

# Projection Mapping Explorations

A  
FINAL PROJECT

Submitted to

**Indian Institute of Technology Hyderabad**

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF  
DEGREE

of  
**Master of Design**

Submitted By

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**July 2019**

## DECLARATION

I hereby certify that the Final Project entitled **projection mapping exploration**, which is being submitted in partial fulfillment of the requirement for the award of **Master of Design**, is a record of my own work carried out under the supervision and guidance of **Delwyn Jude Remedios**, Assistant Professor, Department of Design, Indian Institute of Technology Hyderabad.

The matter presented in this Final Project has not been submitted elsewhere for the award of any other degree.

Date: 01.07.2019

Place: Hyderabad



(Saahil Sagar)

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This is to certify that the above statement made by the candidate is correct to the best of my knowledge and belief.

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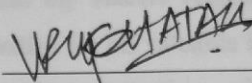
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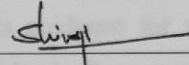
## APPROVAL SHEET

This thesis entitled **Projection Mapping Explorations** by **Saahil Sagar** is approved for the degree of **Master of Design** from IIT Hyderabad.



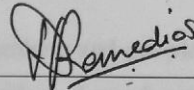
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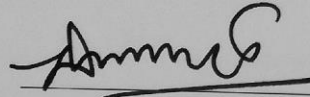
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# **ABSTRACT**

Recent developments in video making and new ways of expressing in the form of the film have given more possibilities to creative people. Techniques like projection mapping, VR, AR, etc. are making room for themselves in a wide range of application like gaming, entertainment, and education. These techniques aid us in finding new ways of illustrating creative audio-visual works and on any of the other surfaces instead of the screen. Video Mapping/ projection mapping is one of the latest video projection techniques that is used to turn almost any dead surface into a dynamic video display. Video mapping aims to create a physical illusion of images by combining audio-visual elements. Earlier, most of the video mapping projects used by artists in concerts, fashion shows, dramas, etc.

Lately, video mapping technique comes as new technology when it started using by artists on sculptures, monuments, public spaces, clubs, schools, live events, etc. The project is an exploration of the technique to understand how the nature of surface matters in the projection and what are the challenges of projection mapping After experimenting all the possibilities of surfaces in IIT Hyderabad the façade of the academic building was chosen to work on. In this building, hundreds of students and faculties come together regularly and work in their respective fields. Being an academic building, it represents all those peoples working spaces. That is why working on a building like this became the idea of working on a theme like sci-fi and technology.



# 1. INTRODUCTION

This project is a step towards understanding the new form of art, that is Projection Mapping as well as to understand the space and architecture and how one can interact with that physical space. This project was done to inculcate a connection and a sense of surrounding between the viewer and the created surrounding.

Initially, this project was intended to create a Gif animation on a particular theme but was later changed based on the reviews from professors. The new idea was to create a Gif installation based on a poem. The work was supposed to have coordinated Gifs and poetry narration, and the viewer was supposed to walk through this animated space. The video was supposed to be supported by audio effects and poem narration. On discussion, the idea changed to creating papercut and folding scenes based on the lines in the poem, which would further culminate into a book. But on further discussion with professor Delwyn Remedios and Dr. Neel Kantan, it was decided that projection mapping will be suitable for the theme as well as the project.

Hence, research on the same started. The surface onto which the projection should be mapped was one of the main concerns for projection mapping. Choosing the right type of surface is the most difficult part because that forms the basis of such work. So research was done to learn the medium and techniques and its possibilities. Initially, a random surface was chosen for experimentation. In discussion with guide Delwyn Remedios on some photographic documentation of the location, it was felt that establishment were needed as a connection between the nature of the architecture and the poem. The theme of the poem is the winter season and how it changes and affects the lives of living beings. Concrete surface, being hard and cold, same as winter was suitable as it can be conceptually linked with the qualities of the season. Visually, when the soft natural forms are projected onto a hard grey surface, the contrast would enhance the projection, the quality of organic life in contrast to the hard cold winter season. The next task was to find a concrete building on the campus of IIT Hyderabad.

The mural in the Academic block seemed suitable for the same, and the work was taken further. In the last project review, professors suggested that the surface is not quite in sync with the poem. The surface is too flat for projection mapping.

Then Guide Prof Delwyn Remedios suggested to focus on the technique of projection mapping and not to restrict the possibilities which were the case with the poem.

Again, the selection process for the surface started but now with a motive to using this medium in its full potential. After going through photos and mapping 5-6 surfaces, the area on the right-side outer part of Academic block ground floor was chosen. The aim was to use the technology to its full capacity and also tell a story which will say something about the surface. Hence an animated projection with sound effects was created. Professor Delwyn helped to choose a surface as well as in the selection and combining the sounds.

What is **projection mapping**?

Video mapping is one of the latest video projection techniques which is being used to convert almost any surface into life, it often combines with sound and plays in live performances like dance, fashion shows, concerts, and many other performing art mediums. Projection mapping aims to create a physical and mental illusion for the audience by combining images and audio-visual elements.

Most technical aspects of video mapping applications can be divided into motion graphics applications, sound designs, real-time video applications, and subcategories such as estimates. The primary purpose of motion graphics applications is to create images for audio-visual communication using various visual effects and digital artifacts. With sound design, the objective is to complement the audio elements to support the visual show.

The concept in projection mapping or we can say video mapping is the most crucial element of the composition or artwork to attract the attention of the audience or viewers by using technology and combining it with artworks.

Urban space has played an essential role in the architectural dimension by providing a platform for these interactions. Apart from this, architecture itself acts as a medium, which gives statements about the structure of the city, its people, and the society's representation.

## 2. BACKGROUND STUDY

(Snider, n.d.)



Figure 1 Grant snider Illustrations

His works are humor, insight, truth, introspection, inspiration, encouraging, and a mix of comics, poetry, and philosophy (Susan Cain, n.d.). His work on nature truly inspires because he works with the content in a minimalist approach and mostly with the pastel color palette.

Learnings from Grant Snider illustrations is how to illustrate the objects with simplicity and in a way that even a small child will be able to understand the form, shape and recognize what is there in the picture. His works can easily narrate a story that anyone will be able to connect with and no matter how childish the drawing will look, the artist should be able to

Grant Snider started it as art, literature and creative process, web-comics began to paint casual comics in 2009. Every day an orthodontist, he is attracted to his life for his creative activities. The Shape of Ideas: An Illustrated Explanation of Creativity (Abrams Comicans), "Review Unique: Comics, Philosophy, and Synthesis of Poetry: A New Way of Packaging Packless Endless Ideas in the Los Angeles Review of Books"

(Shaikh, 2019)

(Snider, n.d.)



Figure 2 Grant snider Illustrations

convey the message that he/she wants to spread. The colors which he used were always pastels, which were very pleasing to the eyes of the viewer. His study of forms and minimally portraying them is the key to his eye-pleasing illustrations. There is always a beautiful story behind everything, and that can be easily be seen in all of his illustrations. No matter how simple the idea and illustration is, but it should always be impactful and convey the message.

(Miyazaki, PONYO, 2008)



Figure 3 A still from Ponyo a film by Miyazaki

(Miyazaki, Madman Entertainment, 2017)



Figure 4 A still from Nausicaä of the Valley of the Wind a film by Miyazaki

The animation director Hayao Miyazaki established his studio in 1985; he called it a studio Ghibli, a name that became the best-animated studio which has produced the best hand-drawn animated movies in the world. Nausicaa of the Valley of the Wind is one of the most beautiful anime movies that have ever made by him as well as amongst all. (Yegulalp, 2019)

List of some best movies by Studio Ghibli

- Princess Mononoke
- Nausicaa of the Valley of the Wind
- My Neighbor Totoro
- Ponyo
- Whisper of the Heart
- Spirited Away
- Porco Rosso

All Studio Ghibli movies have their unique signature style, and the concepts on which the movies have been made is commendable. Since 1985 they have made the best anime movies because of the dedicated work and a fearless team. They have executed the most far fetched ideas with ease as we can see in movies like Ponyo, My Neighbor Totoro or any movie made by Studio Ghibli.

The significant learning from the movie Ponyo, which was recommended by the guide, is how the animators of this movie played with natural forms and shapes. Colors used in the movie look so bright and organic. Sometimes it feels that these colors cannot be seen in nature, but they have creatively used them. Almost every scene of the movie will amaze the audience and make them feel as if this is happening in real life.

These are some of the videos that portray excellent concepts.

(studios, 2016)



Figure 5 Axioma 3D projection mapping

It is showcasing the technology by confirming the perceptions and the natural laws of the world and ripping them to shreds with every scene/element change. The line segments to polygons give the understanding of the nature of construction (perhaps seen thru the mind of Escher) Can one imagine the delight M.C. would get with tools such as we have now.

(Isamu Nishigoori, 2012)



Figure 6 Tokyo station vision

Apart from the amazing content, It is very surprising that the color correction is very hard to filter out the original coloring of the building itself. This has been done amazingly

(Antonin Križanić, 2016)



Figure 7 Interconnection - Visionary projection mapping

The structure of the building is very much appropriate, and the background music and sounds are synchronized perfectly with the projections. It is a fascinating challenge for imagination and inspiration.

(Maxin10sity, 2016)



Figure 8 Projection mapping on the palace of Karlsruhe

They have used the form and building space very interestingly, detail work on architecture in projection mapping was there, and the colors used by them are very eye catchy.

(András Sass, 2015)



Figure 9 Projection Mapping on Bolshoi Theatre

These people have mainly used 3d spaces, but they have used video mapping instead of projection mapping which is sometimes good, but if the use of the surface was not there then working on a 3d space or a plain wall, both looks the same.

(Productions, 2014)



Figure 10 Sydney Opera House: Lighting the Sails

Ancient worlds and the digital age is coming together in perfect harmony, hinting at an exciting future. These people have used the form of the building in a very thoughtful way. Visuals are very catchy and eye pleasing



## Pop up art

(Birmingham, youtube , 2018)



Figure 11 Pop- up Tutorial

(Birmingham, youtube , 2018)



Figure 12 Pop- up Tutorial

(Birmingham, Youtube, 2014)

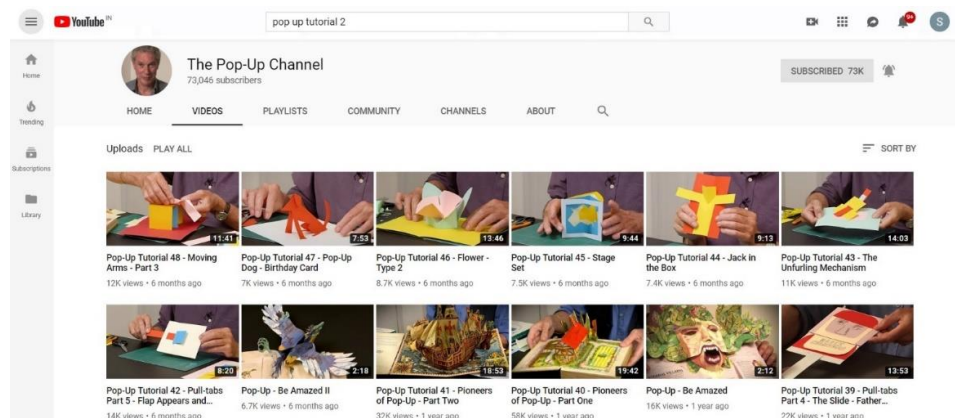


Figure 13 Pop- up art YouTube channel Duncan Birmingham

The images show a YouTube channel by Duncan Birmingham, wherein he shows books by other pop up artists. He also provides tutorials on how to make pop up art. In total, he has uploaded around fifty tutorials ranging from beginner to advanced, pop-up art, progressing step-by-step with increasing level of complexity.

His tutorials are elementary and well-detailed. In between, he shows other famous pop art artists works and their books to inspire as well as how they have used the same techniques to create extraordinary pieces.

Many works exhibited in his tutorials are all by famous artists in the pop-up art industry. These books were made with such patience and skill, that the feeling of just holding an ordinary book does not arise. Instead, it is a path to the imaginative mind of the artist.

.

### 3. LITERATURE REVIEW

Artists have created video art in some form since the 20th century. In 1895, the French Lumiere brothers screened a video projection of 50 seconds, of a train speeding towards the camera and rolling to a stop as its passengers hopped on. The audience of the 19th century haven't seen any moving image till that time, so it was shocking and a new experience to them which led them to stand up from chairs in fear of train which might hit them but, that was the starting of a new era and the age of still image to moving images. It has been ages now, and we do not get scared of moving images because now it became a part of our daily routine, from computer screens to phone screens and from films to advertisements. We live in an era of moving images now.

#### Projection mapping

There are hundreds of videos, and large amounts of data are available on the internet related to projection mapping and video mapping, but only a few of them has been considered by the director to get the information about this technique. Artists are using different surfaces to map the videos and show great artworks

#### 3.1 Video

##### 3.1.1 Video 1

(bucielo, 2010)



Figure 14 Yekpare, train station Istanbul

Yekpare (Monolithic) is one of the video mapping project, which are displayed on Haydapasa Train Station.

It is storytelling to narrate 8500 years story of Istanbul. The symbols have been used in the story from pagan to the Roman empire, from the Byzantine empire to the Latin empire, and from the Ottoman Empire to today's Istanbul and because of it's conceptual, political, geographical location or the depth of its place. To see the whole show from Kadiki Coast; Yekopopar is dramatic as a representation Haydarpasa train station has been chosen.

Duration: 15:26

In this duration, they have divided the whole video into a sequel or scene by scene.

Scene 1: Sunrise (01:18)

Scene 2: visuals and bird sounds were supported by transit.

Scene 3: Byzantine to New Rome then Istanbul (02:47)

Scene 4: Watering and Marbling (04:08)

Scene 5: From Bridge to Migration to Wagons (08:38)

Scene 6: Windows and Crowded (11:10)

Scene 7: Related Structures; People (12:28)

Scene 8: Whirling Dervish (14:33)

(EKİM, 2011 Volume 1 Issue 1)

**A1. Brainstorming / gathering idea**

Theme → Istanbul = metropolitan city, multi-cultural, history, religion, art, migration.



Location → Haydarpasa Train Station = the crossroad of the East and the West civilizations, historical building, location.



Title → Yekpare (Monolithic): ironic expression for Istanbul, a monolithic structure.

Figure 15 process of reaching to a theme

The process of making this video mapping is very systematic, and they have gone through the design process to reach to the theme of this

The learning from this particular projection mapping is how to work on a storyline

Video 2

Markowitz designed the box projection mapping. Earlier it was supposed to function as a technological demo, but after realizing the visual potentiality, it is converted into a design and performance piece. It shows the real and digital space interacting with each other through the medium of projection mapping on the surface which is moving

(DOLLY, 2013)

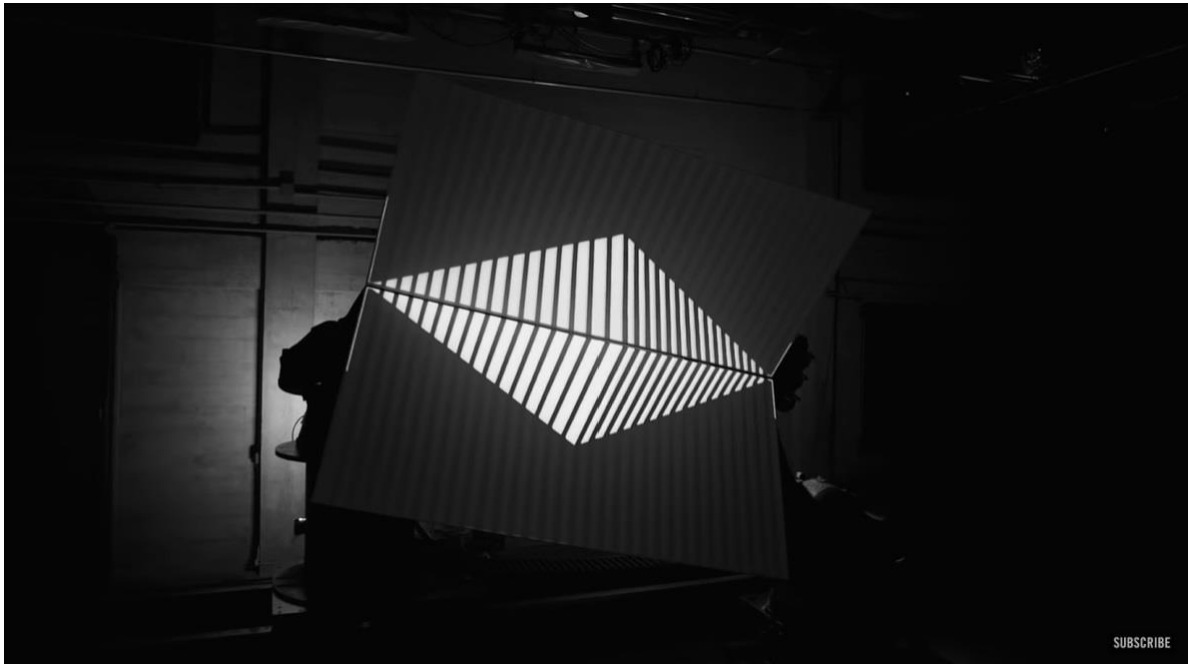


Figure 16 BOX animation

Principles of STAGE MAGIC, which shows five of the basic illusionary.

