRANT | meaning in the Cambridge English Dictionary [Internet]. Dictionary.cambridge.org. 2020 [cited 28 May 2020]. Available from: <https://dictionary.cambridge.org/dictionary/english/immigrant>
60. Disadvantaged definition and meaning | Collins English Dictionary [Internet]. Collinsdictionary.com. 2020 [cited 28 May 2020]. Available from: <https://www.collinsdictionary.com/dictionary/english/disadvantaged>
61. Selfie | Definition of Selfie by Lexico [Internet]. Lexico Dictionaries | English. 2020 [cited 28 May 2020]. Available from: <https://www.lexico.com/en/definition/selfie>

8. List of figures

fig. 1 A path leading to research question, own figure

fig. 2 Design model, own figure, adapted from the Double Diamond – visual map of the design process

fig. 3 Disadvantaged areas of Copenhagen, available at:

https://kk.sites.itera.dk/apps/kk_pub2/pdf/869_yNq8vh4bJF.pdf?fbclid=IwAR3ugAH-MkObPvbWGRSfxhh2zIMjriC1cUXGUp2GVOcasbsBQYBP1IP-Fyo

fig. 4 Map with focus area marked, own figure, based on Google Maps

fig. 5 Photoshoots map, own figure, based on Google Earth

fig. 6 (a,b,c,d) Photos of focus area, own figure

fig.7 Zones and points of focus area, own figure, based on Google Earth

fig.8 Day/night length, own figure based on:

<https://www.timeanddate.com/sun/denmark/copenhagen>

fig.9 Superkilen park, (a) photo: Iwan Baan, available at:

<https://www.toposmagazine.com/superkilen-copenhagen/#!/foto-post-260-3> , (b) available at:

<https://www.toposmagazine.com/superkilen-copenhagen/#!/foto-post-260-3>, (c) photo: Torben Eskerod, available at:

<https://bustler.net/news/tags/superflex/14777/2761/copenhagen-s-superkilen-urban-park-by-big-topotek1-superflex>

fig.10(a,b) Mural “Plac Zabaw”,

(a) photo: Aneta Chmieleńska, available at:

<https://www.nochodz.pl/szlakiem-street-artu-na-pradze-polnoc/>

(b)photo: Aneta Chmieleńska, available at:

<https://www.nochodz.pl/szlakiem-street-artu-na-pradze-polnoc/>

fig.11(a,b) Silent Lights installation,

(a) photo by Rick Lin, available at:

<https://lilrobin.com/news/2014/02/using-placemaking-to-revitalize-communities/>

(b) photo available at: <http://urbanmatterinc.com/silent-lights/>

fig.12(a,b,c) Home Sweet Sundholm installation, own figure

fig. 13 Nordvest Parken, project by SLA Architects, photos available at:

<https://www.sla.dk/en/projects/kvarterparknv/>

fig.14(a, b) “The Pool”

(a) photo: Liam Doran, available at:

<https://www.westword.com/arts/robb-woulfe-of-breckenridge-creative-arts-honored-as-a-colorado-creative-11358264>

(b) photo: Jen Lewin Studio, available at:

<https://www.asiaone.com/food/pasarbella-and-friends-marina-bay-sands>

fig. 15(a, b,c,d)

(a,b) available at: <https://vimeo.com/193173575>

(c,d) available at: <https://www.youtube.com/watch?v=MfByYmZFFis>

fig. 16 “Hakanai” by Adrien Mondot and Claire Bardainne available at:

<https://trendland.com/hakanai-performance-explores-human-condition-with-3d-mapping/>

fig.17 (a, b) Gigantomat

(a) photo: luxera, available at: <https://luxera.se/gigantomat/>

(b) photo: Bertil Göransson, available at:

<http://www.mynewsdesk.com/se/malmo/images/gigantomat-instant-fame-488130>

fig. 18 “Framed”, photos: Alan Nicol, available at:

<http://www.blakejohnsoncreative.com/framed-the-photobooth/>

fig.19 (a,b) Banksy (a)available at: <https://painting-planet.com/flower-thrower-by-banksy/> (b)available at: <https://www.bbc.co.uk/newsround/46632542>

fig.20(a, b) Focus area graffiti, own figure

fig.21(a,b,c,d) Analogous colours found in nature

(a) available at: <https://pl.pinterest.com/pin/310466968066726831/>

(b) available at: <https://pl.pinterest.com/pin/310466968066726769/>

(c) available at: <https://saatkontor.tumblr.com/post/147411929085/dahlie-dahlia-classic-poème-dahlia-hybride>

(d) available at:

<https://lifeistooshortdont.tumblr.com/post/117813480580/favorite-season-the-sound-of-colors-by-sven>

fig. 22 Analogous colours, available at:

