TAMPERE UNIVERSITY
OF APPLIED SCIENCES

Digital Animation Workflow for Live Cinema

“Roll” - Visual Performance

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ABSTRACT

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GIRALDO SALDARRIAGA SINDY TATIANA:
Digital Animation Workflow for Live Cinema
"Roll" - Visual Performance

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The purpose of this thesis was to analyse and suggest a potential workflow of digital animation used in live cinema projects. The theoretical part presents an introduction to digital animation, analyzing the different types of techniques available. The following part describes live cinema field, investigating the use of visual content in connection with sound.

In order to accomplish the study, I took part in a visual performance project, where I faced the production steps, from the pre-production to the final execution. In addition, I conducted a research on the experience of 50 professionals in the field of live cinema and digital animation.

The data collected from the questionnaire were placed in comparison with the production pipeline followed during the visual performance project I took part in. It was found that there are no fixed rules to approach the creation of performative content, partly because each artist approach the production in different ways, depending on different factors.

However, following a structure during the production is a valid option, especially to ensure not to forget some important steps while making a visual performance.

Keywords: digital, animation, live cinema, video jockey, performance, workflow.

CONTENTS

ABBREVIATIONS AND TERMS

TAMK	Tampere University of Applied Sciences
Vj	Video Jockey
CGI	Computer Generated Imagery
3D	Three Dimensional
2D	Two Dimensional
Mac OS	Oration system developed by Apple Inc.
Box office	Commercial success of a film in terms of audience
VFX	Visual Effects
Glitch	Temporary malfunction of equipment
VAMPIRE	Video and Music Program for Interactive Real-time Exploration/Experimentation
Dj	Disk Jockey
MTV	Music Television
Chiptune	8 bit music
Pixel	Physical point in a raster image
R&D	Research and Development
FBX	Filmbox - proprietary file format
XML	Markup Language
OBJ	Object file
COLLADA	Collaborative Design Activity
HDMI	High Definition Multimedia Interface
VGA	Video Graphics Array
RAM	Random Access Memory
GB	Gigabyte
Codec	Device or computer program for encoding or decoding
Live Cinema	Real-time audiovisual performance
CPU	Central processing unit
HDD	Hard drive disk
PC	Personal computer

1. INTRODUCTION

The purpose of my thesis is to design and suggest an ideal process of digital animation used for live cinema, a recently coined term for real-time audiovisual performance. (Makela 2006, 1) To help my research, I took part in a visual project, in collaboration with Markku Laskujärvi (student of Media at Tamk University of Applied Sciences) and Lassi Kähärä (aka Inner - student of Music production at Tamk University of Applied Sciences). The project started in November 2015 and ended in June 2016. During this period, Markku and I worked together to create a visual performance for the artist Inner, which aimed to interpret visually his 4 minutes audio track “Roll”.

During the process, I faced the production stages of digital animation for performative purpose, from the pre-production to the final execution.
In this study, I utilized an heuristic approach to accomplish the project, learning from mistakes and finding the right solutions to problems. After the project was completed, I collected the useful information to build an ideal workflow to present in this thesis.

In addition, to support my concept, I conducted a research based on the experience of 50 professionals in the field of live cinema. The research method I used was a questionnaire, shared on social media, targeting animators, visual designers, Vjs (Visual Jockey) and visual performers. The respondents answered to 20 questions, 10 multiple choices and 10 open questions. All the questions were related to their workflow using digital animation for visual performance. This research allowed me to compare different methods when addressing to the production of live cinema.

The first part of the thesis introduces the reader to the digital animation field, presenting the different types of digital animation and the typical pipelines for each method.

The second part consists of an overview of live cinema, offering the basic information to understand this medium. In this section, the types and components of live cinema are explained and listed.

The results of the expert interviews conducted on media professionals are presented in the third part of this thesis, analyzing the outcome and generalizing the information obtained.

The fourth part of the thesis presents the project pipeline of “Roll” visual performance, analyzing the steps made during the 8 months of production.

The last part presents the suggested workflow of digital animation for live cinema.

This document is addressed to those interested in creating digital content for visual performance, focusing on the complete process of digital animation, from pre-production to execution. However, the pipeline presented in this thesis should be interpreted as a suggestion, since there are no fixed rules to approach the creation of performative content.

2. DIGITAL ANIMATION

Digital animation is based on the traditional process of animating. As stated by the animator Wyatt A. , animation is the illusion of movement created by playing manipulated images in fast succession. (Wyatt 2010, 6) The term “digital” applies to animation when the sequence of images are created with a computer, producing a digital form, which can be described, electronically, as series of one and zeros. (Paul 2003, 11)

Technically, digital animation produces computer-generated imagery, also called CGI. Often this terminology is used to refer to three-dimensional (3D) computer graphics, but actually, it attributes to two-dimensional (2D) and three-dimensional computer graphics (Picture 1). (Dube R. 2009)

PICTURE 1. Example of 2D graphics (left) and 3D graphics (right) (Giraldo, 2016)

Traditional and digital animation utilise the illusion of movement, which is based on the “persistence of vision” and “Phi phenomenon”. In his article about the illusion of movement, the writer McKinney M. described how “persistence of vision” works, by explaining that the human eye holds an image for a fraction of a second, and during this short time, any image´s changes would not be recognized by the eye. Therefore, a

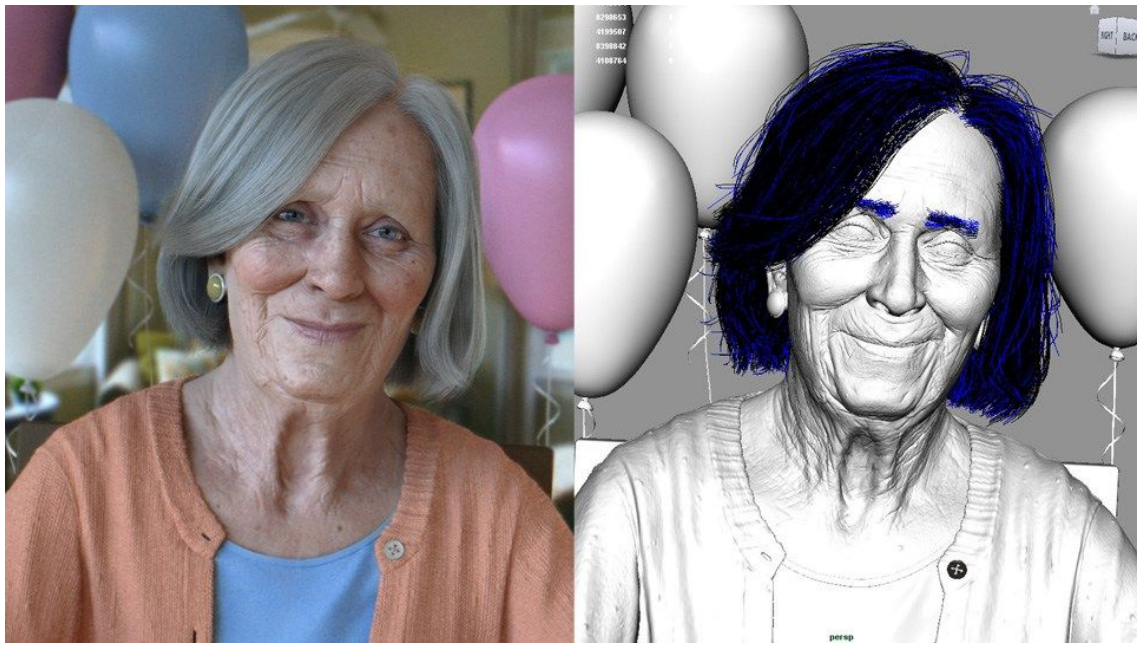
slightly different image can be substituted at this time, generating the illusion of movement. (McKinney 2008) On the other hand, “Phi Phenomenon” allows the brain to join and fill blank moments between a sequence of static images, creating the illusion of movement. (Danwen 2013)

Basically, when we watch an animation, we are actually watching at a sequence of still pictures (also called frames), 24 every second, in such a fast speed that our eyes cannot catch the distinctions. (Lord & Sibley 2004, 18) The lowest frame rate acceptable to create the illusion of movement does not drop below 12 frames per second, otherwise the animation would appear jerky.

With the traditional method, the animator used to hand-draw frame by frame on transparent sheets, also called “cels”. These sheets were then placed on top of a background image, creating a multi-layered composition. This method is still practiced, but many animation studios that once used this technique have switched to digital animation, for example the well known japanese studio Ghibli used the traditional method on “Princess Mononoke”, which was the last Ghibli film to be traditionally painted and the first to use digital animation in couple scenes (Picture 2). (Fenlon 2012)

PICTURE 2. Cel frame from “Princess Mononoke” (Mockman, 2008)

But why to switch from traditional to digital? As Dube R. states in his article, digital animation facilitates many of the production processes, for instance the layer composition, which is digitally easy to modify, delete or undo any of the components available in the scene. Besides the practical issue, there is a visual and aesthetic reason. In fact, digital animation, especially 3D, can achieve a level of realism, difficult to create with traditional method (Picture 3).