1. Transformation
2. Levitation
3. Intersection
4. Teleportation
5. Escape

### Transformation

(DOLLY, 2013)

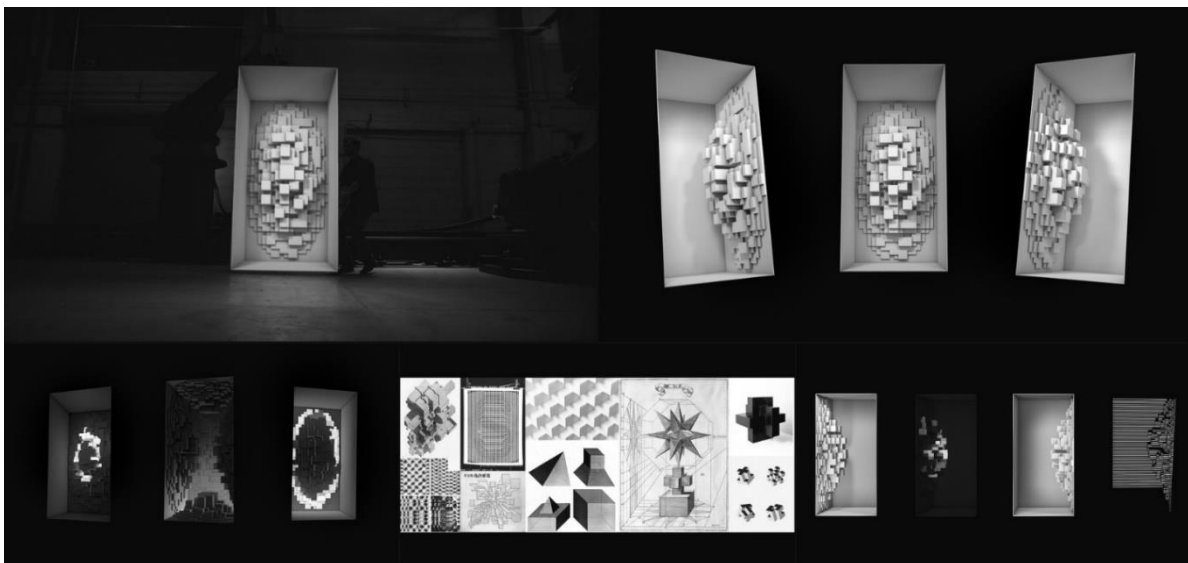


Figure 17 Transformation of surface

The first principle of magic discovered in the piece is the change, where it changes from one state to another, changing the silk handkerchief or trick card from one suit to another. In this case, The touch and gesture of the box character were obtained by the first reaction, and then its movement, the geometry of the box and the volume subdivided by these actions.

### Levitation

(DOLLY, 2013)

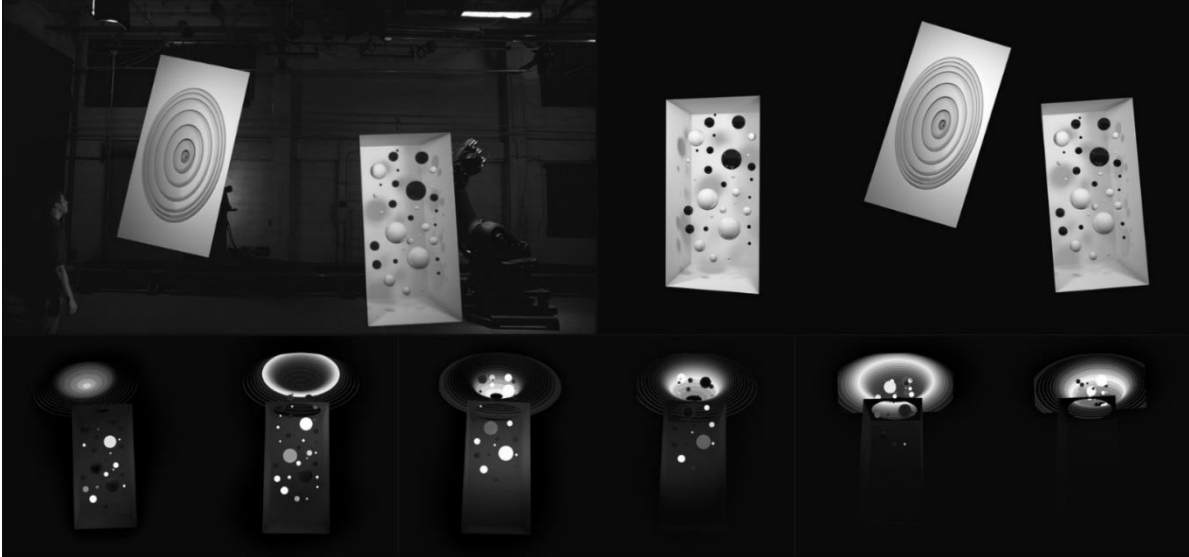


Figure 18 Levitation of surface

The second principle of magic is the Levitation, where many magicians tell gravity to dump and walks a few inches away from the floor, the canvas starts rising from the ground and touches the real. A bunch of spherical interacting with an enlightened tunnel renders delusions and delusions of items from one canvas to the other.

### Intersection

(DOLLY, 2013)

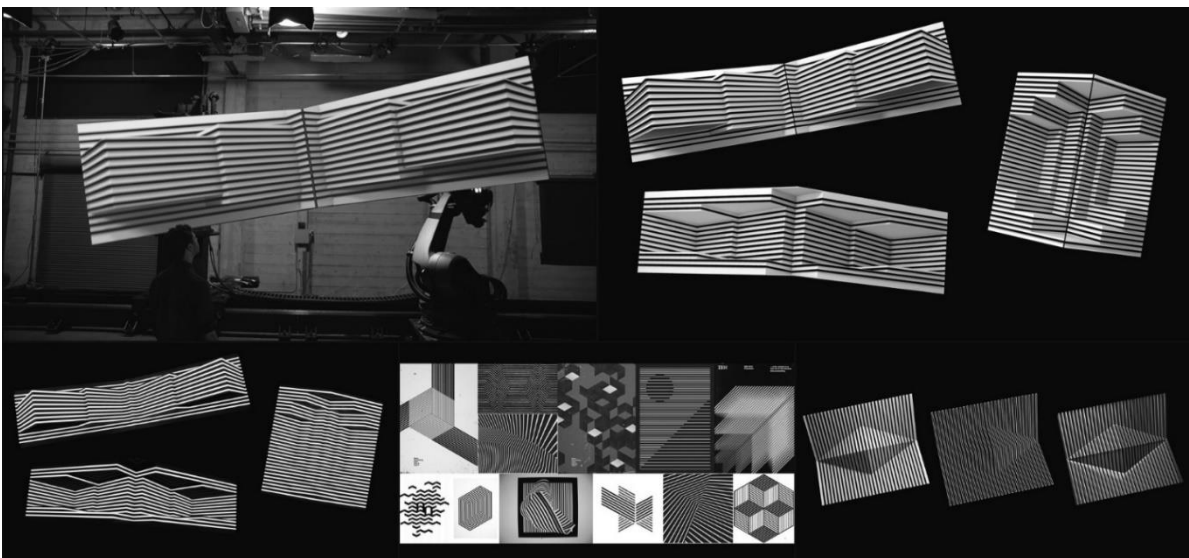


Figure 19 Intersection of the surface

A set of links and unlinks to the ring. Swords passing through two canvas interacted with each other while rendering the visual 'solid-solid' effect in graphics solutions.

### Teleportation

(DOLLY, 2013)



Figure 20 Teleportation of the surface

The fourth principle of magic is teleportation, where the magician causes anything to move from place to place that is how they made the form teleport from one canvas to other, which looks like it goes from one canvas to other and at the end, the form dropped on the floor and teleported there.

### Escape

(DOLLY, 2013)

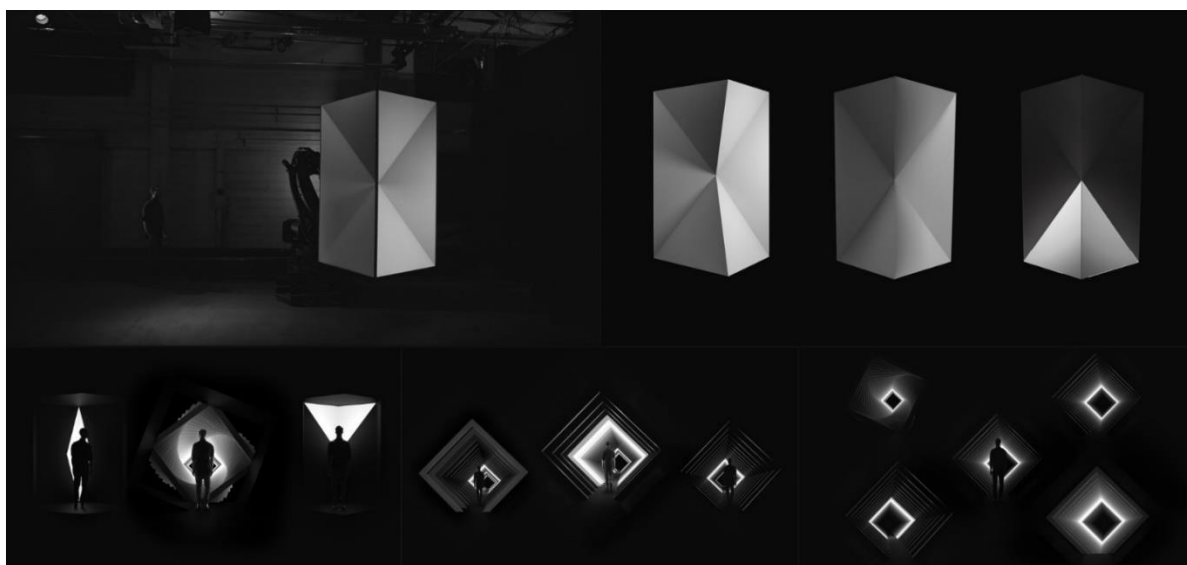


Figure 21 Escape from the surface

The final principle of magic is where the magician gets himself put into a death trap and escapes from it. Here they show that the man got trapped into those geometric forms, and strategically, he escapes himself into the canvas itself.

They have worked with minimalistic forms and fractal geometry. The primary learning from this video is how can a dead surface also be used in such a way, and a strong concept should be there behind any such artwork.

### Video 3

(Crossley, 2017)



Figure 22 TedX talk on projection mapping

This is a TEDx talk by the artist Joe Crossley. He explains, everywhere we go, there are empty surfaces around us whether it is a market, home, and even the schools. His works involve 3D printing, lighting, sculptures, and projection mapping. According to him, projection mapping is the best way to transform this environment and empty spaces. He believes that this new form of art is an essential tool for education as well as cultural communication to fill the gap between people and to address sensitive and delicate subjects in the public arena.

He explained how in schools and educational institutes, projection mapping could be used by converting the walls of the classroom into lively spaces which discuss the topics they are studying, and this visual and audio experience will make the students connect and grasp more about the subject.



More likely he talks about the possibility and use of an artificial intelligence system to projection map plants with projector lights by using the right form of lights and project it onto the greenest part of the plants because that is the part where photosynthesis is produced. With the help of bio cameras, artificial intelligence, projectors, and the right amount of light, more plants can be produced. This talk and his works address the highest possibilities of projection mapping and what all can be done.

#### Video 4

(Tarek Mawad, 2014)



Figure 23 Projection on mushrooms in the forest

(Tarek Mawad, 2014)



Figure 24 projection on the spider web in the forest

This video is made by artists Friedrich van Schoor and Tarek Mawad and named as "bioluminescence." It took the artists around six weeks to capture the essence of the forest and make this extraordinary projection mapping.

In this projection mapping, artists choose random but living surfaces of the forest such as the bark of the tree, mushrooms growing on the trees, spiders on the web, frogs, leaves and, many such surfaces which was never imagined by any other artists to work upon.

Majorly all of his works are on this kind of irregular surfaces, where he makes the surface lively.

It was a major learning and realization that sometimes even a small surface could overpower the idea of working on a large scale.

#### Video 5

(Filip Sterckx, 2016)



Figure 25 projection on the Dining table

This video is by Skullmapping, an organization that works on projection mapping, holograms, and VR, founded in 2010 by Filip Sterckx and Antoon Verbeeck. These people develop stories and believe in storytelling.

In some of their projection mapping videos, they choose tables in restaurants for projection, which is a unique way. Usually, people think that projection mapping is for projecting on the surfaces like historical buildings, towers, backdrops, etc. but they broke this stereotype of people and got art on the food table itself.

Learning from their works is that, no matter what the surface is, the audience should be amazed and should connect with art, and this is what they are doing with their work.

### 3.1.2 Tutorials

#### Tutorial 1

(Tutorials, 2016)



Figure 26 scatter effect

It is one of those tutorials that has helped in learning some tricks and some particular effects in adobe after effects. This video tutorial teaches how to use cc scatter tool and give this kind of scatter effect to anything.

#### Tutorial 2

(Sharifian, 2012)

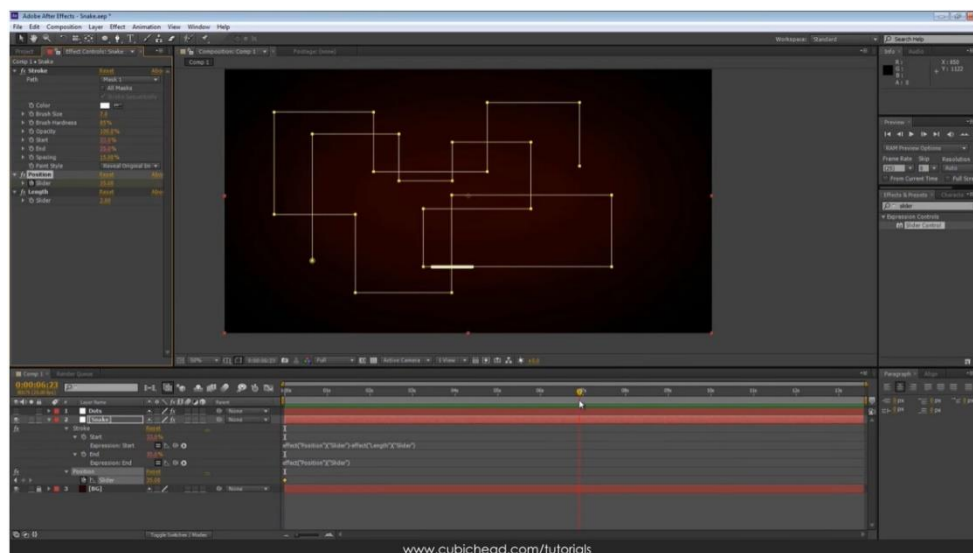


Figure 27 Tutorial on the use of sliders

This tutorial was about how to give a snake game effect with the help of simple lines and dots. In this tutorial, a path was made to provide the line a track to move upon and on the certain points dots will be placed in a way that when the line crosses the dot, the length of the dot will increase and another dot will appear at the same time. This effect was used in the final video.