<https://www.elledecor.com/design-decorate/color/a27793858/analogous-color-scheme/>

fig. 23 Age of the respondents, own figure

fig. 24 Proportion of nationalities, own figure

fig. 25 Results table, own figure

fig. 26 Schematic representation of filtering, own figure

fig. 27 Comparison between threshold in value 127(left) and 60(right), own figure

fig. 28 A histogram in Photoshop, own figure. Portrait of Oliver Kumbi by Adam Katz Sinding

fig. 29 Representation of the projection of the image, own figure

fig. 30 Yearly colour wheel, own figure

fig. 31 Colours of July and August, own figure

fig. 32 Two visual layers, own figure

fig. 33 TouchDesigner, own figure

fig. 34 The brick wall projection example, own figure

fig. 35 Two ways of participation scheme, own figure

fig. 36 Scheme of the activity, own figure

fig. 37 Physical participation, own figure

fig. 38 Shadow removal setup, inspired by: https://www.youtube.com/watch?v=_SREVKe8QhQ

fig. 39 Complementary colour wheel, own figure

fig. 40 Final design, own figure

9. Appendix

9.1. Survey results

n	NATIONALITY	SEX	AGE	IMAGE AVAILABLE ONLINE (YES/NO)	WILLINGNESS TO TAKE PART IN PARTICIPATORY URBAN PROJECTS (%)	WILLINGNESS TO SHARE A SELFIE (%)
1	POLISH	F	18-24	Y	100	0
2	DANISH	F	18-24	N	90	3
3	POLISH	M	18-24	Y	77	82
4	DANISH	F	25-34	Y	49	38
5	POLISH	F	25-34	N	100	37
6	POLISH	F	25-34	Y	66	69
7	POLISH	F	45-54	Y	64	58
8	ITALIAN	M	25-34	N	48	0
9	POLISH	F	25-34	Y	26	13
10	POLISH	F	25-34	Y	14	49
11	DANISH	M	25-34	Y	100	65
12	ROMANIAN	M	18-24	Y	100	71
13	GERMAN	F	25-34	N	100	40
14	SLOVAK	M	25-34	Y	80	84
15	POLISH	F	35-44	Y	60	70
16	POLISH	F	35-44	Y	50	82
17	DANISH	F	25-34	Y	60	0
18	GERMAN	M	25-34	Y	20	3
19	LATVIAN	F	18-24	Y	82	0
20	MEXICAN	F	25-34	Y	100	95
21	DUTCH	M	18-24	N	80	49
22	USA/SWISS	F	25-34	Y	66	11
23	ITALIAN	M	25-34	Y	66	37
24	MEXICAN	F	25-34	Y	78	55
25	MEXICAN	F	25-34	Y	89	90
26	POLISH	F	45-54	N	20	24
27	POLISH	F	<18	N	44	61
28	DANISH	F	25-34	Y	36	2
29	DANISH	M	25-34	Y	77	33
30	POLISH	/	35-44	Y	12	37
31	GREEK	F	25-34	N	100	54
32	POLISH	F	25-34	N	84	55
33	ROMANIAN	M	18-24	Y	48	100
34	AUSTRALIAN	M	25-34	Y	100	99
35	POLISH	F	25-34	Y	61	0
36	MEXICAN	M	25-34	Y	100	10
37	SWEDISH	F	18-24	Y	80	84
38	POLISH	M	35-44	Y	69	19
39	POLISH	M	18-24	N	87	88
40	POLISH	F	18-24	Y	100	100
41	POLISH	M	25-34	Y	69	59
42	POLISH	F	25-34	Y	100	63
43	ARGENTINIAN	M	25-34	N	82	100
44	SPANISH	M	25-34	Y	100	100
45	POLISH	M	25-34	Y	0	23
46	GERMAN	F	18-24	Y	48	83

n	NATIONALITY	SEX	AGE	IMAGE AVAILABLE ONLINE (YES/NO)	WILLINGNESS TO TAKE PART IN PARTICIPATORY URBAN PROJECTS (%)	WILLINGNESS TO SHARE A SELFIE (%)
47	HUNGARIAN	F	18-24	N	85	20
48	GREEK	F	25-34	Y	82	16
49	AUSTRALIAN	F	25-34	Y	86	92
50	POLISH	F	18-24	Y	100	100
51	MEXICAN	F	25-34	Y	100	8
52	CHILEAN	M	25-34	N	0	0
53	ARGENTINIAN	F	35-44	N	100	100
54	HUNGARIAN	M	25-34	Y	8	80
55	GERMAN	M	25-34	Y	52	51
56	POLISH	F	25-34	Y	100	0
57	SWEDISH	F	25-34	Y	100	100
58	LATVIAN	F	18-24	Y	49	37
59	POLISH	F	25-34	N	33	61
60	ROMANIAN	F	18-24	Y	100	92
61	POLISH	F	45-54	Y	51	89
62	POLISH	M	25-34	N	80	76
63	GREEK	M	25-34	Y	100	15
64	MEXICAN	M	18-24	Y	100	100
65	POLISH	M	25-34	Y	40	57
66	GERMAN	M	25-34	Y	65	8
67	MEXICAN	M	25-34	Y	100	48
68	DANISH	M	25-34	N	15	8
69	UKRANIAN	F	25-34	N	100	66
70	ARGENTINIAN	M	25-34	Y	100	40
71	GREEK	M	25-34	Y	100	66
72	DANISH	F	25-34	N	50	14
73	POLISH	M	25-34	Y	0	100
74	GREEK	F	25-34	Y	88	0
75	MEXICAN	F	25-34	N	98	100
76	POLISH	F	18-24	N	100	100
77	DANISH	M	25-34	Y	54	100
78	GREEK	F	25-34	Y	100	6
79	GERMAN	M	25-34	Y	100	99
80	ROMANIAN	F	25-34	Y	100	84
81	FRENCH	M	25-34	Y	30	28
82	FINNISH	F	25-34	Y	64	77
83	POLISH	F	25-34	Y	100	100
84	ROMANIAN	M	18-24	Y	83	100
85	GREEK	M	25-34	N	100	19
86	MEXICAN	M	25-34	Y	82	100
87	ITALIAN	F	25-34	Y	72	73
88	DANISH	M	18-24	Y	52	100
89	POLISH	F	25-34	N	26	52
90	GREEK	F	25-34	N	91	67
91	POLISH	M	45-54	Y	51	56
92	SPANISH	F	18-24	Y	100	100
93	POLISH	F	18-24	N	35	24
94	ARGENTINIAN	F	25-34	N	26	24