PICTURE 3 . Example of realistic 3D portrait using Autodesk Maya (Roarty D. 2014)

The level of realism, however, has improved over the years due to the development of computer technology. In fact, computers were originally created only to make quick calculations, and the first animations were created mostly by scientists, which were considered nothing much than experiments. (Paul 2003, 18 -19)

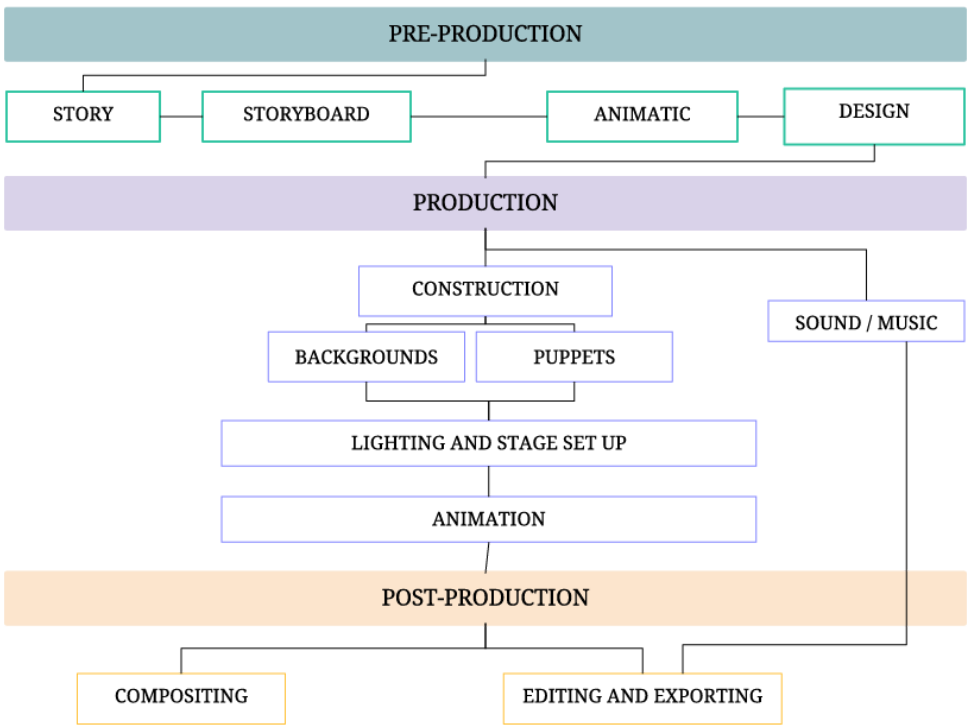
The processing power (CPU) has a lot to do with the development of digital animation, allowing to calculate more data to create 2D and 3D content. (Dube R. 2009) Additionally, the possibilities to store everything digitally facilitated the archiving process, which nowadays can be done on data storage devices, such as hard disk drives (HDD), much more convenient in comparison with the archiving of traditional “cels”, which were likely to be fold, risking to be damaged during the preservation. (U. Archives, 2014)

2.2 Types of digital animation

In order to suggest a valuable workflow of digital animation for live cinema, it is important to understand how digital animation functions. To do so, this chapter analyzes briefly the types of digital animation, presenting a typical pipeline for each category.

2.1.1 Stop-motion animation

Stop-motion, or stop frame animation, is a type of animation that uses physical objects in a scene, which movement is captured by a photo camera, one frame at the time. The movement is created usually by human or by a mechanical system. (Dragonframe n.d.) This technique seems to have nothing to do with digital animation, but contrariwise, it does use computer and softwares to digitize live images, allowing the animator to see each frame in real-time (Picture 4). Furthermore, these images are later manipulated in editing softwares, usually to interpret the frame-rate and to edit the compositions. (Wyatt 2010, 8)



PICTURE 4. Typical workflow for Stop Motion production (Giraldo, 2016)

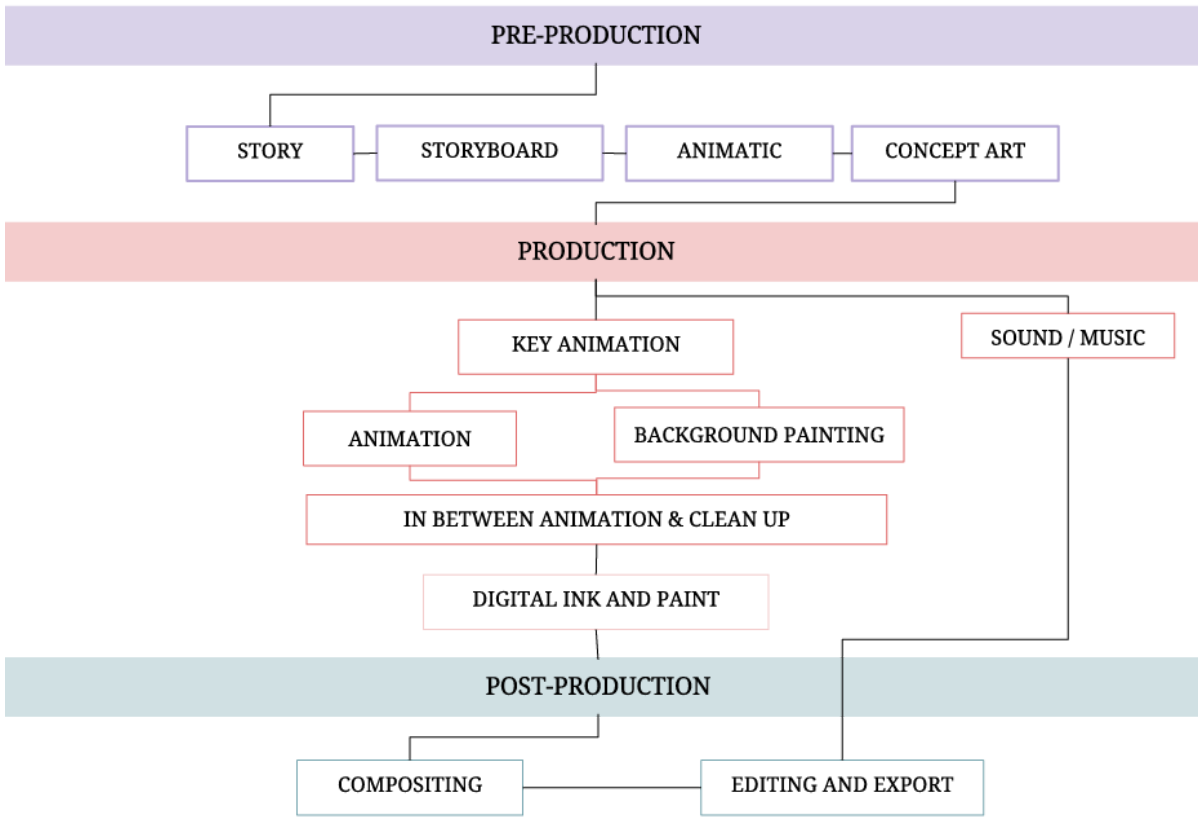
This type of animation requires different steps to achieve the final product, including the physical construction of the backgrounds and the puppets. The times of production can last for years, for instance, the animation Anomalisa directed by Charlie Kaufman and Duke Johnson, took over 2 years to complete (Picture 5).

PICTURE 5. Anomalisa shooting in progress (N.P.R. 2016)

Nowadays in the market there are different tools available to help stop-motion animation productions to frame-grab the scenes. Couple popular examples are DragonFrame, Stop Motion Pro and IStopMotion. (Lord & Sibley 2004, 70 - 71)

2.1.2 Digital 2D animation

2D computer animation is often confused with traditional 2D animation. In fact, according to the animator Sanders A.L. , traditional animation indicates the technique used by drawing each frame by hand and computer animation, as the name implies, it uses computer technology to digitally draw the frames (Picture 6). (Sanders 2015)



PICTURE 6. Typical workflow of digital 2D animation (Giraldo, 2016)

In a computer workspace, 2D has two dimensions, horizontal axis (X) and vertical axis (Y). Technically, the elements can move up and down, left and right, but they do not move towards or away. It is up to the 2D animator to draw the illusion of a three-dimensional object if needed. 2D digital images are made of either pixels or vectors. (Learn 2014)

Technically, vector graphics are made of paths. These paths can be lines or other shapes and they can be used to create drawings. The special feature of vector graphics is that they are not made of dot numbers and they can be scaled to a larger or smaller size without losing image quality. (TechTerms 2016) Due to display technology, the vectors are turned into pixels for the final output.