### Tutorial 3

(studios, 2016)

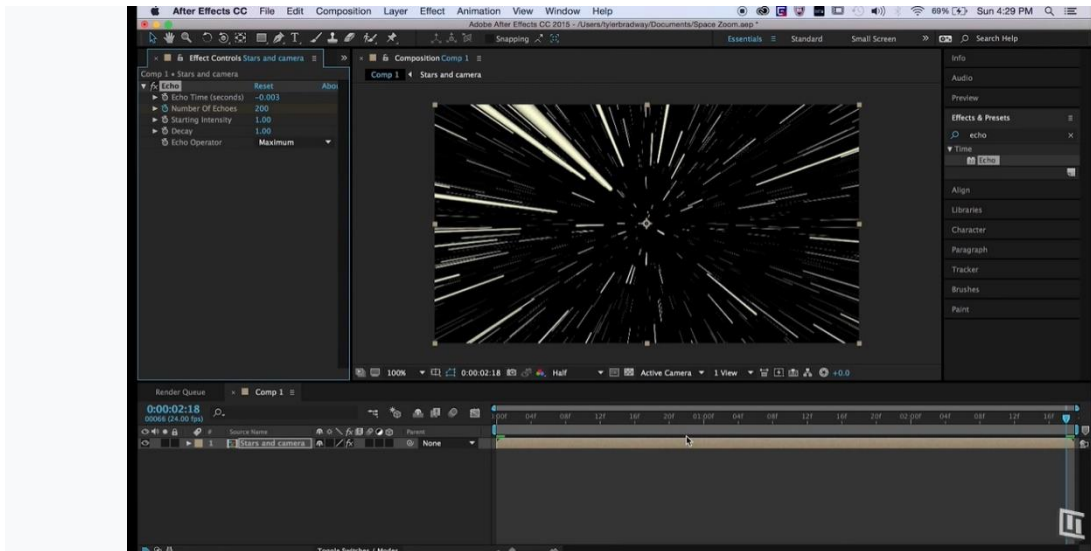


Figure 28 Tutorial on the echo effect

This tutorial was about how to give cc ball action and echo effect. It makes the ball into motion, and from certain manipulations, with the settings, it provides the space jump effect. Help has been taken from this video to create an animation sequence for projection mapping

### Tutorial 4

(SonduckFilm, 2018)

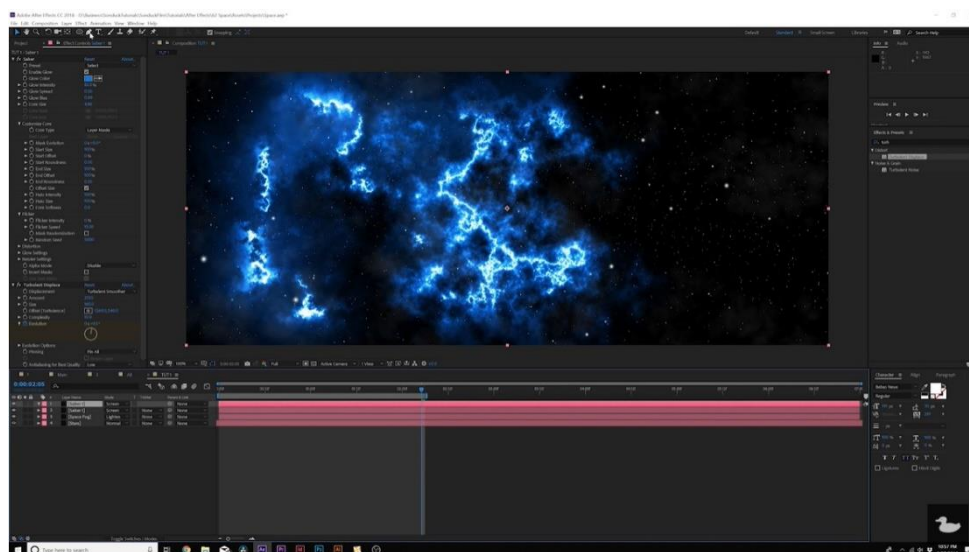


Figure 29 Tutorial on Sci- fi space scene

This effect has been used to create a sci-fi space scene. Space fog atmosphere, stars, and nebulas have been made by using some particular effects. There is a plugin for one effect which was made by the artist to help the users named as a saber. This tutorial helped in making a sci-fi background and teaches the possibilities of working on this type of theme. Help has been taken from this tutorial to make a sequel for the projection mapping.

### Tutorial 5

(graphicINmotion, 2018)

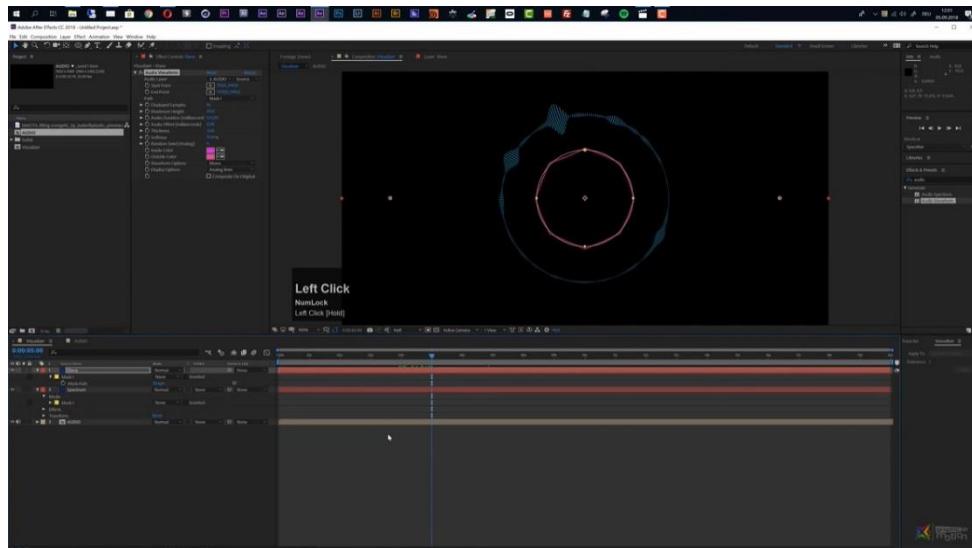


Figure 30 Tutorial on how the sound will react with the sound

This tutorial helps in learning how to make soundwaves react to music in different shapes and forms. It helps in visualizing the sound into motion and how to create that motion. It has not been used, but learning from this tutorial helped in visualizing and creating.

### Tutorial 6

(Copilot, 2014)

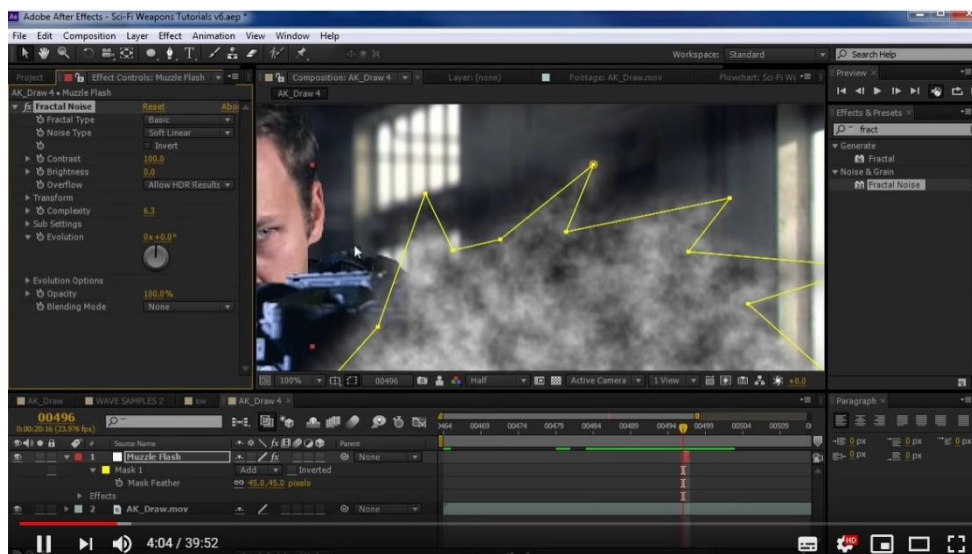


Figure 31 Tutorial on sci-fi weapon blast

This tutorial helps in learning, that how sci-fi war weapon can be created as the theme was sci-fi for projection mapping. So, instead of making the same war effect, the effect of bullet pressure and light that is coming out from the gun can be used in many different ways, and that is the leaning from this tutorial.

## Inspiration

(Getter, 2015)



Figure 32 Still from a Music video by getter

This music video by the artist Getter is the inspirational video for this projection mapping project. This video is famous for its exciting visuals as well as how the video has been made, by combining any random things and put them in a video altogether. It doesn't feel like that there is no need to put this random thing. Visual and graphics used in this video are made in a certain way that it will give a psychedelic feel with the music.

There are so many visuals and randomness in this video, and that is the best part about it.

## 4. METHODOLOGY

### 4.1 Methodology

Methodology

- Data collection from music videos, projection mappings, and other resources
- Critical analysis of selected video artworks.
- Projection experiments on the various surfaces

#### 4.1.1 Concept 1

Making Gifs

The first concept was to make gif animation in the Indian context. The aim was to use Delhi slang, which is used by local vendors in Delhi markets to attract customers. Some of these are- '100 ke 4', 'aao looto', 'madam girgaya', '35-35/ 50-50', 'Dhyan kidhar hai-maal idhar hai', 'raste ka maal saste mei', etc. The idea of making Gif animation came from a senior's thesis project, which is on Gif animation and the theme of the project is slang used by local vendors in Karnataka's local market. Being a Delhite, it was easy to work on something similar, but the main concern was to present it in such a way that people from other states also can understand and connect with it.

In a discussion before the 1<sup>st</sup> review, it was suggested to come up with ideas and see the works of seniors as well as artists who had worked on something similar.

The first step to start the project was to collect data, videos, and tutorials.

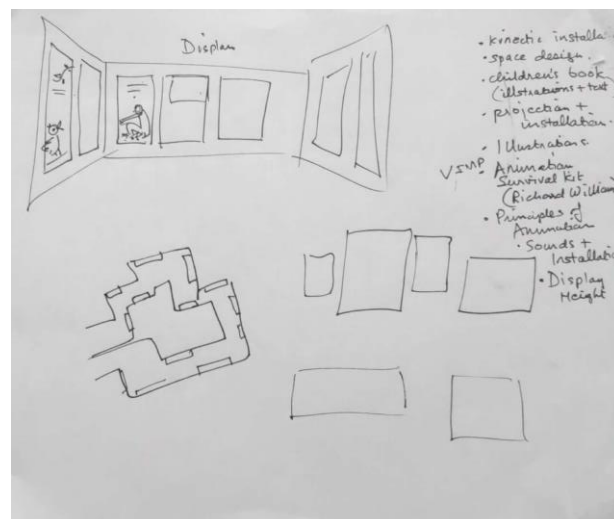


Figure 33 Initial installation layout

The guide prof. Delwyn Remedios made this drawing to discuss the look of the gif installation. The plan was to install small projectors for all the gifs and install that in a way

that it will become a walk-through installation wherein the starting and end points are directed.

The installation will cover areas like space design, projection, installation, illustration, sound installation, and design.

#### 4.1.1.1 Review 1

Other professors suggested that this kind of work does not have much scope and learning because many people had already done such gif animation work on slang. Moreover, it is necessary to step out of the comfort zone built by the projects that happened earlier. It is now right to start with something new and original.

#### **4.1.2 Concept 2**

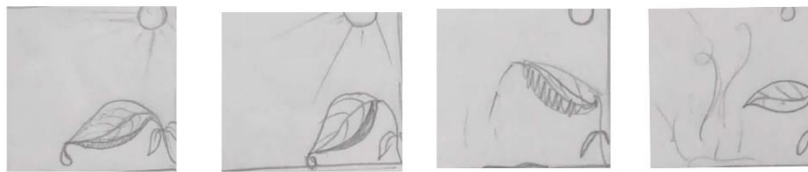
In the second concept, it was decided to enhance the idea of the gif animation, leaving aside the 'slang project.' The research was done on technological advancements in recent years. Other ideas were to combine small projections with building a larger narrative. Where in the soul of the installation will be video projections to build a sort of environment. It was necessary to base this idea on a theme or concept. That is how the idea of writing a poem came up. Different Gif animations will be created which combine and narrate the poem.



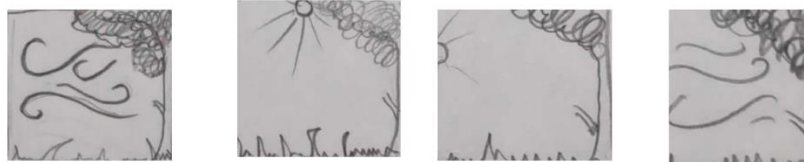


#### 4.1.2.2 Initial storyboard

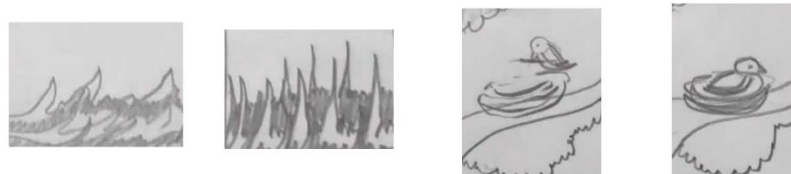
In storyboard creation, it was essential to study what type of plants grow in the winter season, colors and the birds seen in this season and how winter affects the lives of all living beings. All of this was to be researched, taking into consideration the winter season of Delhi. After the discussions and guidance from the guide, the idea got its face in the form of a storyboard.



Season o season, how it changes,  
The sun is swallowing the cool of the dew drops.



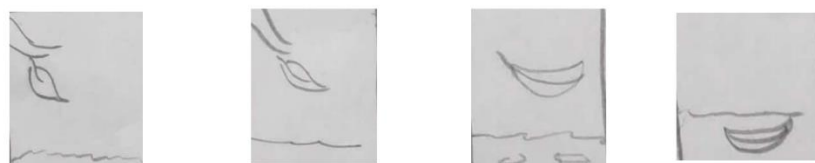
From chilly nights to morning heat, All still being tolerated by that tree on the side,  
Season o season, how it changes.



That damp grass has also probably dried up now,  
That sparrow has also finished weaving/building maybe,

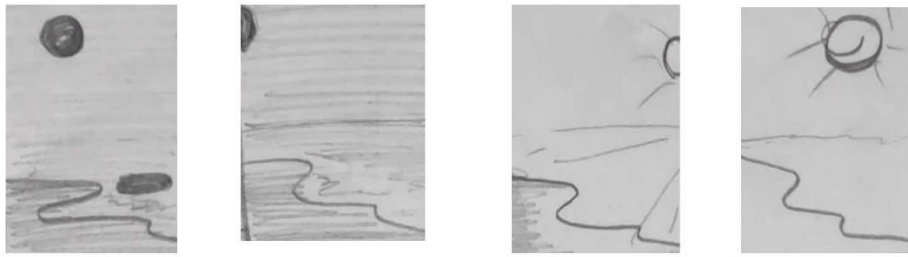


Squirrels have yet again built a home together,  
The season that had passed has come again today,



The season that had passed has come again today,  
Season o season, how it changes

Figure 34 Initial storyboard of poem



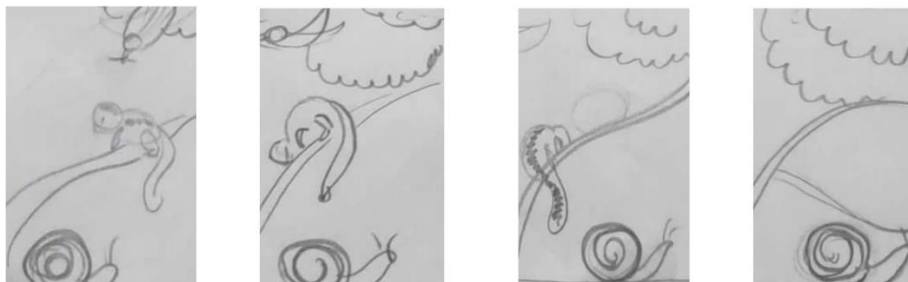
The sun will again take time to rise,



The rooster will probably crow later than



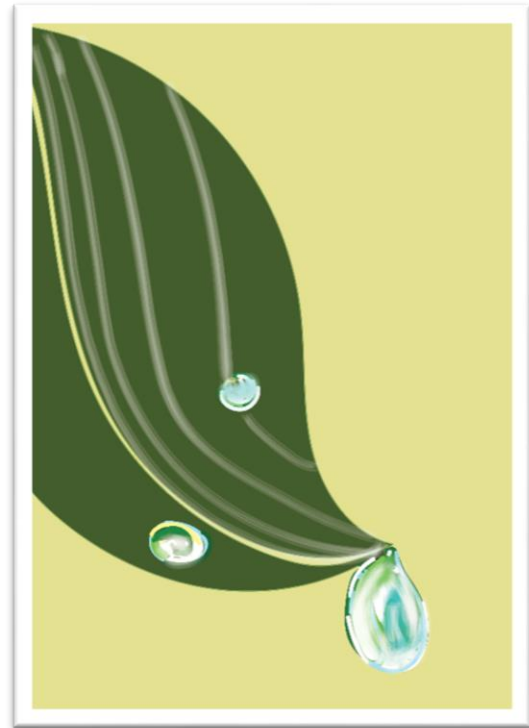
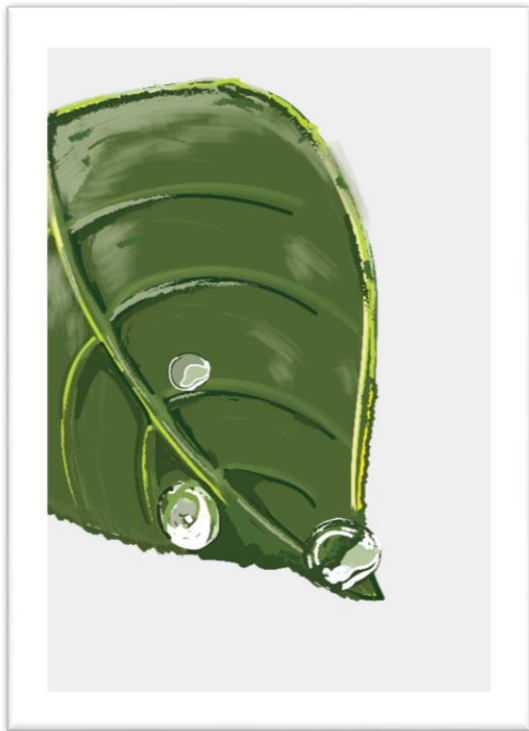
And the cuckoo will chirp lesser,



Softly singing the songs of this chilly season,

Figure 35 Initial storyboard of poem

#### 4.1.2.3 Initial drawings look and feel



These are some of the initial leaf drawings for the first scene where the dewdrop falls from the leaf on the ground.