n	NATIONALITY	SEX	AGE	IMAGE AVAILABLE ONLINE (YES/NO)	WILLINGNESS TO TAKE PART IN PARTICIPATORY URBAN PROJECTS (%)	WILLINGNESS TO SHARE A SELFIE (%)
95	EUROPEAN	M	18-24	Y	87	100
96	ARGENTINIAN	M	25-34	N	63	74
97	POLISH	F	35-44	Y	100	72
98	POLISH	F	35-44	Y	0	0
99	POLISH	F	25-34	Y	62	73
100	POLISH	M	25-34	Y	40	33
101	POLISH	F	55-64	Y	92	0
102	ARGENTINIAN	F	25-34	Y	100	100
103	POLISH	M	35-44	Y	78	71
104	POLISH	F	45-54	Y	89	1
105	POLISH	M	45-54	Y	0	1
106	POLISH	M	18-24	Y	24	76
107	POLISH	F	25-34	Y	100	100
108	POLISH	F	35-44	Y	17	0
109	ARGENTINIAN	F	25-34	Y	100	55
110	POLISH	M	45-54	Y	51	99
111	ITALIAN	F	25-34	N	100	50
112	POLISH	F	45-54	N	49	80
113	POLISH	F	25-34	Y	74	73
114	POLISH	F	45-54	Y	72	63
115	FRENCH	M	25-34	Y	100	50
116	POLISH	F	45-54	Y	92	96
117	POLISH	F	18-24	Y	100	71
118	POLISH	F	25-34	Y	72	50
119	BRITISH	M	18-24	N	51	99
120	GREEK	F	25-34	Y	100	32
121	ROMANIAN	M	25-34	Y	98	100
122	BRITISH	F	25-34	Y	100	68
123	MEXICAN	M	25-34	Y	100	100
124	POLISH	F	18-24	Y	72	11
125	POLISH	F	25-34	Y	74	16

age	number of responders	IMAGE AVAILABLE ONLINE (YES/NO)		WILLINGNESS TO TAKE PART IN PARTICIPATORY URBAN PROJECTS (>50%)		WILLINGNESS TO SHARE A SELFIE (>50%)	
45-54	10	9	90%	6	60%	5	50%
25-34	78	59	76%	59	76%	41	53%
35-44	9	8	89%	5	56%	5	56%
18-24	26	19	73%	20	77%	18	69%

gender	number of responders	IMAGE AVAILABLE ONLINE (YES/NO)		WILLINGNESS TO TAKE PART IN PARTICIPATORY URBAN PROJECTS (>50%)		WILLINGNESS TO SHARE A SELFIE (>50%)	
F	74	54	73%	57	77%	42	57%
M	50	40	80%	37	74%	31	62%

	number of responders	IMAGE AVAILABLE ONLINE (YES/NO)	WILLINGNESS TO TAKE PART IN PARTICIPATORY URBAN PROJECTS (>50%)	WILLINGNESS TO SHARE A SELFIE (>50%)
ARGENTINIAN	7	3	6	5
CHILEAN	1	1	0	0
MEXICAN	10	9	10	7
total:	18	13	16	12
		72%	89%	67%
DANISH	10	7	6	3
SWEDISH	2	2	2	2
FINNISH	1	1	1	1
total:	13	10	9	6
		77%	69%	46%
POLISH	53	41	34	32
		77%	64%	60%

9.2. TouchDesigner video outcome

Videos in three velocity versions can be found under links below:

slow:

<https://drive.google.com/file/d/1oQqrFWdPSgyMHVHenb1k1uykZpynRaz0/view?usp=sharing>

medium:

<https://drive.google.com/file/d/18k1RnfMw6eKb4Wx6jvdxKdjl8P3wca5L/view?usp=sharing>

fast:

<https://drive.google.com/file/d/1-qYMITHy2-TzDICS LPwUEZyrCO22T7Lf/view?usp=sharing>