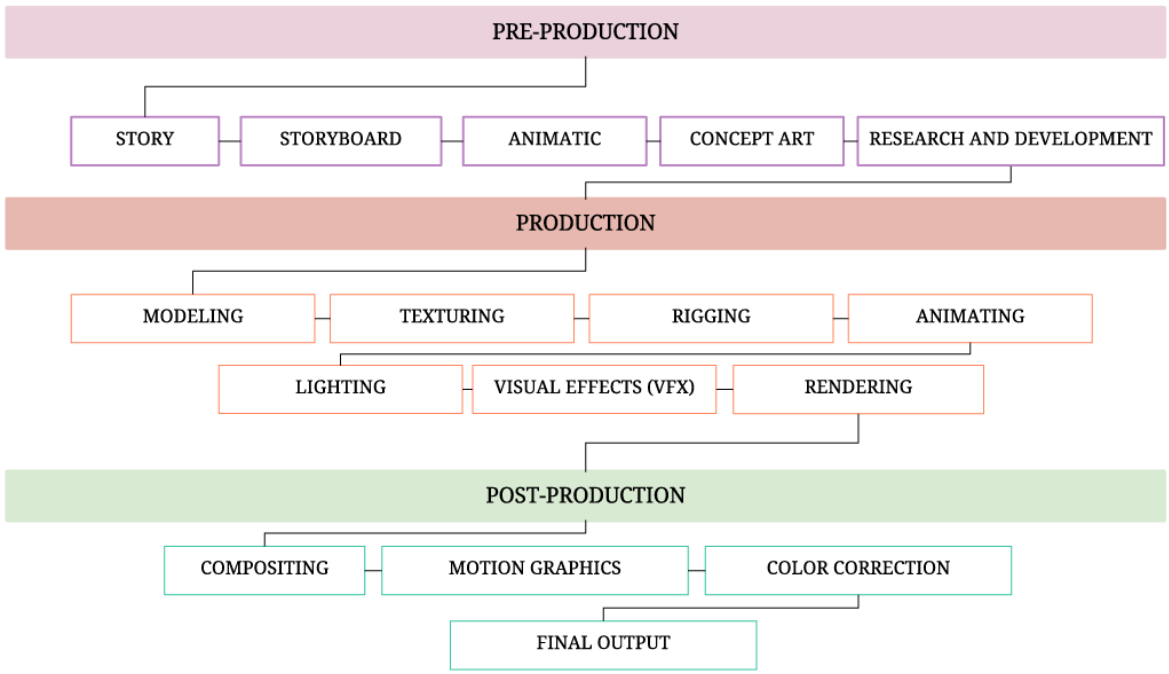
The possibilities to create valuable content with 2D animation softwares are visible by looking at Hayao Miyazaki's animations, in collaboration with Ghibli studio. An example is “Spirited Away” (Picture 7) , a fantasy animation created with Toonz, that earned over 250 million euro, overtaking “Titanic” at the box office. (O’connell, 2016)

PICTURE 7. Frame from “Spirited Away” (Koski 2014)

2.1.3 3D animation and motion graphics

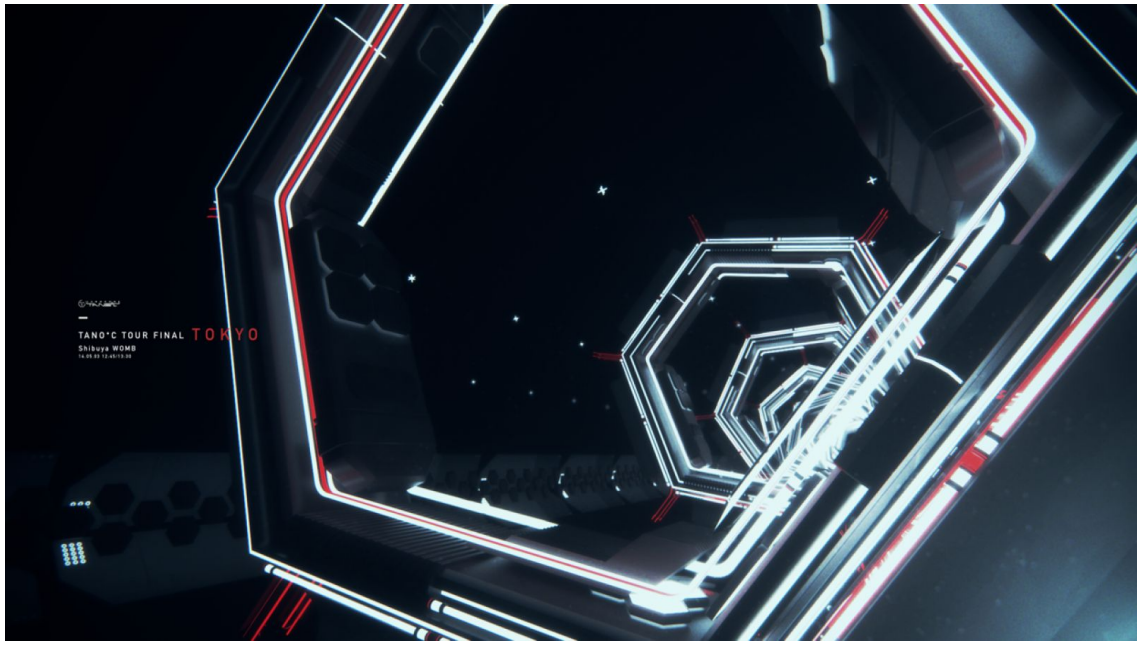
3D animation uses digital three-dimensional space to create a model or a scene. In a computer workspace, 3D has three dimensions, such as horizontal axis (X), vertical axis (Y) and depth axis (Z). (Franklin 2000)

Generally, in 3D everything has to be build from scratch, from the characters to the environment. According to Beane A. , 3D animation production can be compared to a car assembly line. Each person has their own task in a sequential order to finish the production. In 3D animation industry, the production can consist of over 400 people or as few as 2 (Picture 8). (Beane 2012, 21)



PICTURE 8. Typical workflow of 3D animation (Giraldo, 2016)

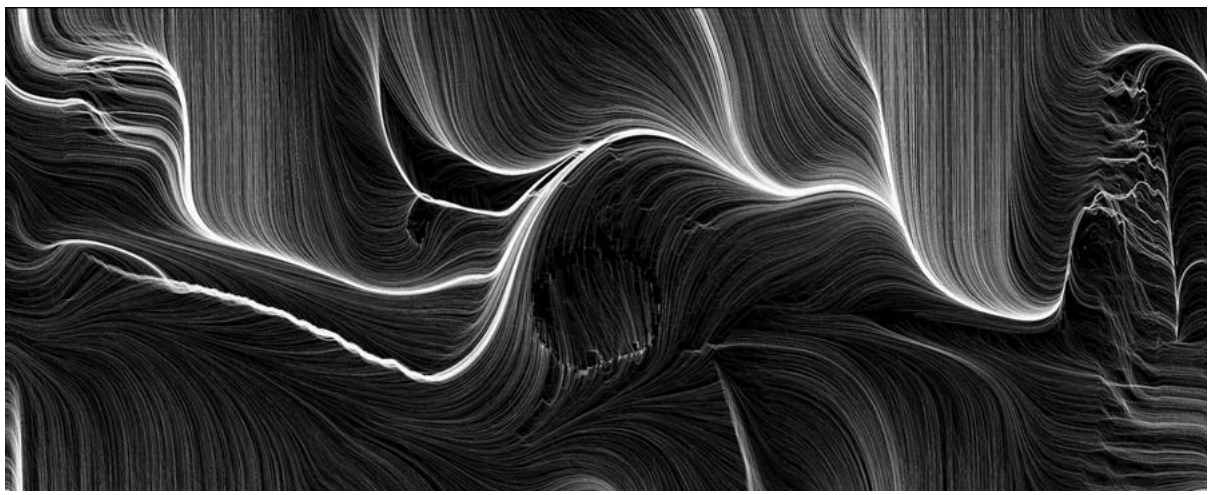
As part of the 3D animation pipeline, motion graphics is a common digital technique that merge typography, illustration, logos, shapes, sound and video (Picture 9). (Boardman, 2016)
Generally, they are used in film title sequences and television commercials, but lately they expanded also in the live entertainment industry. (Beane, 2012)



PICTURE 9. Example of Motion graphics (Yuzi 2014)

2.1.4 Creative coding and generative art

Creative coding and generative art are defined as an art that allows the artist to create a set of computer language rules to create something expressive instead of functional (Picture 10). (Jeya 2009)



PICTURE 10. Example of Generative art (Solaas L. n.d.)