The first leaf has a bit realistic approach. The second one is fluid with curve lines and softness and in the third one solid color patchwork done on the other flat color.



These are some of the initial leaf drawings for the first scene where the dewdrop falls from the leaf on the ground. The gif animation was made by exploring three different styles of making leaves.

Figure 36 Nature study



Figure 37 Illustration by Delwyn Jude Remedios

The first leaf has a bit realistic approach. The second one is fluid with curve lines and softness and in the third one solid color patchwork done on the other flat color. Professor Delwyn Remedios makes this illustration, and it demonstrates the look and feel of the gif animation. Here he has used a very soothing color palette to create the winter season. From one side, he has used warm color in the manner that it looks like the sun is shining, but because of the clouds and fog, there is not that much light. Such demonstrations helped understand how one can create impactful visuals to communicate the real emotions.



Figure 38 Illustration after the tutorial by Delwyn Jude Remedios

After the guidance, this illustration has been done to learn the technique and style of how it should be done. Here the same kind of tree has been made, but to give the feel of a real tree, the leaves were made in a bit stylized way. The colors that have been used are a bit brighter than the reference image.

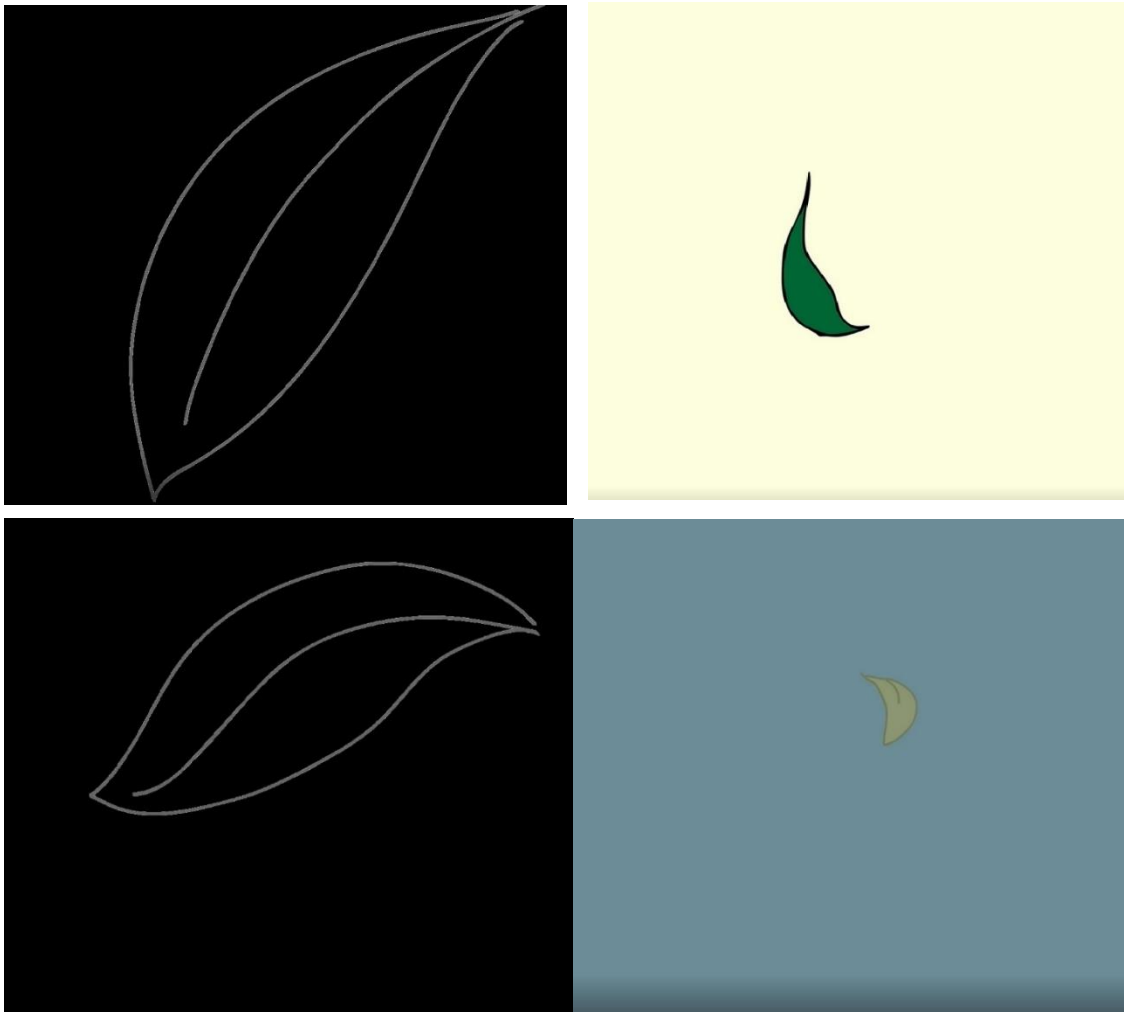


Figure 39 GIF Animation explorations

These are a few initial gifs that were created to understand the movement and to get a better understanding of how gif animation as a medium or technique works. In the beginning, it was tough to create as gif animation does not work like standard animation. The starting and end of the video should be the same only then it will create a continuous video playing on a loop from start to end then again end to start.

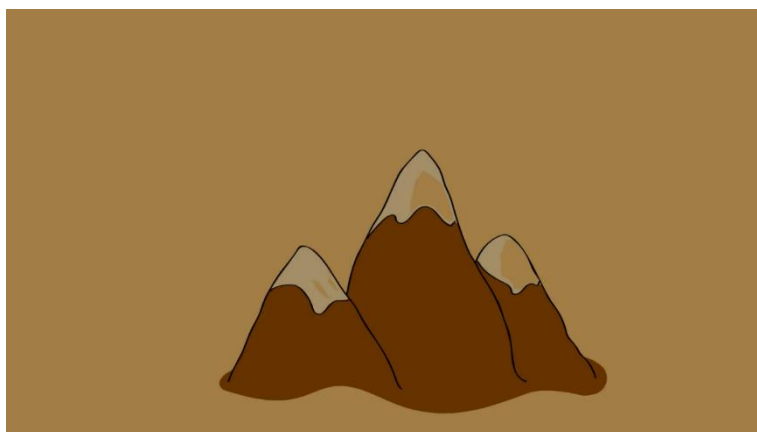


Figure 40 gIF animation explorations

Grant Snider's illustrations inspired this illustration. In this illustration, very soothing colors have been used to create a subtle, uniform, yet attractive visual.

#### 4.1.2.4 Review 2

In the second review, the professors suggested focussing on the wholeness of the video. Focussing on the entirety of the project.

Focus on the animation as it should be precise and crisp. The neatness and organization of the video are of utmost prominence. It is essential that the aim of the visual is achieved and reaches the audience.

### 4.2 Concept 3

Before encountering concept three, there was an in-between thought of making pop up book on the poem, which will be a good learning experience for children to learn about the season. The scope of this thesis covers one book on winter season. Based on another season, the same is introduced after completing the first book. It started with watching tutorials on the craft and the production of pop up books. There are very few artists who focus on pop up art today. Earlier when connectivity to the internet was scarce, when kids used to play in grounds rather than with technology, such pop-up book art was more popular. The change in lifestyle and the advancement of internet technology moved these pop up books out of the limelight.

Technology moved these pop up books out of the limelight.

#### 4.2.1 Pop- up Art

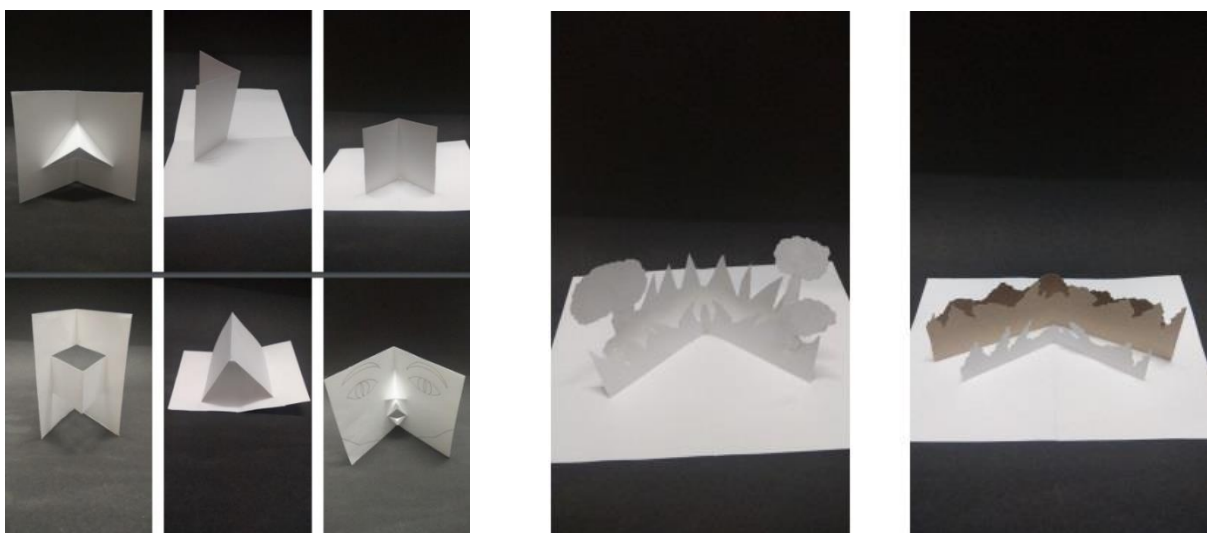


Figure 41 Pop- up and Paper folding

The significant learning from these tutorials by Duncan Birmingham is how to work with folding paper techniques and how to employ this medium as a way to tell stories more graphically and visually, with minimal text. He starts from scratch and goes all the way to



making a complete book, laying emphasis on many confusing and counter-intuitive folds and bends. He repeats the process to let the viewer understand properly. The images show some of the novice-level paper foldings made with the help of tutorials.

After making some initial pop-up art pieces, these were presented to the guide to get feedback on using this idea for the poem. It was intended to continue with gif animation if the pop-up art idea did not seem appropriate. Gif animation idea obtained many positive feedbacks, but a discussion regarding the installation part was to be done with Dr. Neelkantan PK.

Dr. Neelkantan discussed many ideas in a meeting. For instance, making the poem into an installation where the words made with scrap material and welding presented as a text installation art, Due to time constraints, this idea was discarded. Proceeding with projection mapping would be a better alternative to gif animation. This idea came up after watching some online works on the same by different artists.

So that is how the idea of working on projection mapping came up, and it was told by Dr. Neelkantan to look for surfaces for projection mapping and to start working in this as soon as possible because this technique takes time. Further discussion regarding the usage of projection mapping was also found apt by the guide prof. Delwyn Remedios. This technique is new to both the director and the guide, hence serving as an opportunity of learning for both.

Now the study on projection mapping starts with the basics and techniques that have been used to make this form of art. Browsing through the videos available on the internet on types of projection mapping and the process involved in making those videos were done.

Primarily, projection mapping serves as a medium to convey stories or sometimes as the background for fashion shows, dance performances, live performances, et cetera. There are many videos on projection mapping where artists use the historical buildings as the surface and show the story of that particular building. In relevant social causes these videos were used. However, projection mapping amazes the audience and works as public art.

#### 4.2.2 Initial Projection mapping trials

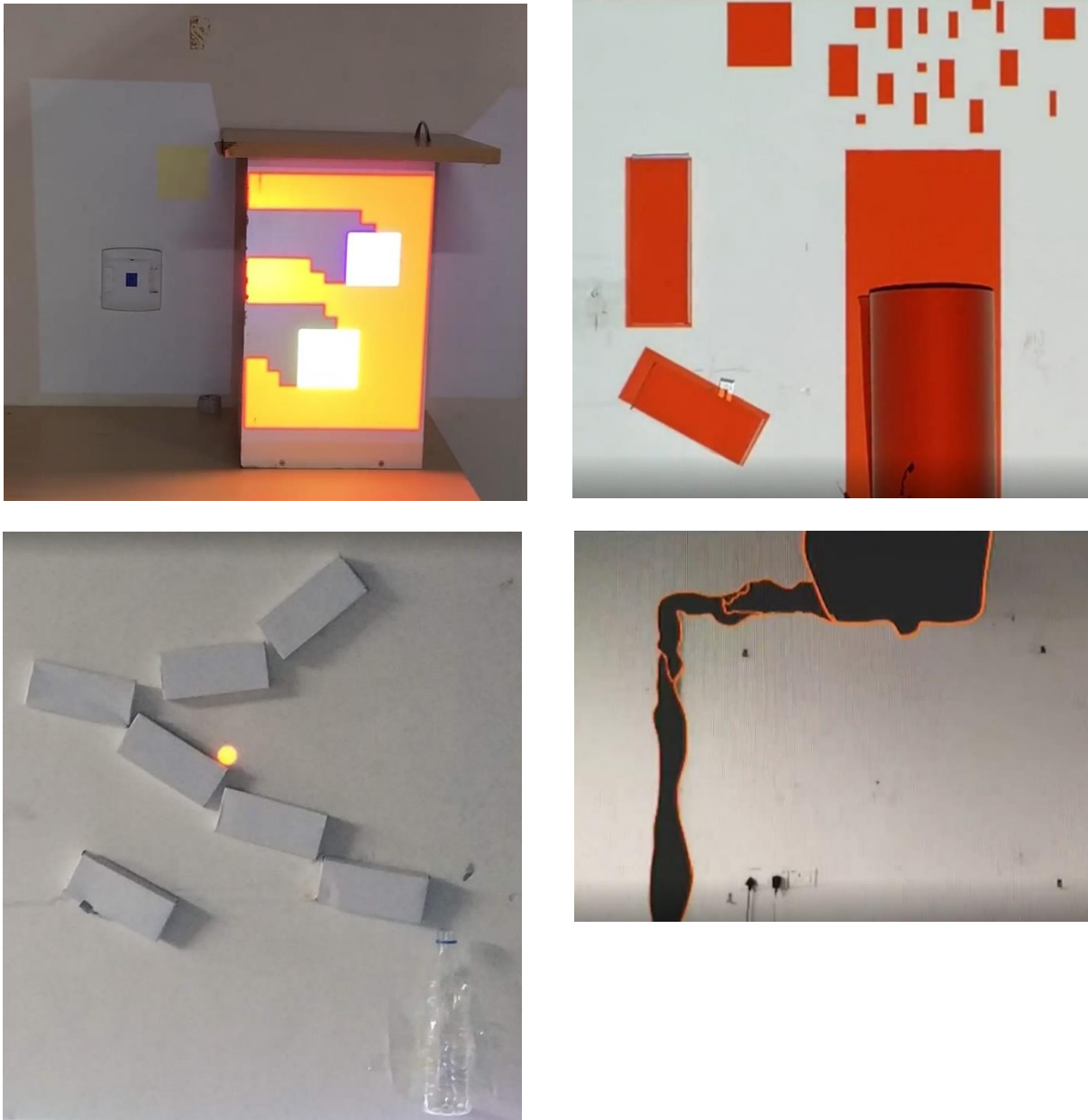


Figure 42 projection mapping trails

These are some of the initial projection mappings that have been done to learn the technique and this new form of art. The surfaces chosen in these mappings are small compared to the mappings that done on the buildings, stages, monuments, et cetera. After performing these pilot tests, it was realized that there is much scope in this and could be taken to more sophisticated levels.

#### 4.2.3 Review 3

In the third review, all the professors, including the guide, decided that projection mapping can be taken up as a project, and it could be done on a larger surface so that more possibilities can be explored.