Nowadays the use of coding to visualize a content is used in visual performance scene. However the need to have some fundamental skills of computer programming leads to few users. As mentioned by the art professor Shiffman D. , to simplify the coding process, many platforms and libraries facilitated the procedure by allowing coders to focus on the creative side of the project. Besides this, many artists share scripts or tutorials, encouraging the growth of the coding community. (OffBook, 2013)

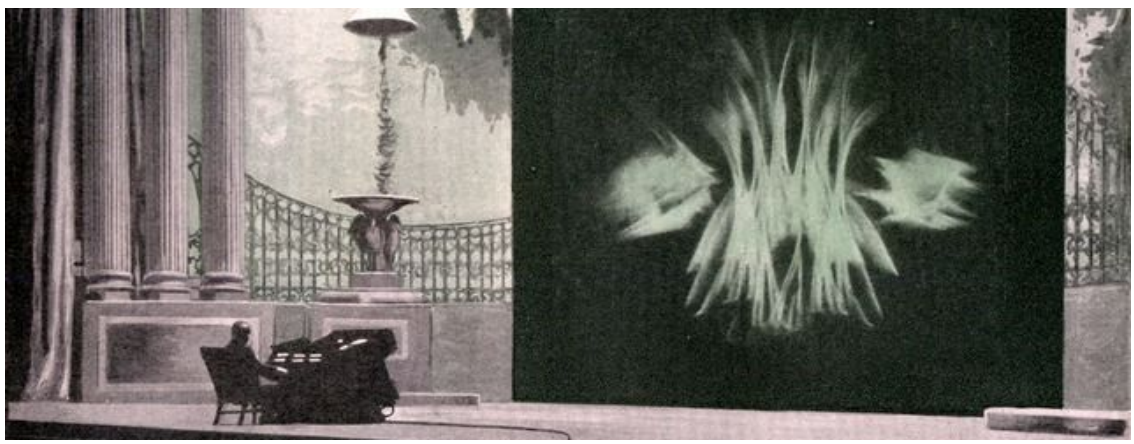
Some of the tools used to create this type of content are: Processing, NodeBox, After effects scripts, Structure Synth, Adobe flash with ActionScript, vvvv and more.

3 LIVE CINEMA

The term Live Cinema was introduced quite recently into the media art field as term to refer to the audiovisual performance controlled in real-time, specifically, during the actual moment it takes place. In this case, the idea of cinema is purely experimental, allowing different approaches to narrative or non-narrative visualization. (SuperEverything* n.d.)

As the visual artist Makela M. stated, the distinction between cinema and live cinema is based on the freedom of expression and improvisation. For instance, cinema follows the basic cinematography rules, such as linear narrative, with stories told through dialogues and actions. What happens in live cinema is established on the connection between the music and the visuals. Usually, the relation between sound and visual overtakes the real meaning of a concept. (Makela 2006, 1)

Back in the 18th century, technical exploration of connecting audio and visuals gave birth to instruments that would display abstract colored light, reacting to the sound produced. (Ciufo n.d. , 2) One of the most popular example is the machine “Clavilux”, created by Thomas Wilfred in 1930 (Picture 11). The machine displayed a three dimensional matter , using a color scheme representing emotions changing according to sound. (Modern 1924)



PICTURE 11. A photo taken of “Clavilux” by Thomas Wilfred. (Modern 1924)

In the 70s, the development of computing technology influenced also the methods of performing visually. Max Mathews and Laurie Spiegel created VAMPIRE (Video and Music Program for Interactive Real-time Exploration/Experimentation). This computer was an instrument for creating audio and visual content at same time and it was used in live performances. (Lew 2004 , 145)

Nowadays, any performance that incorporate the presence of a human manipulating moving images in front of an audience can be depicted as live cinema. (Lew 2004, 1) According to the media researcher Lew M. , live cinema can be divided in three types:

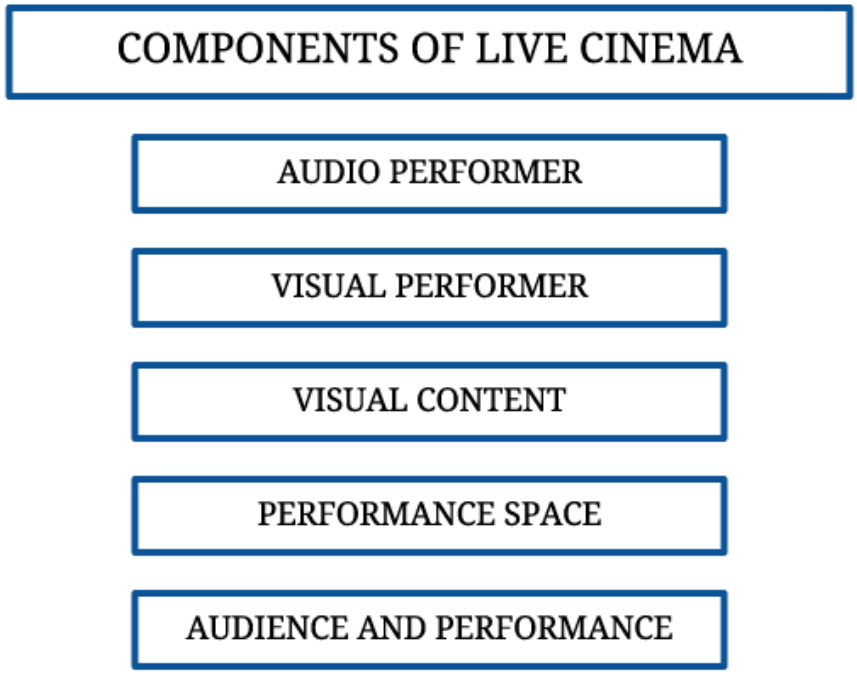
- **Abstract synthetic cinema:** This category covers the use of procedural programming and mathematical functions to create abstract content, also called "light art". The artist´s outcome can target colors, shapes and rhythm elements, manipulated according to one chosen parameter, transforming everything in a graphical choreography. (Lew 2004, 144)

- **camera-based cinema** :This type of cinema appeared already at the time of the silent era, when movies without dialogues were projected on walls, accompanied by musicians to amuse the viewers.
  The main concept of this type of live cinema is to use video manipulated content to translate the music. Thanks to new tools developed over the years, this type of cinema has become more dynamic, for instance, allowing musical instruments to control the video manipulation parameters. (Lew 2004 , 145)

- **graphical cinema** : Graphical cinema utilizes digital tools to represent visually the audio element. The visual elements in this cinema can be created before hand or at the time of the performance . (Lew 2004 , 145)

3.1 The components of live cinema

If we think about the components of live cinema, the production is not only based on the visual side, but it is necessary to implement other main elements to complete the full package.



PICTURE 12. Components of Live Cinema (Giraldo, 2016)

In a typical live cinema situation, the components are (Picture 12):

- ***Audio performer***: It indicates the person responsible behind the auditory part. It can refer to the disk jockey (DJ), who plays the music, previously mixed, or mixed as it is playing, or it can refer to musicians who play instruments live. In agreement with Lew M. , the task of a Dj is to choose the record first, then preview the audio on headphones and adjust speed, filters and add effects. After that, the Dj needs to introduce the material in the actual stream and manipulate the content live. (Lew 2004 , 145)

- The ***visual performer,*** also called video jockey (Vj) , is the person that accompanies the audio performer, presenting and controlling the visual content in a performance. (Makela 2006 , 1)

  The term Vj comes from the 70s but it became popular in the 90s, when the clubbing scene evolved and the house parties took place, demanding a new visual experience to entertain people. (Crevits 2006, 14–19) . MTV channel used the term Vj to indicate the hosts that used to announce music videos back in the 90s. Nowadays this terminology transformed to implement artists who create and perform live visuals in performances. (Makela 2006, 1)

- ***Visual content :*** Nowadays visual performances present different types of content. It usually depends on the visual performer approach to choose what type of content to perform.

  This thesis is focused on the use of digital animation as a tool for live cinema, however, the visuals are not limited to digital animation, but it also includes digital or analogue video manipulation and synthetic abstraction, also called "light art".