## Selection of initial surface

Post specific experiments done on small surfaces, it was decided to proceed on a larger scale. We visited the sites on campus, and photographs were taken from the sites a reference for a demo. After consideration of demonstrations, at various locations, the final site was chosen, and the project took its final course.



Figure 43 Surface trial for projection mapping



Figure 44 Surface trial for projection mapping

This surface was found a bit interesting and was finalized after the discussion with the guide.

MDes2018 batch students made this surface, and this is a mural which was done individually and then collectively by each student of MDes18 batch under the guidance of sculptor and muralist Jagruti Dutta.

Based on the hanging place of the mural, the aesthetics of the material used to make the mural and the poetry written about the winter season, the surface was chosen. This mural is made up of clay and then baked to give the strength as well as durability to the material. This material comes from nature, and the poem is written in winter, explaining how the season changes and affects the lives of every living being. So both the surface as well as poetry somehow connect to nature, and that was the main reason for selecting this surface for projection mapping.

#### 4.3 Some of the frames from the initial workings on this surface

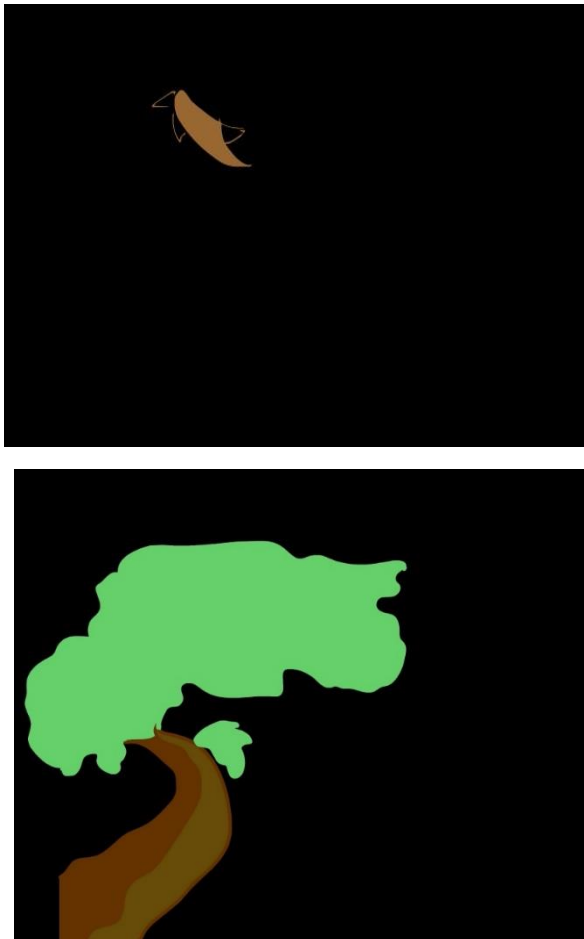


Figure 45 Mapped surface

### **4.3.1 Final Review**

In the final review, the professors saw a short clip of projection, but they were not satisfied with the work or the surface. This surface was not viewed suitable for projection mapping as the surface was too flat. Working on a flat surface diminishes the potential of this technique. Techniques like projection mapping appeal to the audience if projected on larger surfaces. Another important point raised was against using poetry for this purpose, as it would be constricting further explorations. Using a soundtrack to accompany the projection mapping was suggested to be a more fitting alternative. Poetry somehow restricted the idea generation. So it was suggested to look for some soundtracks or produce appropriate sound as well.

## 6. PROCESS OF PRODUCTION

After the review and discussion with the guide, the idea of the poem and the surface, both were discarded. New surfaces and soundtracks were searched, some surfaces were documented, and trials projections were made.

Initially, the process of mapping the surface was carried out from photographs only, but there were accuracy issues with the pictures. Hence the projection will not fit on the real site.

After individual practice and working on the spot helped in learning the mapping process properly. Here are some of the initially mapped and photographed surfaces.



Figure 46 Surface 1 C block building entry

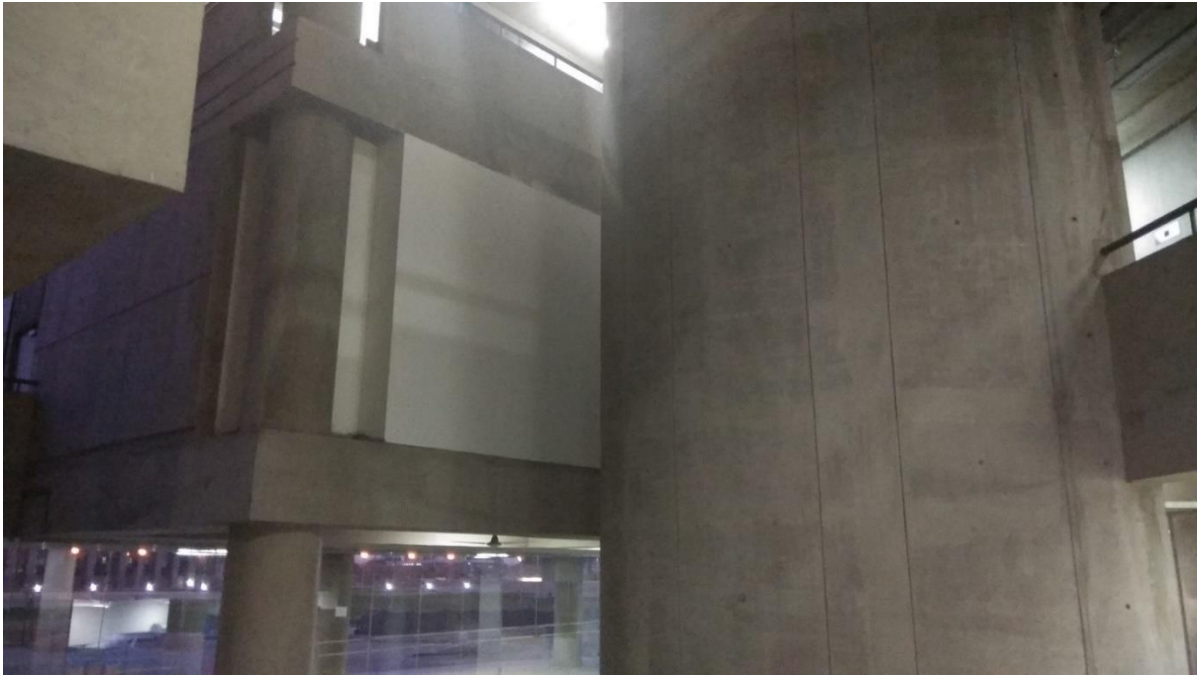


Figure 47 Surface 2 C block building

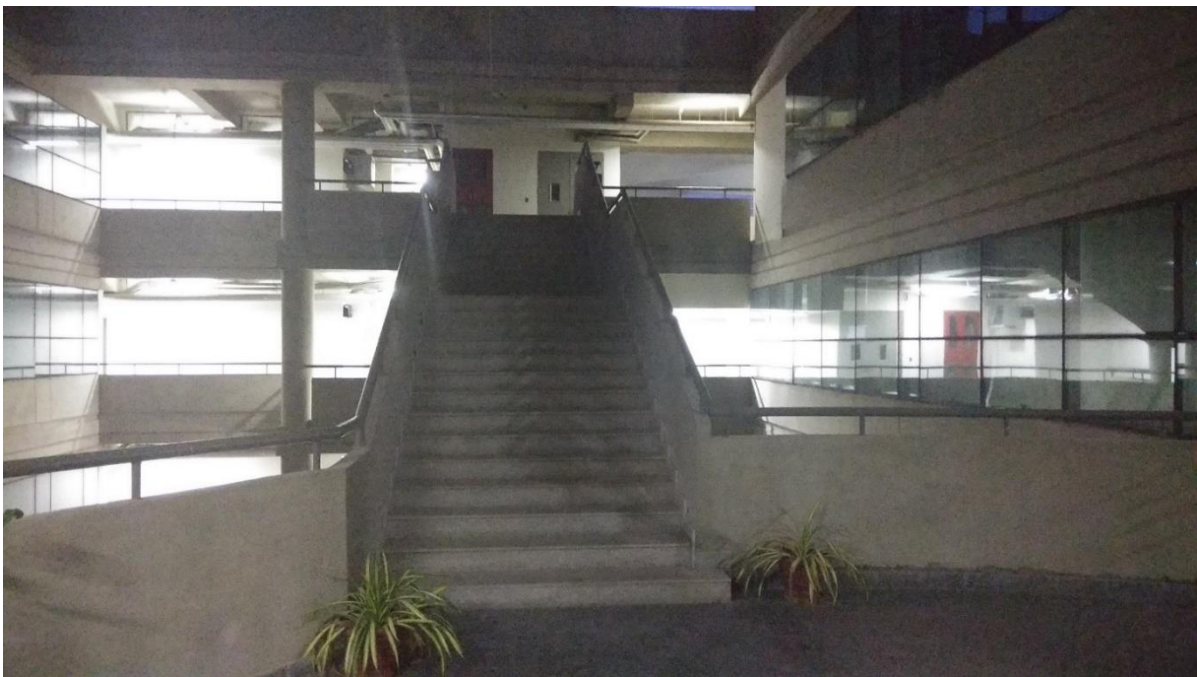


Figure 48 Surface 3 C block 5th-floor staircase



Figure 49 Surface 4 Academic building ISAC gate



Figure 50 Surface 5 Academic block ISAC gate





Figure 51 Surface 6 Academic block courtyard 1

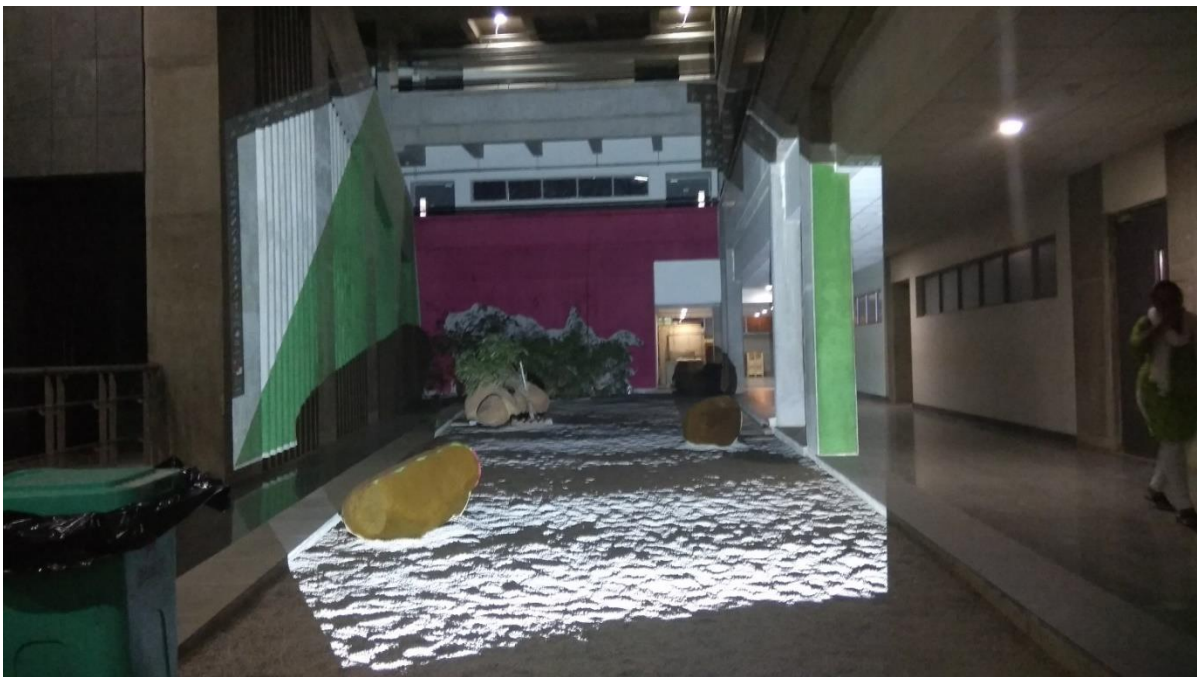


Figure 52 Surface 7 Academic building courtyard 2



Figure 53 Surface 8 Academic building courtyard 3



Figure 54 Surface 9 Academic building 2nd floor to 6th floor



Figure 55 Surface 9 B block

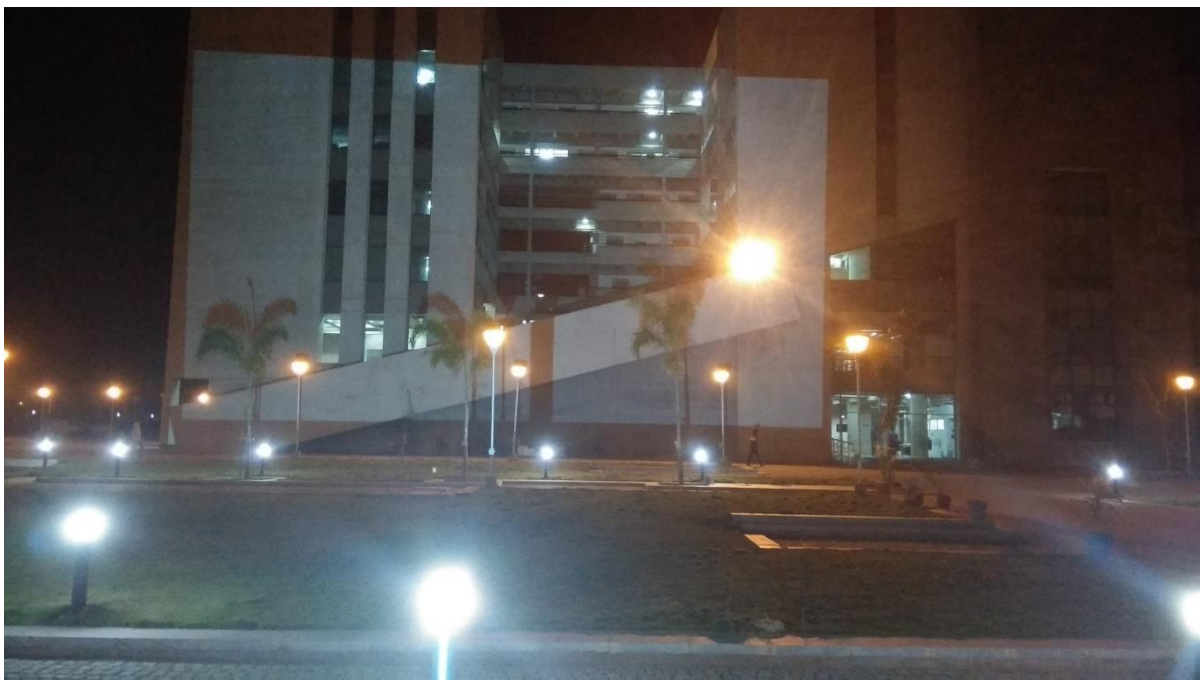


Figure 56 Surface 10 Academic building 1



Figure 57 Surface11 Academic building 2



Figure 58 Surface 12 C block building



Figure 59 B block building

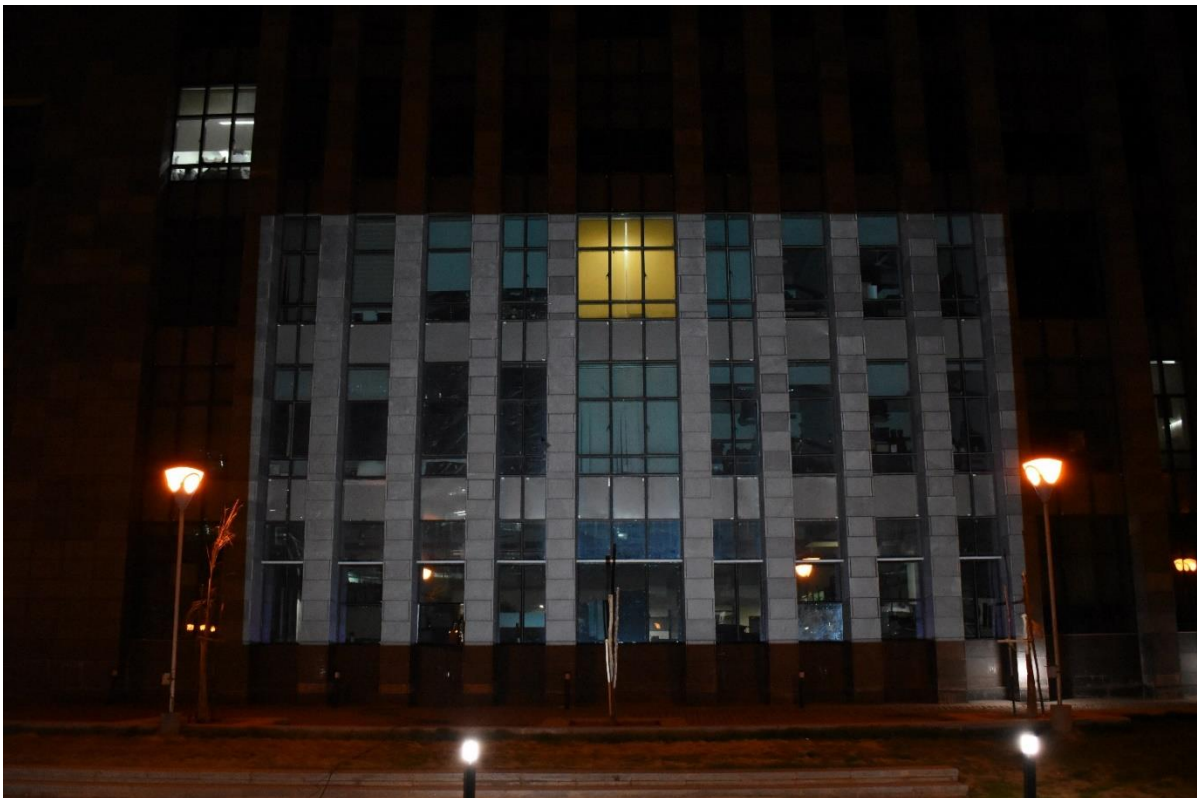


Figure 60 Academic building right side

Final surface Academic building right side panels

After mapping these many surfaces (architectural sites), this image was finalized as the surface for projection mapping. Many surfaces were discarded because, on these surfaces, there was a problem with the symmetry or sometimes due to surface.

## **6.1 Sound Design**

As the original audio, the poetry, was discarded, new soundtracks were researched. New audio was to be designed, keeping in mind the surface. So some of the existing soundtracks were discussed with the guide, and these are as follows:

### 1 Duet- Glen Keane 2014 animation movie

It was discussed with the guide that this is appropriate and works with the surface. However, the idea of using the soundtrack on which the animation was already done was not convincing. There was a rejection of the idea since there was a considerable chance that the audience would start comparing the video with the existing animation movie.

### 2 Movie- Requiem for a dream

Name of the music- Lux Aeterna by Clint Mansell

Musician- Kate chruscicka

A violin piece by artist Kate Chruscicka, It is a slow song and has a certain sadness in the music. The music is based on a narration of a story in between. From the starting to the end, the music is narrating a story. There was a trial of merging the violin cover by artist Vesislava Todorova on the movie Godfather with this sound. However, this did not work so well, so it was discussed to look for some other sound, which is of a high tempo and connects with the audience and is suitable for a projection.

### 3. harmonic frequency- fractal forest

### 4. video copilot shockwave test part 2 by xFoondom

### 5. ultimate 5D sound experience by Random Billionaire

### 6 Hyperdrive epic powerful futuristic music Epic Sci-Fi Hybrid music composed by Tim Besamusca and published by Revolt production music

After discussing and analyzing some soundtracks and sounds, in which the guide recommended few, it was finalized to use Sci-Fi theme based music as well as the projection mapping.

So three sounds were combined to make a soundtrack.

**These Soundtracks are as follows -**

CINEMATIC TRAILER SOUND EFFECTS PACK! - Video copilot “Motion Pulse” by [CGI Pakistan](#) starting of the music

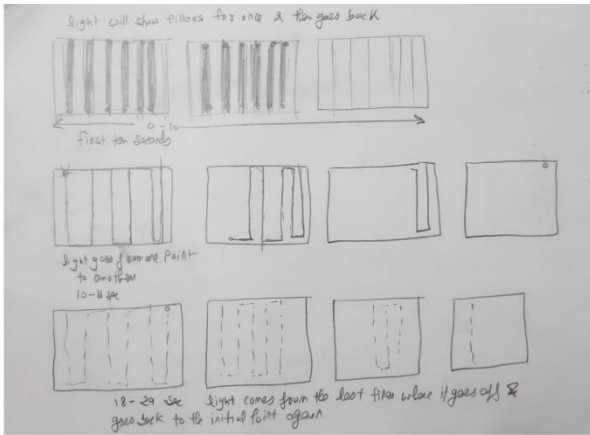
Technology- no copyright music (published by [Music For Youtubers](#)) middle part of the track  
SHOCKWAVE W SYNC W/ DUBSTEP music by Ramzoid – Ricochet published by

[Maxwell Eduardo | Motion Designer](#)

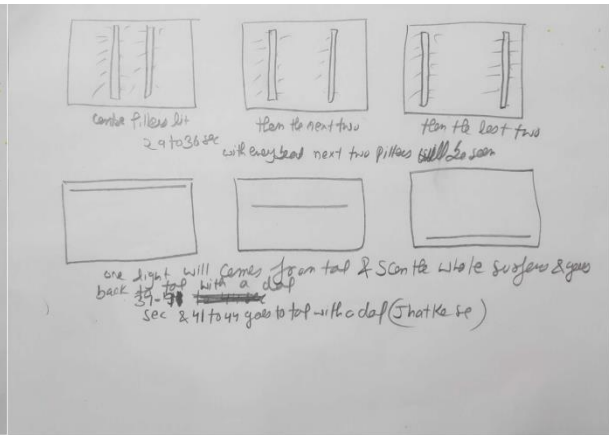
These three tracks were combined and mixed to make one soundtrack and finalized for projection mapping.

The theme for the projection was finalized on Sci-Fi and technology because such theme justifies the importance of the architecture onto which it is projected.

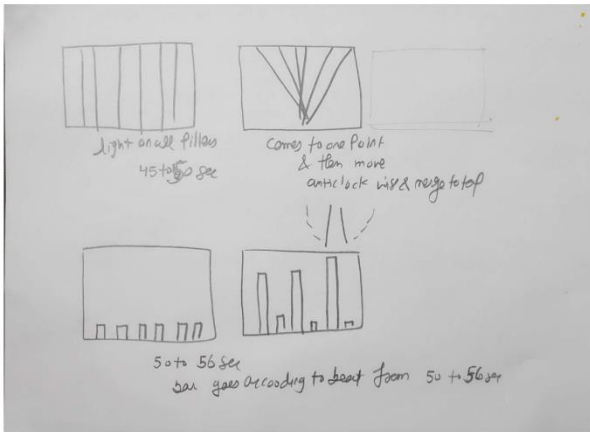
## 6.2 Initial Storyboarding for projection



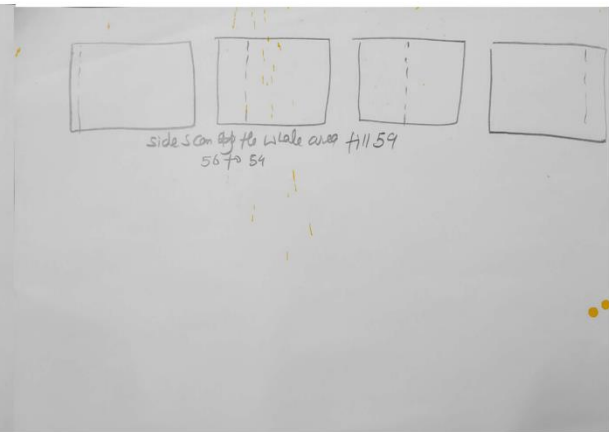
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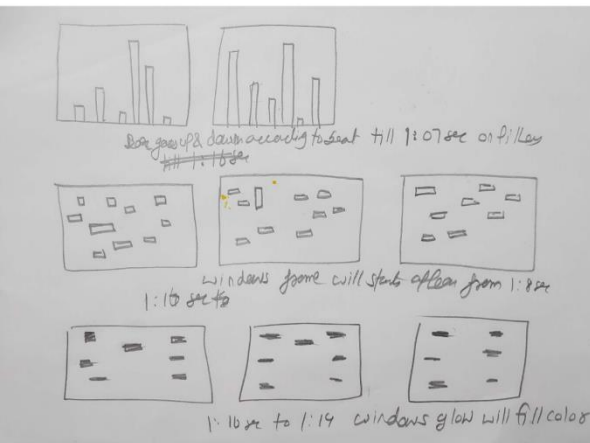
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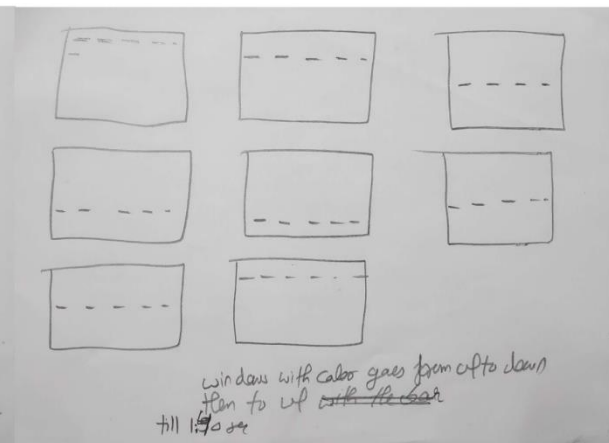
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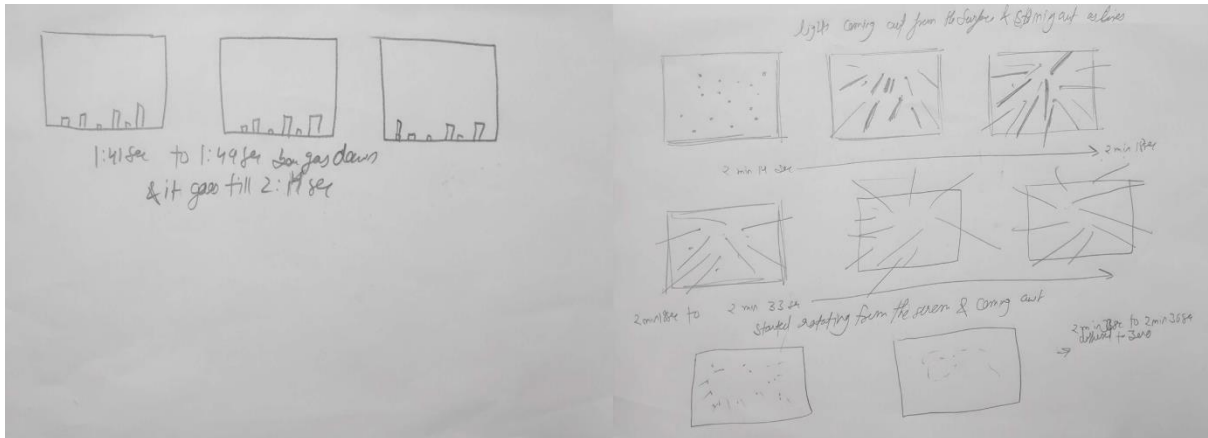
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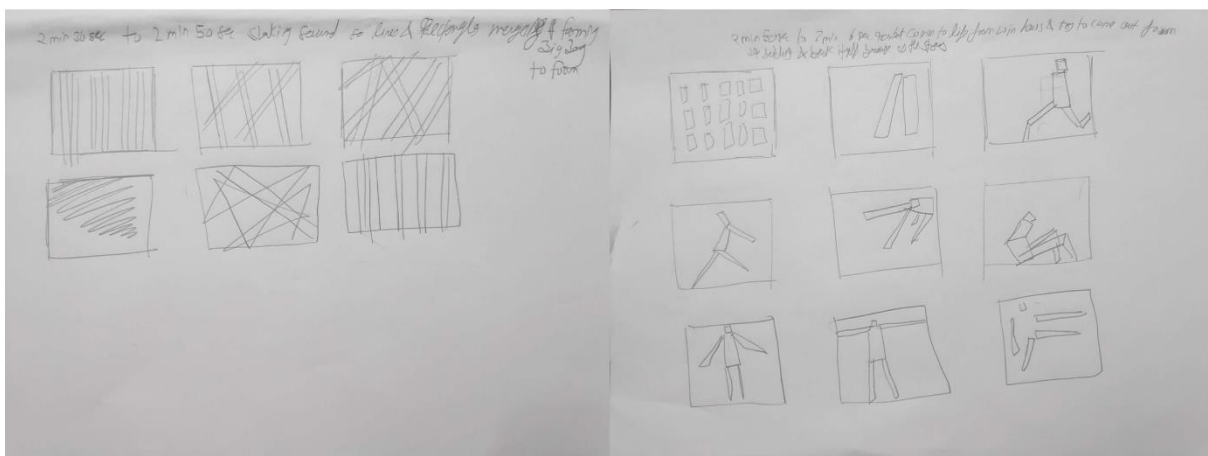
Figure 61 Initial storyboard for projection





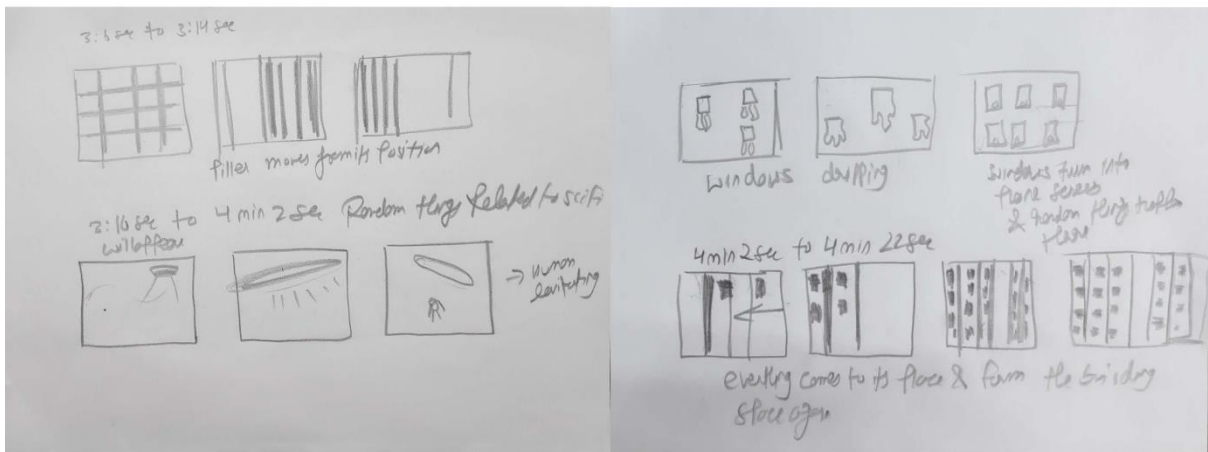
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Figure 62 Initial storyboard for projection

### 6.3 Measurement for projection mapping

(CENTRAL, n.d.)