- ***Performance space :*** Performances and art installations usually require a meaningful construction and analysis of perception of space. Digital environment does not exhibit as physical reality spaces but, conversely, part of the goal is to make the audience sense to be in a surreal environment. (Paul 2003, 94-95)

  The performance space is the location where all the visual act is going to be, usually also called stage. In the most common situation, the Dj or musician is located on the stage, surrounded by the visuals. (Makela 2006 , 2)

  The audio performer's presence on stage is not mandatory, but very often it is essential, mostly because the audience relates to the performer's body language , searching for a demonstration of the visual and music authenticity. (Grossberg 1993, 204)

- ***Audience and performance:*** As Michael Lew states, the most difficult part of a live performance is to impress the audience and give them an impressive visual experience. (Lew, 2004) Live cinema does not have strict narrative rules, in fact, some artists decide to play around with the random factor, and present to the audience a completely non-narrative content.
  However, as music connects to audience, also the visuals has to keep up attention. To do so, it is positive to deliver stories to audience, in order to evoke personal emotions and gain attention. (Lenz 2010, 10)

3.2 Examples of visual content and tools

To better understand the concept of live cinema, this chapter introduces examples of visual performance using specific types of visual content, focusing mostly on the digital animation side.

2D animation and motion graphics are commonly created with digital tools such as Toon boom, Adobe After effects, Adobe Flash, Adobe Photoshop and others.

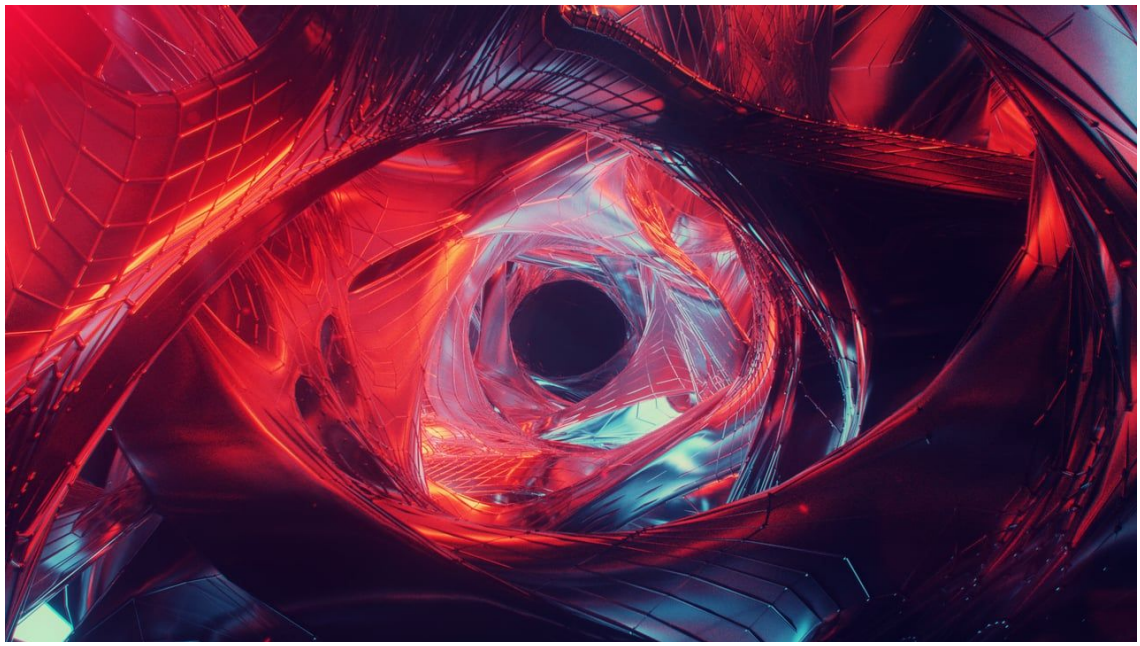
This technique can be found often in performances with synthesized electronic music, for instance “Chiptune music” (8 bit). A popular example is the visual event organized by Eindbaas in 2012, in collaboration with the game-animators Paul Veer and Vj Illuminator. The visuals were a mix of motion graphics and pixelated 2D animations, designed as 2D games from the 80s. During the event, the content was projected on the Dom Tower´s surface (tower in Utrecht, Netherlands) (Picture 13). (Eindbaas 2012)

PICTURE 13. An example of 2D animation used in Live Cinema (Eindbaas 2012)

3D animation for live cinema is usually created with 3D softwares, such as Cinema 4D, Blender 3D, Maya, 3Dsmax and others. Some artists utilize game engines, for instance

Unity 3D or Blender Game Engine, which allow them to create content and use game commands to control the graphics in the live situation.

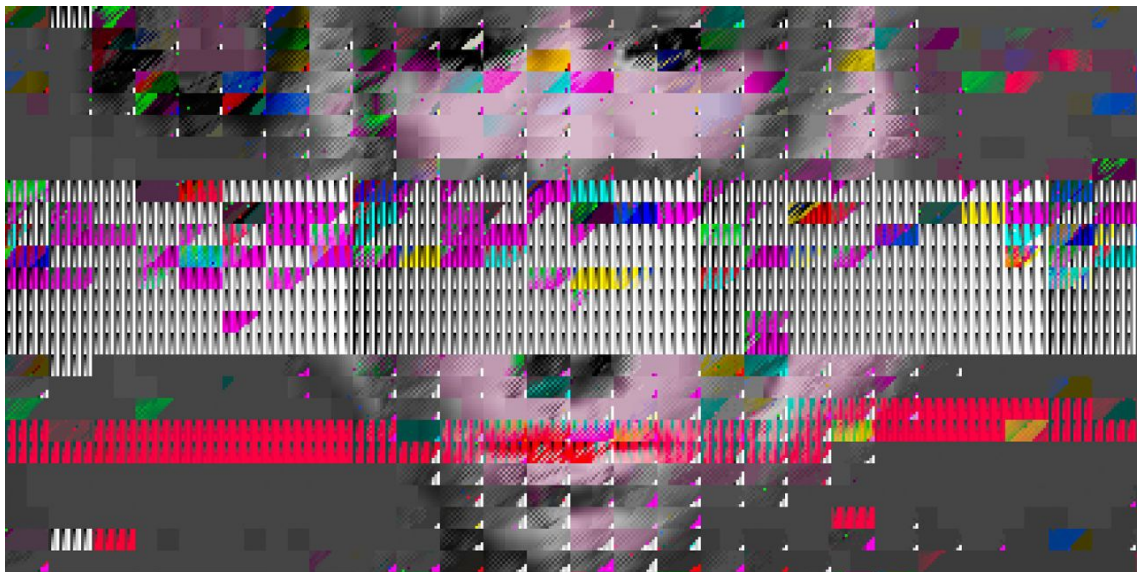
There are several important artists that contribute often to the vj community, by sharing their own 3D video material and even 3D project files for everyone to use.
An example is Beeple, a 3D artists that publishes daily 3D art and shares video clips under common license (Picture 14).



PICTURE 14 . Frame from the vj clip " VRMMM" (Beeple 2016)

Creative coding and generative art: A valuable part of visual designers uses coding to create visuals for performances. In this way, the visual performer is able to control the parameters in a more specific way, focusing on the relation between audio and video. According to Veronika Maz , an italian based vj, it is important to be able to control the audio reactivity during a performance, otherwise most of the artists would just use QuickTime player to reproduce the material. (Appendix 3)
For this reason, generative art allows the artist to produce graphics using a partly autonomous computer language. The result variates from abstract art to line art, creating abstract figures that at the same time are controlled by some parameters. (Zenbullets 2010)

The practice of “glitch art” (Temporary malfunction of equipment) is currently a very significant tool in creative coding area. In fact, many artists use this technique, often using specific softwares, to produce an aestheticization of digital errors (Picture 15). To create generative content, artists can use Vj tools or specific coding tools, such as Processing, NodeBox, VVVV, BPMC and more. (Glitchet n.d.)