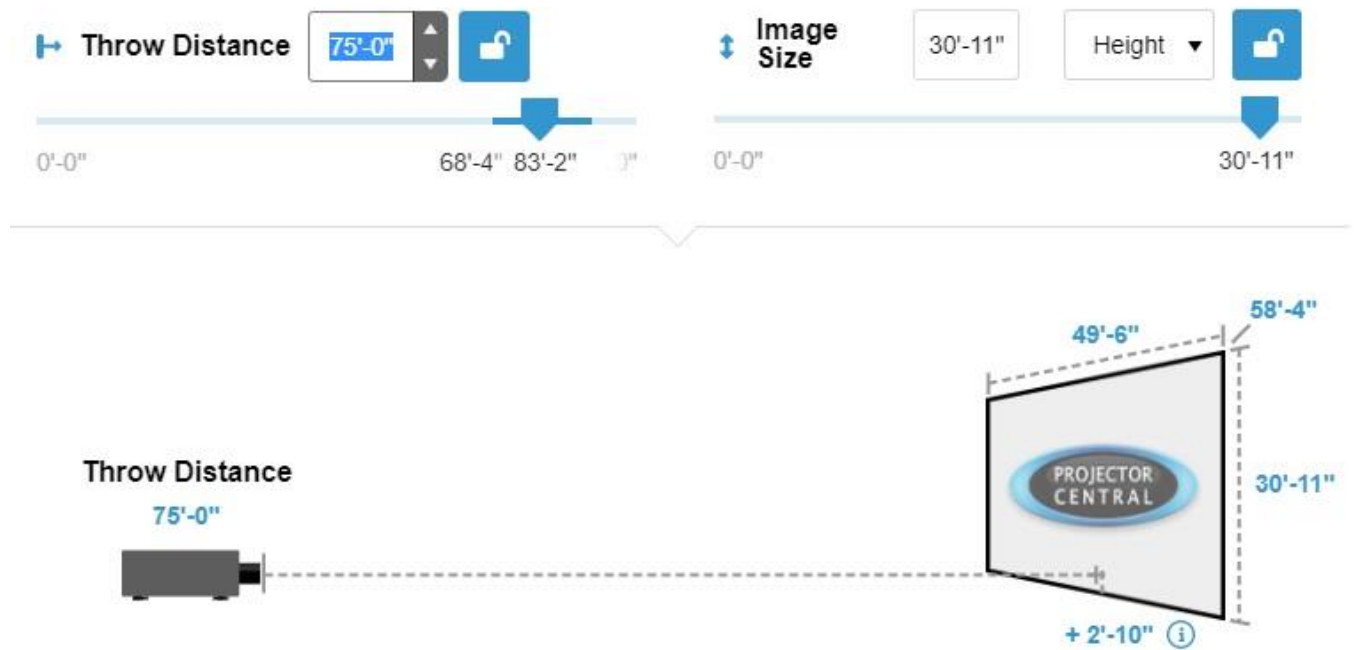


Figure 63 calculation of throw distance

### 6.4 Stills from the masking process in adobe photoshop

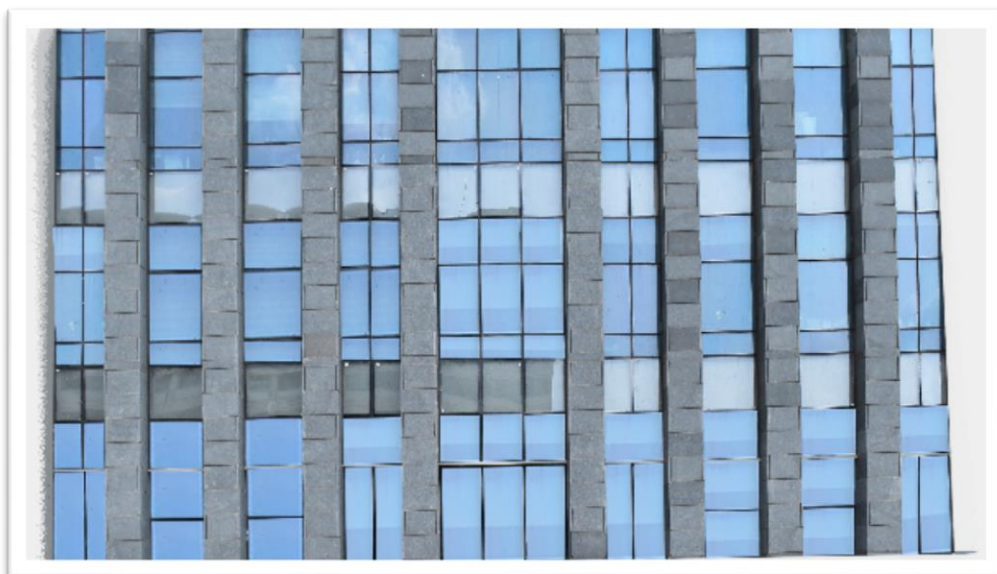


Figure 64 Initial surface before masking

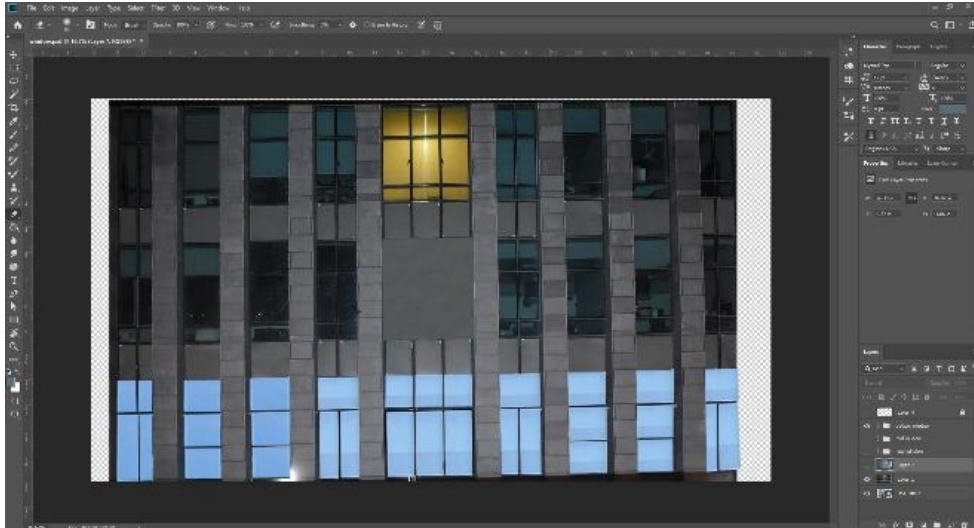


Figure 65 Masking process 1

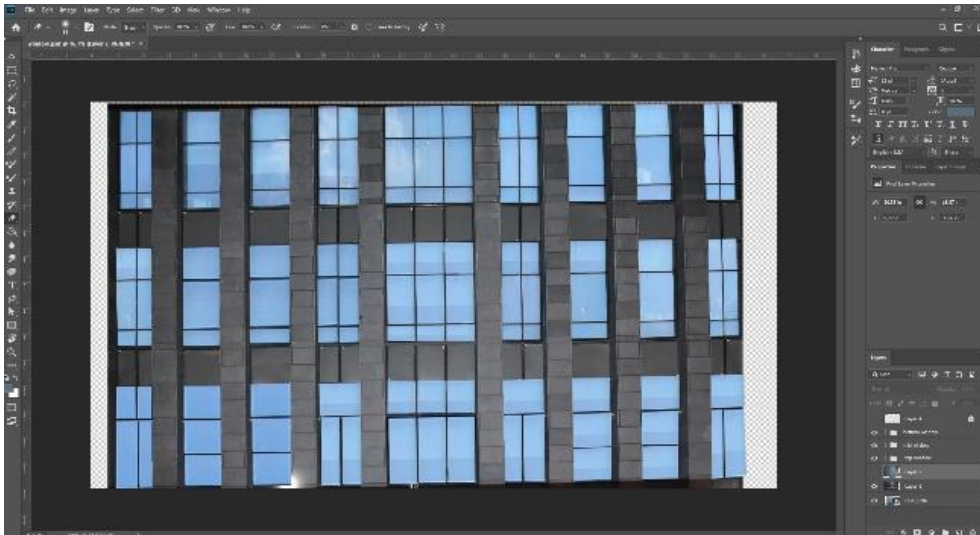


Figure 66 Masking process 2

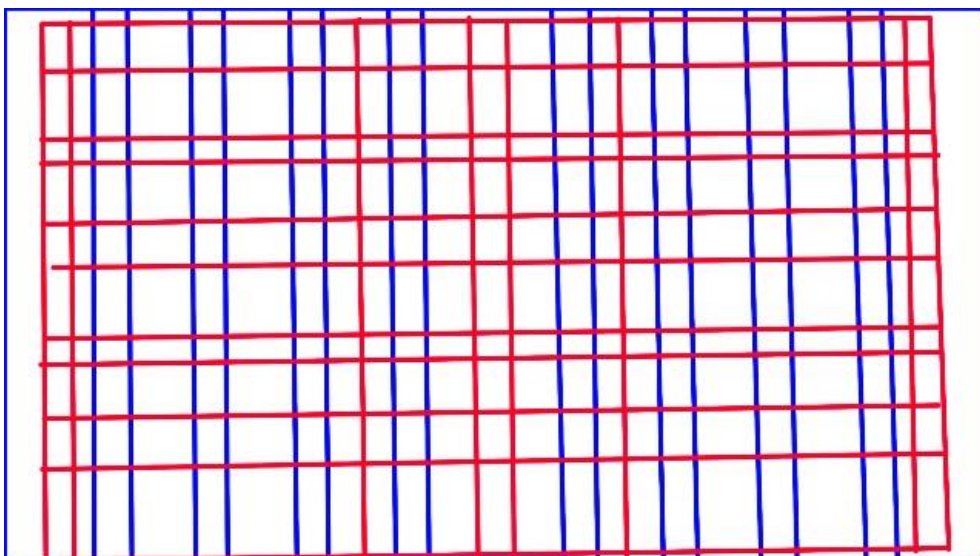


Figure 67 Grid layouts

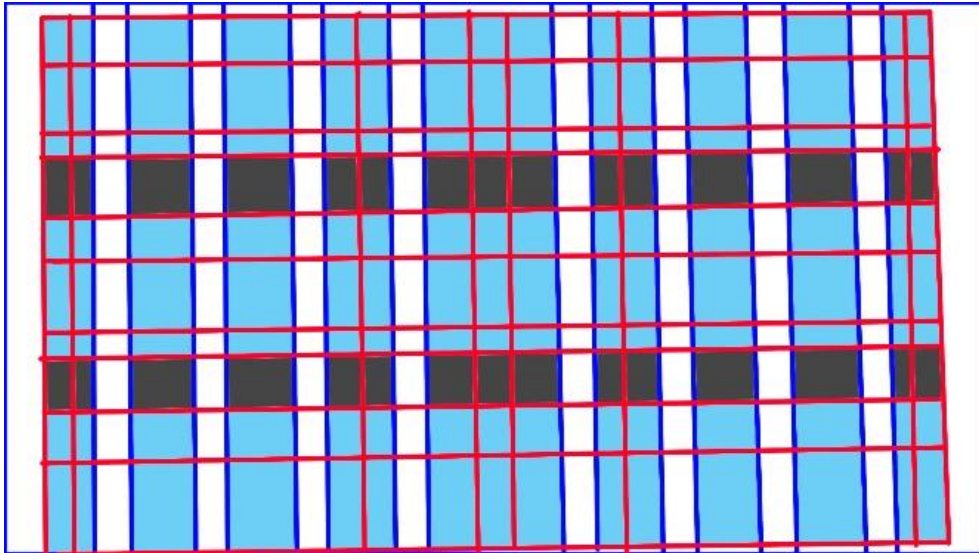


Figure 68 Masked surface

There is a process by which the software masks the surface and how every part of the surface separates from each other. Every single part is turned into an image to ease the animation and production part of the projection mapping.

Adobe Photoshop is used for masking the surface and in the pre-production for the movie.