PICTURE 15. Example of glitch art (Menkman 2014)

3.3. New methods and technologies

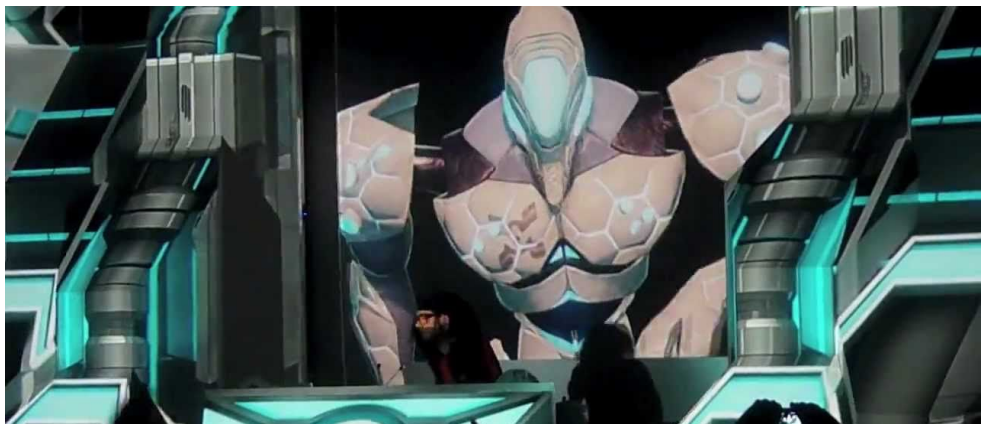
Nowadays, the range of possibilities using the previously mentioned tools are covering new areas, just as:

- ***virtual reality***: It allows people to interact and navigate in a three-dimensional, computer generated environment or camera recorded environment. (VRS Society 2016) The use of this technology brought to a new era of performance, in fact, thanks to this technology, audience can experience a visual performance in 360 degrees just by sitting at home. This technology is still in development, and, currently, it would need goggles to virtually experience it completely. An example is the video "Tomorrowland 2014 -360 degrees of madness", (Picture 16) which allows viewer to sense the famous festival experience, just by navigating with a smartphone or goggles. (Tomorrowland 2014)

PICTURE 16. Tomorrowland 2014 (Scopic 2014)

- ***motion capture***: This is the process of recording a live motion act and apply the data to a 3D model, recreating the act performance. (Organic Motion n.d.) Motion capture is used particularly in the film industry, game industry and visual effects (VFX), but it found its place also in the performance entertainment.

In 2011 and 2012, the music producer Skrillex performed in a motion capture suit on stage. Behind him, a huge 3D animated character would follow his movements in real-time. The technology used was the Xsens MVN motion capture suit (Picture 17). (Xsens n.d)

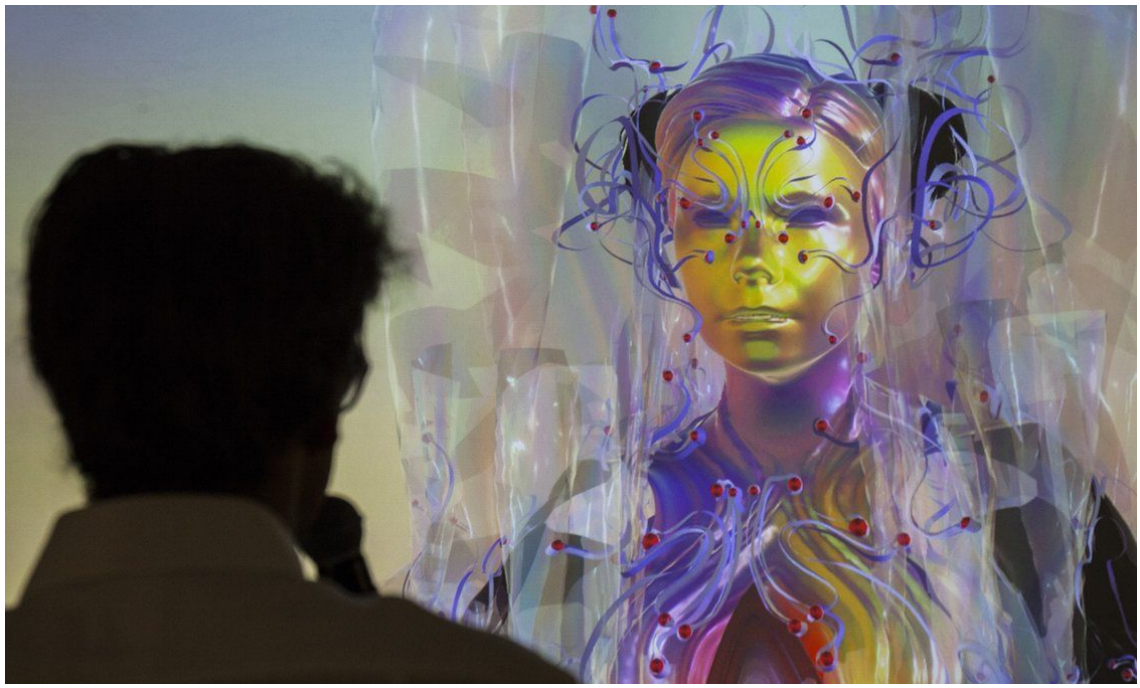


PICTURE 17. Skrillex performing using Xsens MVN technology (Liikuma 2011)

- ***Projection mapping***: As stated by the interactive designer Jones B. , "projection mapping is the display of an image on a non-flat or non-white surface". In fact, projection mapping is the action of projecting visual content on a particular surface, which, usually, it is not flat but three dimensional. (Jones 2012)
  The use of this technique is common in live cinema. Usually the stage elements are made in purpose to create an architectonic environment (Picture18). (Paul 2003)

PICTURE 18. 3D Projection Mapping at Fête des Lumières, France (Krautsack 2011)

Today, some musicians see the power of visual technology, allowing visual artists to collaborate in innovative performances. For instance, the Icelandic artist Björk, just released the dates of her new virtual reality exhibition called “Björk Digital”. This performance is the result of a collaboration between the artist and REWIND:VR, a virtual realty company. The outcome is an immersive performance that sees the artist combined to capture techniques, high definition 3D scans and real-time spatial audio design (Picture 19) . (Rewind 2016)



(PICTURE 19) Björk Digital - virtual reality interview (Santiago Felipe 2016)

4. INTERVIEW RESULTS

To better understand the digital animation workflow used in live cinema, I conducted a research to analyze the experience of professionals in the field of live cinema, focusing on the use of digital animation as a tool.

The research method I used was a questionnaire, shared on social media, targeting animators, visual designers, Vjs and visual performers. This chapter contains the results obtained after receiving 50 submissions.

In the first section of the questionnaire, respondents were asked to fill some basic information, and they were free to decide whether to remain anonymous or not. However, the 90% of respondents mentioned their name, profession and country. According to their location, most of the answer presented in this thesis concern the european Vj culture (TABLE 1).

Table 1. Country of the respondents

Country	N.Applicants		Country	N. Applicants
Albania	1		India	1
Argentina	1		Ireland	3
Australia	1		Italy	2
Austria	2		Malta	1
Belgium	3		Mexico	3
Bulgaria	1		Netherlands	1
Canada	3		Portugal	1
Colombia	1		Sweden	1
Finland	2		Tunisia	1
France	2		United Kingdom	7
Germany	3		USA	4

The respondents answered to 20 questions: 10 multiple choices and 10 open questions.

The structure of the questionnaire can be shared in 4 parts: Animation, performance, tools and pipeline.

4.1 Animation

In this section, the respondents were asked to answer the following questions:

- ***"Do you use animation in your workflow?"*** (TABLE 2)

Table 2. The use of animation in the workflow of 98% respondents

Answer	Num. respondents	Tot	Tot mentioned
Yes, but not always	26	53.1%	53.1%
Yes, always	18	36.7%	36.7%
Other	5	10.2%	10.2%

The majority answered "Yes, but not always", proving animation as a relevant tool in visual performance and commonly used by Vjs. Some of the respondents that answered "Other" stated to prefer abstract content, and use video material as visual element.

- ***"What type of animation do you usually create?"*** (TABLE 3)

Table 3. Types of animation used by 96% of respondents

Answer	Num. respondents	Tot	Tot mentioned
3D Animation	38	79.2%	27.7 %
2D Animation	36	75%	26.2 %
Motion graphic	35	72.9%	25.5 %
Stop-motion	10	20.8%	7.2 %
Traditional Animation	10	20.8%	7.2 %
Other	8	16.7%	5.8 %

According to the results, the most common type of animation used in live cinema is “3D animation”. The respondents that answered “Other” mentioned to use generative art and stereoscopic video material instead.
The responses to this question helped me to consider which types of animation introduce in this thesis, recognizing the relevance of generative art and coding in live cinema.

- ***“Why do you use animation as a visual tool?”*** : (84% of respondents answered this open question.)

Most of the answers described animation as a tool to enhance reality: “There are things you can film in the physical world but when you use animation, you can create things that are otherwise impossible to film”. Others defined it as a mean to visualise music, trying “to bring the audience inside the music and its meaning”. On the other hand, some respondents considered animation as a powerful low cost tool to create appealing content for clubs and events.

4.2 Performance

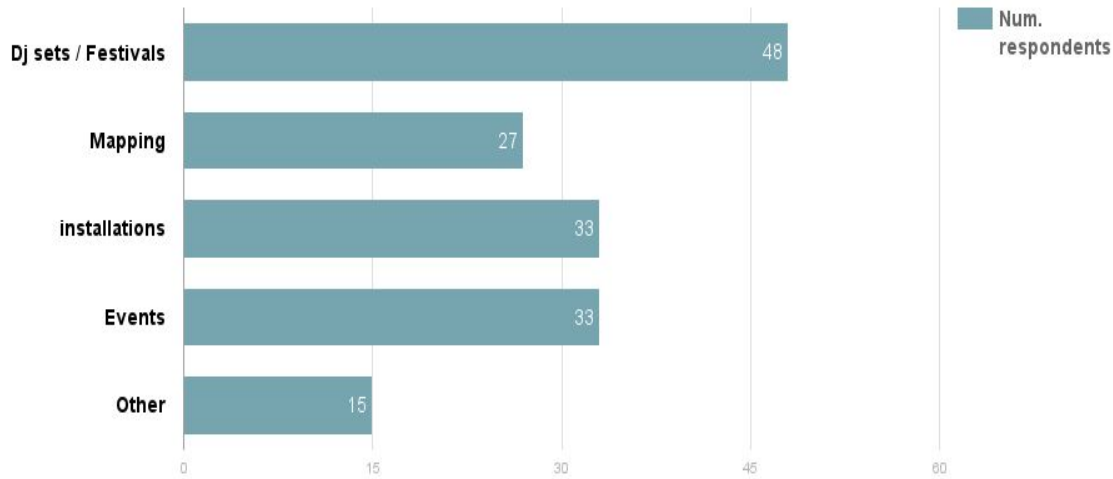
It was important for the research to understand what type of visual performances the professionals are used to work for, and what kind of approach they decide to take in linking music to image.
In this section the interviewees were asked to answer the following questions:

- “***In your opinion, what is a visual performance?”*** (88% of respondents have answer this question.)

The answers obtained for this question were varied and difficult to generalize.
Couple answers that popped up described a visual performance as “an immersive scene for the audience to lose themselves in time and space”.

According to a respondent, the word " performance" indicates something created by human, and "visual" indicates "something other than human, more mechanical and artistic in some form". Other interviewees answered in a more technical way, listing the elements needed to create a visual performance, for instance "lighting, sound, video, projection, screens and more".

- ***"Your visuals are created for..."***



PICTURE 20. The target events for respondents visuals (Giraldo 2016)

According to the majority of respondents, the most common situation to perform visuals are Dj sets and festivals. The interviewees that replied "Other" stated to create visual content for different events, such as concerts, corporate work and online events (Picture 20).

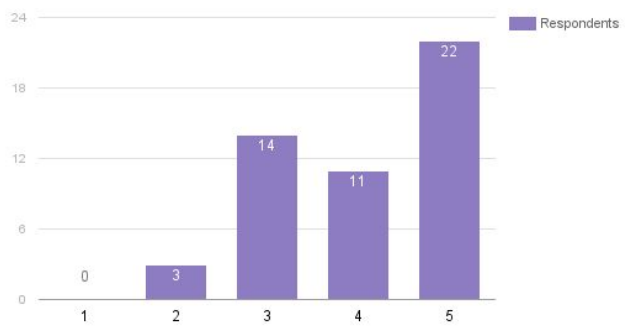
- "***What type of content do you usually present in a visual performance?"*** (TABLE 4)

Table 4. Type of content presented in visual performance

Answer	Num. respondents	Tot	Tot mentioned
Computer generated material / Animation (Previously created)	38	76 %	20.1 %
Raw video material	21	42 %	11.1%
Previously manipulated video material	30	60 %	15.8 %
Real-time manipulated video material	33	66 %	17.4%
Real-time computer generated material / Animation	33	66 %	17.4%
Interactive material	29	58 %	15.3%
Other	5	10 %	2.6%

The majority of respondents mentioned to use "Computer generated material, previously created" during their live sessions. However, a slightly lower amount of respondents mentioned to create "Real-time" visual material. This information proves that most of the professionals prepare visual material before the performance, without underestimating the importance of real-time manipulation.

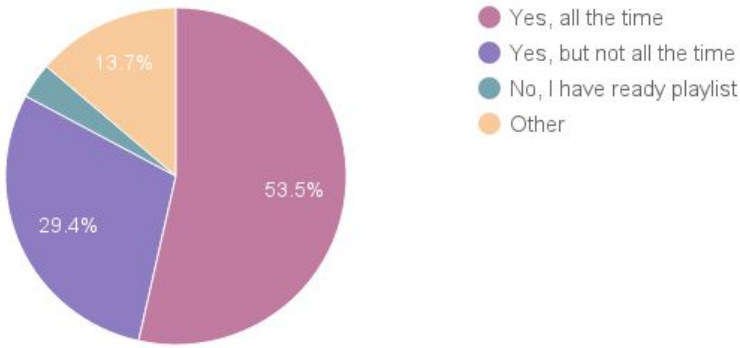
- "***How important is for you sound-reaction in your visuals?"*** (100% of respondents answered this question.) The respondents were asked to valuate from 1 to 5 the importance of sound reaction in their visuals (Picture 21).



PICTURE 21. Importance of sound reaction in live cinema (Giraldo 2016)

According to 44% of respondents, audio reaction is “very important” during live cinema. This feature can emphasize the connection between audio and image, and it can help to control the visuals during the performance, without the need to control it personally all the time.

- ***“During a visual performance, do you control the content in real-time?***” (98% of respondents have answer this question) (Picture 22).



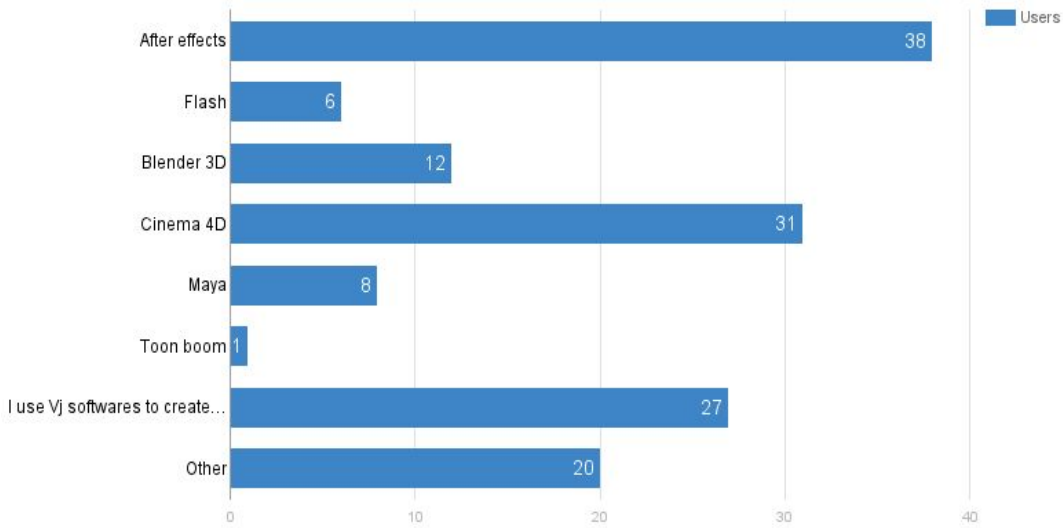
PICTURE 22. Amount of respondents that control visual content in real-time (Giraldo 2016)

The 53.5% of interviewees answered to control their content all the time. Others mentioned to control the visual all the time, but in a more procedural way, which changes by itself, without the need of continuous human input. On the other side, some respondents mentioned to mostly work on the visual content side and then deliver it to programmers, who usually take care of control the material in real-time.

4.3 Tools

In this section, the respondents were asked to answer some questions about the methods and tools used during their workflow.

- "***What tools do you use to create animation?***" (100% of respondents have answer this question) (Picture 23).



PICTURE 23. Digital animation softwares (Giraldo 2016)

According to the results, the most common software to create animation for live cinema are Adobe After effects and Cinema 4D, mentioned by the majority of respondents.

The respondents that answered "Other" mentioned to use other tools, such as: VVVV , Unreal Engine 4, Tachyons +, BPMC, LoFi Future, Photoshop, Lightwave, Octane Render, 3DSmax, Première Pro, Illustrator, Quartz composer, d3/Notch/TouchDesigner/Isadora, Motion, Shaders, games, Unity 3D, Imovie, Quicktime, TouchDesigner and own visual synth tool.

- ***"What tools do you use to visually perform your content?"*** (TABLE 4)

Table 4. Vj softwares used by the respondents

Answer	Num. respondents	Tot. Respond.	Tot mentioned
Resolume	37	75.5 %	33 %
MadMapper	16	32.7 %	14.3 %
Modul 8	11	22.4 %	9.7 %
Arkaos GrandVj	5	10.2 %	4.4 %
Quartz composer	9	18.4 %	8 %
ProVideoPlayer	0	0 %	0 %
VDMX	5	10.2%	4.4 %
TouchDesigner	8	16.3 %	7.1 %
Other	21	42.9 %	18.76 %

According to the results, the most common vj tool to perform the content is Resolume, mentioned by the 33% of respondents. This tool allows the visual designer to mix video and add effects in real time situations.