### 6.5 Some stills from the process of making projection mapping video on adobe after effects

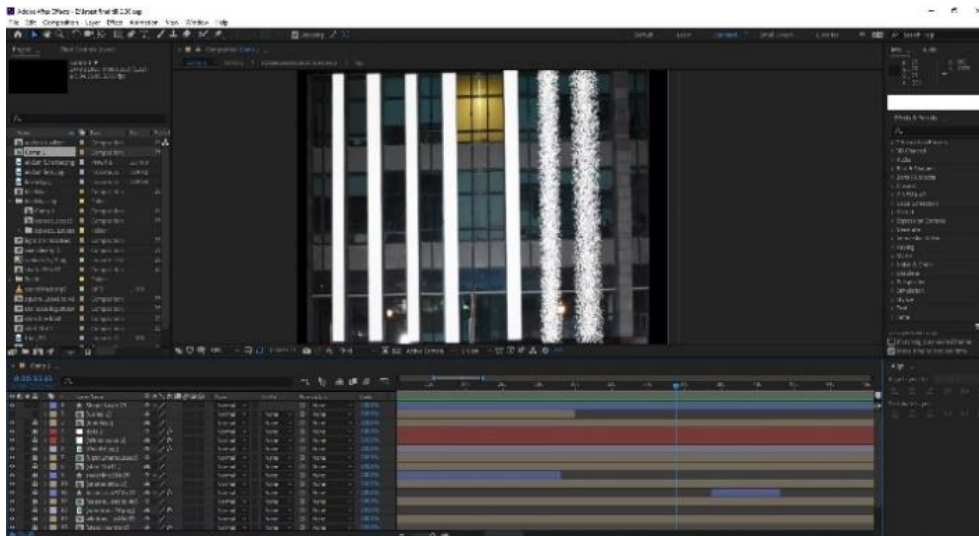


Figure 69 Scatter effect on pillars

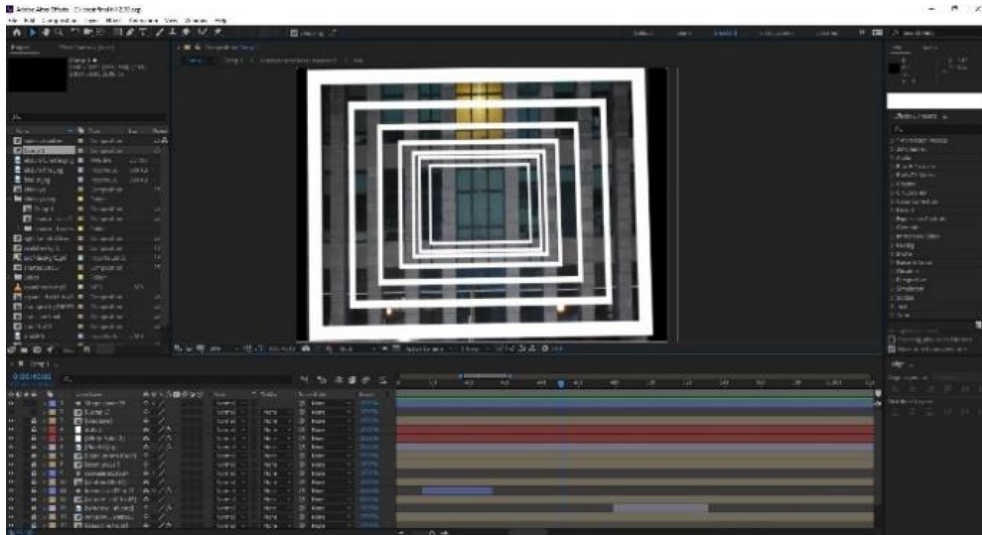


Figure 70 Continues looping of forms

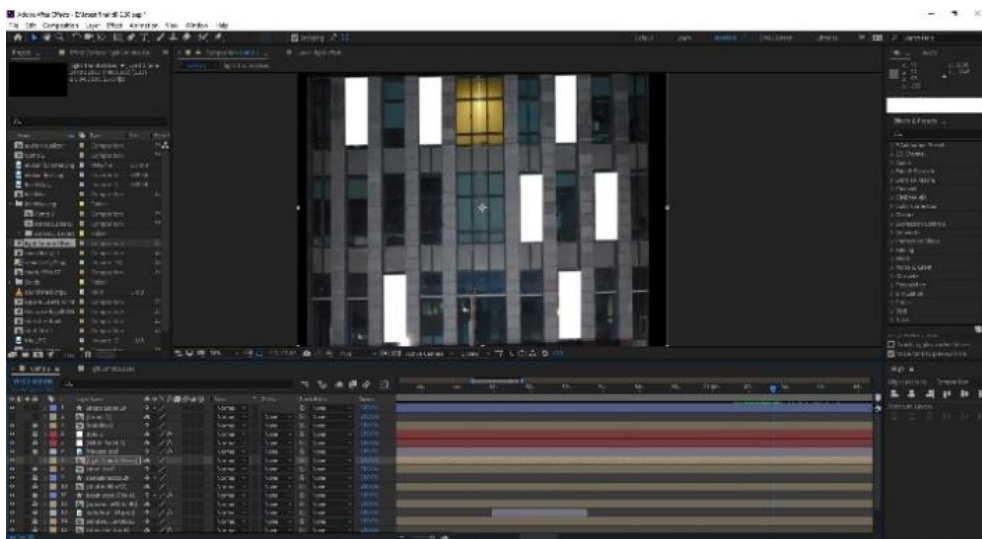


Figure 71 Light blinking on windows

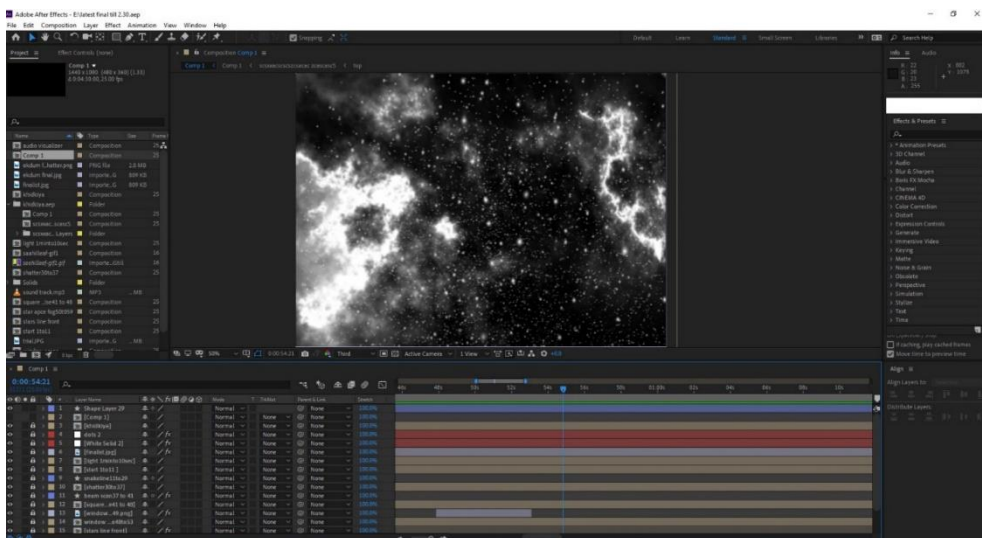
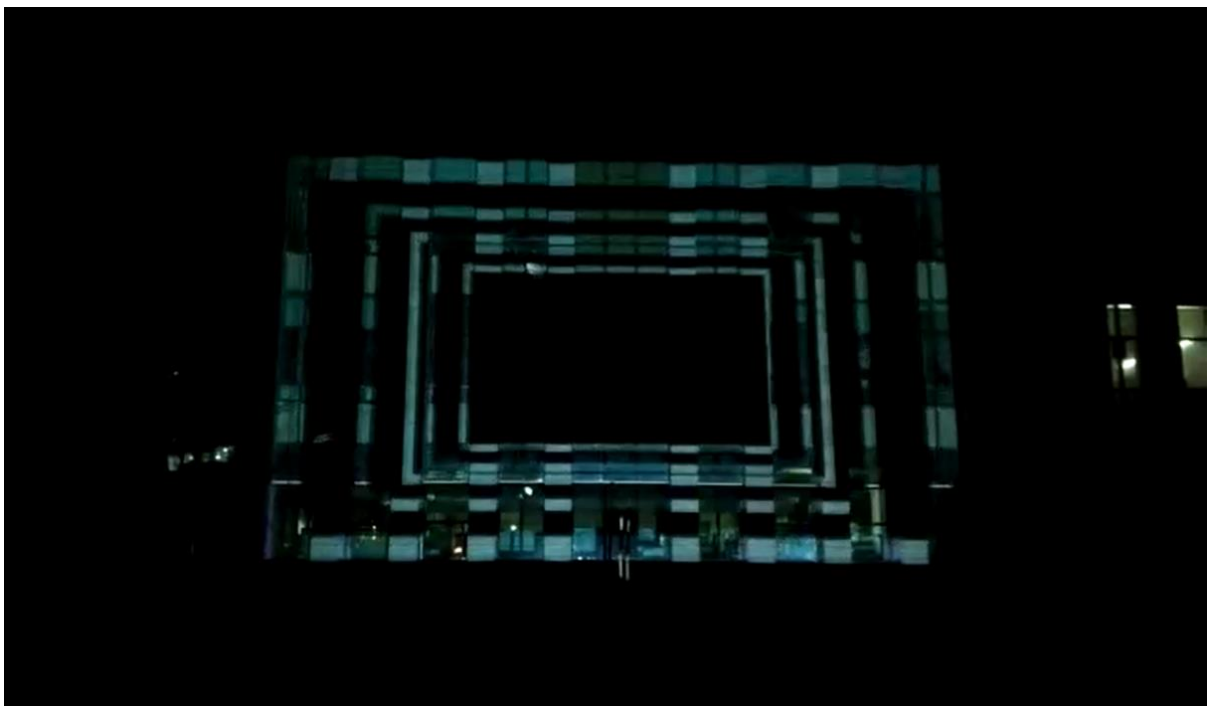
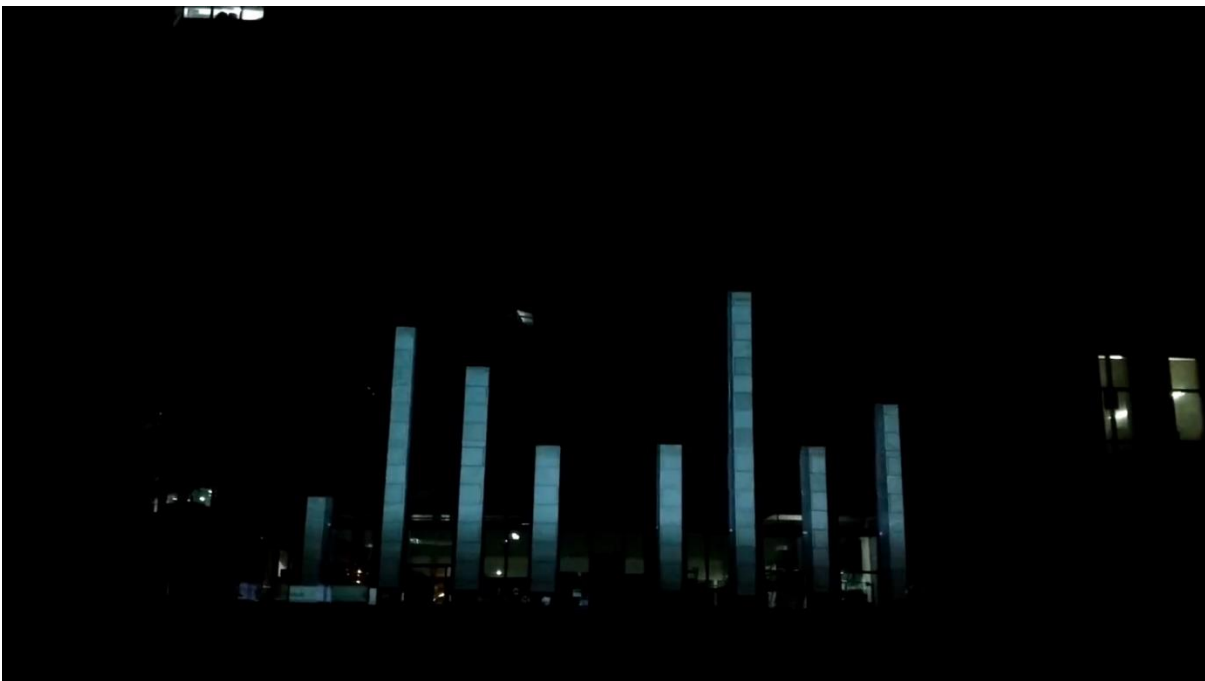
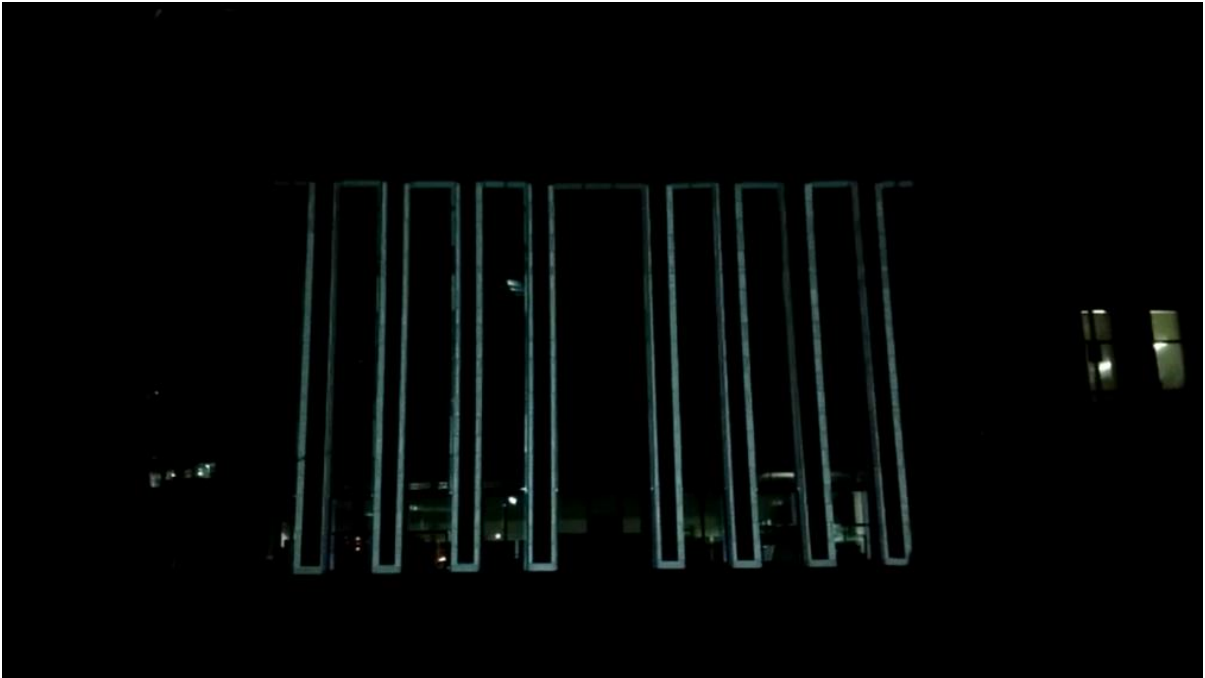


Figure 72 space fog and Sci-fi environment

6.6 Some stills from the site of projection mapping.





## **6.7 Process**

Brainstorming

Development of initial ideas

Change of concepts, ideas and, mediums

Storybuilding

Trial for surfaces

Surface selection

Sound

Production

The process of making projection mapping is quite an intricate task. It starts with the selection of the surface for projecting. Then the process of working on the spot has started, which needs much time because while masking a surface projector needs to settle down and fixed on the spot from where it needs to be projected. Then the masking of surface needs much patience because it is a time-consuming process, and every part of the surface needs to be masked.

Once the masking process is done, the image should be saved on the particular ratios which vary from different projectors. It usually works on 1920 x 1080. Then the production part will start on software, which varies to the preference and use of the artist. Artists use adobe after effects in general. In Post production; the video needs to be exported on the ratio on which the projector works.



## 7. LEARNING

After completing the Bachelor's course in sculpture, doing a Masters degree in design was a major shift in the manner of perceiving things. It was easy to express thoughts through sculptural means. Coming to IIT Hyderabad to study design added a whole new dimension. It was a new challenge to express thoughts through software.

Over two years, many new skills were learnt. A lot of discussions with professors and fellow students opened new arenas and dimensions of looking. It was difficult in the beginning to understand the language.

It has always been fascinating to see how great thoughts are expressed through films and animation, how filmmakers created such dramatic and apt visuals. It was difficult to imagine the amount of effort that went into making animations and films.

The interest in animation paved the way for Projection Mapping. The urge to combine poems and animation could be satisfied through this. The journey became exciting with the final project of Projection Mapping. Being completely new to this, it was important that all the supporting software and elements were learnt from the start. It was a challenge.

The project tested the limits of thinking. The guidance of the professors was of high importance in understanding the same.

With this extensive project, many aspects of building an animated visual were realized. I am working on a theme, researching on elements in support of the same, correcting and re correcting the results.

A lot has been learned about the manner of 'how to research' and the intensity to which it can be extended.

The aim is to take Projection Mapping even further and to work on more projects in the future. To create awareness, raise issues, and celebrate culture and moments of happiness.

## 8. BIBLIOGRAPHY

- András Sass, L. C. (2015, September 29). *youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=2dh9Zl2vQ](http://www.youtube.com/watch?v=2dh9Zl2vQ)
- Antonin Križanić, D. V. (2016, september 25). *youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=a1v4W95wJnM](http://www.youtube.com/watch?v=a1v4W95wJnM)
- BarclayPBS. (n.d.).
- Birmingham, D. (2014, October 15). *Youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/channel/UCx2M2bGHtXBszG6tuR\\_NIbQ/videos](http://www.youtube.com/channel/UCx2M2bGHtXBszG6tuR_NIbQ/videos)
- Birmingham, D. (2018, february 17). *youtube* . Retrieved from [www.youtube.in: https://www.youtube.com/watch?v=yosWjl8XsC0](http://www.youtube.in/watch?v=yosWjl8XsC0)
- bucielo*. (2010, December 24). Retrieved from Youtube: <https://www.youtube.com/watch?v=3BhZ8TqIyV4>
- CENTRAL, P. (n.d.). *projector central*. Retrieved from ProjectorCentral.com: <https://www.projectorcentral.com/projection-calculator-pro.cfm>
- Copilot, V. (2014, july 21). *youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=UWppqLrS6cU&t=239s](http://www.youtube.com/watch?v=UWppqLrS6cU&t=239s)
- Crossley, J. (2017, August 23). *Youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=hnEGU8ZGxHI](http://www.youtube.com/watch?v=hnEGU8ZGxHI)
- DOLLY, B. &. (2013, september). Retrieved from <https://gmunk.com/BOX>
- Dolly, B. &. (2013, September). *Gmunk*. Retrieved from [Gmunk.com/BOX: https://gmunk.com/BOX](https://gmunk.com/BOX)
- EKİM, B. (2011 Volume 1 Issue 1). A VIDEO PROJECTION MAPPING CONCEPTUAL DESIGN. *The Turkish Online Journal of Design, Art and Communication*, 10-19.
- Filip Sterckx, A. V. (2016, february 11). *skullmapping*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=LXyX-OvZIUg](http://www.youtube.com/watch?v=LXyX-OvZIUg)
- Getter. (2015, September 02). *OWSLA*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=2YllipG12Is](http://www.youtube.com/watch?v=2YllipG12Is)
- graphicINmotion. (2018, September 6). *youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=3CuQQz9ebc0](http://www.youtube.com/watch?v=3CuQQz9ebc0)
- Isamu Nishigoori, M. N. (2012, september 23). *youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=jws0Ns4Gicc](http://www.youtube.com/watch?v=jws0Ns4Gicc)
- kubasta, v. (2018, february 17). *youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=yosWjl8XsC0](http://www.youtube.com/watch?v=yosWjl8XsC0)

- Maxin10sity. (2016, august 12). *youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=VeGZ6p37now](http://www.youtube.com/watch?v=VeGZ6p37now)
- Miyazaki, H. (Director). (2008). *PONYO* [Motion Picture]. Retrieved from [https://www.google.com/imgres?imgurl=http%3A%2F%2Fdeeperintomovies.net%2Fjournal%2Fimage16%2Fponyo4.jpg&imgrefurl=http%3A%2F%2Fdeeperintomovies.net%2Fjournal%2Farchives%2F11678&docid=JLqjSCaMpQ8FcM&tbnid=zJTL6EpZGFFUdM%3A&vet=12ahUKEwi0kuHIjYPjAhWCdn0KHS\\_](https://www.google.com/imgres?imgurl=http%3A%2F%2Fdeeperintomovies.net%2Fjournal%2Fimage16%2Fponyo4.jpg&imgrefurl=http%3A%2F%2Fdeeperintomovies.net%2Fjournal%2Farchives%2F11678&docid=JLqjSCaMpQ8FcM&tbnid=zJTL6EpZGFFUdM%3A&vet=12ahUKEwi0kuHIjYPjAhWCdn0KHS_)
- Miyazaki, H. (2017, September 17). *Madman Entertainment*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=6zhLBe319KE](http://www.youtube.com/watch?v=6zhLBe319KE)
- Productions, 5. (2014, May 29). *youtube*. Retrieved from [http://59productions.co.uk/: https://www.youtube.com/watch?v=cFTVt2CofRo](http://59productions.co.uk/https://www.youtube.com/watch?v=cFTVt2CofRo)
- Shaikh, S. R. (2019, august 19). *The Indian Express* . Retrieved from <https://indianexpress.com/article/express-sunday-eye/people-forget-that-cartooning-is-writing-grant-snider-5312188/>
- Sharifian, M. (2012, November 22). *Youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=typCIrjnJdU](http://www.youtube.com/watch?v=typCIrjnJdU)
- Snider, G. (n.d.). Retrieved from <http://www.incidentalcomics.com/>
- SonduckFilm. (2018, August 28). *youtube*. Retrieved from [youtube.com: https://www.youtube.com/watch?v=Zw1aqL5NqjA&t=16s](http://www.youtube.com/watch?v=Zw1aqL5NqjA&t=16s)
- Studios, C. (2016, March 22). *youtube*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=DcZMDVW5BE4](http://www.youtube.com/watch?v=DcZMDVW5BE4)
- studios, O. (2016, february 24). *youtube*. Retrieved from [youtube.com: https://www.youtube.com/watch?v=CpRLwLcLHNA](http://www.youtube.com/watch?v=CpRLwLcLHNA)
- Susan Cain, C. V. (n.d). *words and pictures by grant snider*. Retrieved from <https://www.grantsnider.com/>
- Tarek Mawad, F. v. (2014, December 22). *3hund*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=PZwS-N0\\_j7E](http://www.youtube.com/watch?v=PZwS-N0_j7E)
- Tutorials, A. E. (2016, January 06). *YOUTUBE*. Retrieved from [www.youtube.com: https://www.youtube.com/watch?v=C913enLWYxE&t=51s](http://www.youtube.com/watch?v=C913enLWYxE&t=51s)
- Yegulalp, S. (2019, may 23). *liveaboutdotcom*. Retrieved from <https://www.liveabout.com/hayao-miyazaki-and-studio-ghibli-films-145390>

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