The majority of respondents that answered "Other" mentioned using "Isadora" and "VVVV". The other tools mentioned are the following:
Unreal Engine 4, Pioneer SVM 1000, Edirol V-4, Pioneer DVJ 1000, other Hardware, Millumin, QLab , Custom Built in Unity3d , lumen, processing, Max MSP and own software.

- "***Does the budget usually affects your performance?"*** (98% of respondents have answer this question.) The respondents were asked to valuate from 1 to 5 the importance of a budget for a visual performance. The majority (32.7 %) stated that the budget "definitely" affects the result of the performance.

- ***"Usually, how long does it take to create the visual content for a performance?***"(100% of respondents answered this question.)

According to the respondents, the average amount of time to produce visual content for live cinema depends on the budget, client and event. However, the majority mentioned an average production time between days to weeks.

- "***What are the tools and equipment you need for a visual performance?***" (94% of respondents have answer this question.)

Each respondent listed the tools needed to accomplish a visual performance. Obviously, each artist have different approach to the performance, for this reason the tools variated from artist to artist.

In general, as output video devices, the respondents mentioned to use mostly powerful computers with storage drives and library content. Others mentioned to use Ipads, digital video cameras, DVD (Digital video disc) players, sensors and Xbox 360 kinect. The mentioned tools to control the video content were MIDI (Musical instrument Digital Interface) controllers , PlayStation or Xbox Joystick controllers, computer keyboard, analogue "old school" or digital video mixer kit with monitors for the preview and microphones (Picture 24).

PICTURE 24. Analogue V4 video mixer (left) V-4EX Digital video mixer (right) (Roland)

As final output devices, the interviewees mentioned projectors, led screens and cinema beamers. For the stage couple artists said to create surfaces for mapping and to use fog machines during some particular visual performances.

4.4 Pipeline

In this section, the respondents were asked to answer the following questions:

- "***What do you suggest to consider when using animation for visual performance?***" (74% of respondents answered this question.)

The suggestions mentioned in the answers covered different parts of the production in live cinema, besides the technical side, some artists suggested to consider the budget, event theme and the location. Part of respondents mentioned the importance of a rehearsal, mostly to test the visuals and the controls, avoiding last minutes technical problems.

The powerful enough projectors were often mentioned, ensuring the resolution and the brightness of the beamer, calculating the right distances between the projection surface and the projector itself.

The suggestions for the visual content concerned the storyline, the render times, the frame rate and the creation of seamless loops, i.e. the creation of digital animation that begins and ends with the same frame, allowing the possibility of continuity during a performance.

Other important suggestions were related to the archiving of visual material, creating folders that allow to select the material needed in a handy way. In addition, some respondents mentioned the importance of having pre-rendered material as a backup, just in case, being prepared to improvise.

- ***"What is usually the workflow to create your visuals and the performance?"***
  (82% of respondents answered this question)

The results proved that every artist has his/her own approach to creating digital content, without specific rules or structures. However, the majority of respondents listed a lineup of steps, which they usually follow when working on digital animation for visual performance.
All production information was collected, grouped and divided into 4 parts:
pre-production, production, post-production and execution.
According to the respondents, the average workflow for live cinema is the following:

- The **pre-production** contains the following steps:
  Idea, inspiration, client analysis and budget, team- up, location analysis, brainstorming, concept adaptation, research and development, prototyping, project plan, concept art, styleframes.

- The **production** stage consists of :
  3D and 2D production, stage design, experimenting, rendering, programming, coding, creating loops and sequences, recording video material, client review.

- The **post production** steps are:
  Compositing, testing, calibrate sliders to react to music frequency spectrum, codec convert, organise files, import material, prepare vj-set, setting up effects and presets, MIDI mapping, 3D mapping, stage set-up and maintenance.

- The **execution** consist of:
  Perform, improvise, record, get paid, build stage down, publish on youtube and vimeo, feedback, archiving.

4. CASE: “Roll” - Visual performance

“Roll” is a double layered visual performance, that consists of a transparent layer positioned between the artist and the audience. The performance was created in collaboration with Markku Laskujärvi and Lassi Kähärä. The production started in November 2015 and ended in June 2016. It has been part of Tamk International Week 2016 program and Tampere Talo exhibition in May. The full performance was executed on 3rd of June 2016 in Mediapolis - TAMK filming studio (Picture 25).

PICTURE 25. “Roll” visual performance promo picture (Giraldo & Laskujärvi 2016)

In this chapter I introduce the production stages done during “Roll” visual performance. However, “Roll” was created without following a specific pipeline, in fact, it developed while researching.

5.1 Pre-production

The pre-production is the first phase of a project and includes the planning, the designing and the researching stage. (Beane 2012, 23)

5.1.1 Planning

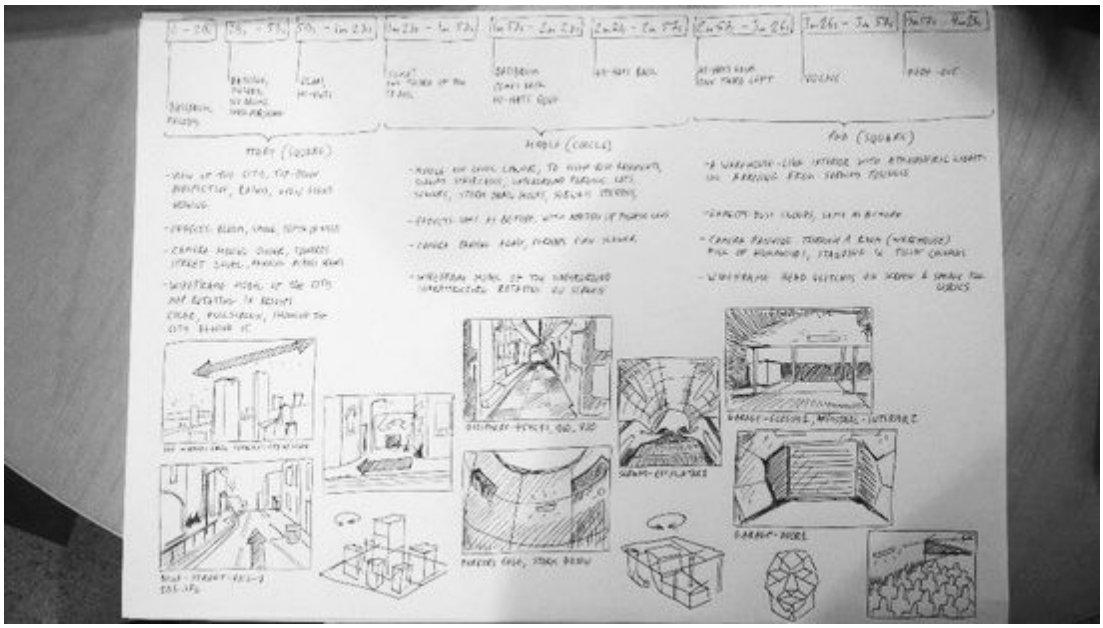
In the case of "Roll", at first, the main ***idea*** was to use 3D animation and performative techniques to create a music video for the artist Inner.
Everything starts from ***idea*****,** which can be generated by almost anything. Sometimes giving information to the mind and let data flow, brings later the intuition to an idea naturally. (Basso J. - Appendix 2) Inspiration is important in this case, but for some creative people it could influence too much , without permitting to dig themselves enough to find original ideas. (Quintini S. - Appendix 2)
The ***client*** has a very strong role in the production. It is usually involved in all stages from design to final production, giving feedback and ensuring the project is going right.

In the case of "Roll", Markku and I found essential to interview the artist, principally, to figure out the meaning of the track and the visual style he wanted us to implement.
The results from the interview show us his music background and personality, the connection of nature with his music and the relevance of city environments in his style.

Through the interview, we understood that the audio track "Roll" describes the mood of a dark night, a travel from a place to another. This was a crucial point for the next steps of the production, bringing us to implement some atmospheric elements he mentioned during the interview.

The ***brainstorming*** is the process for generating and developing ideas. (Brainstorming 2012) The process done for "Roll" can be defined similar to a team idea mapping. The process begun by analyzing the client needs, the audience needs and our needs.

Focusing on the track, we divided it in 3 parts. For each part we assigned some actions, arising new ideas and developments.



PICTURE 26. Timeline created after the brainstorming (Giraldo & Laskujärvi 2016)

Writing the real script was our next step. Technically, a **script** is a structured written form of the final story. (Beane 2012, 27) It contains the character movements, environment, times and actions. In our case, the script followed the audio track timeline (Picture 26).

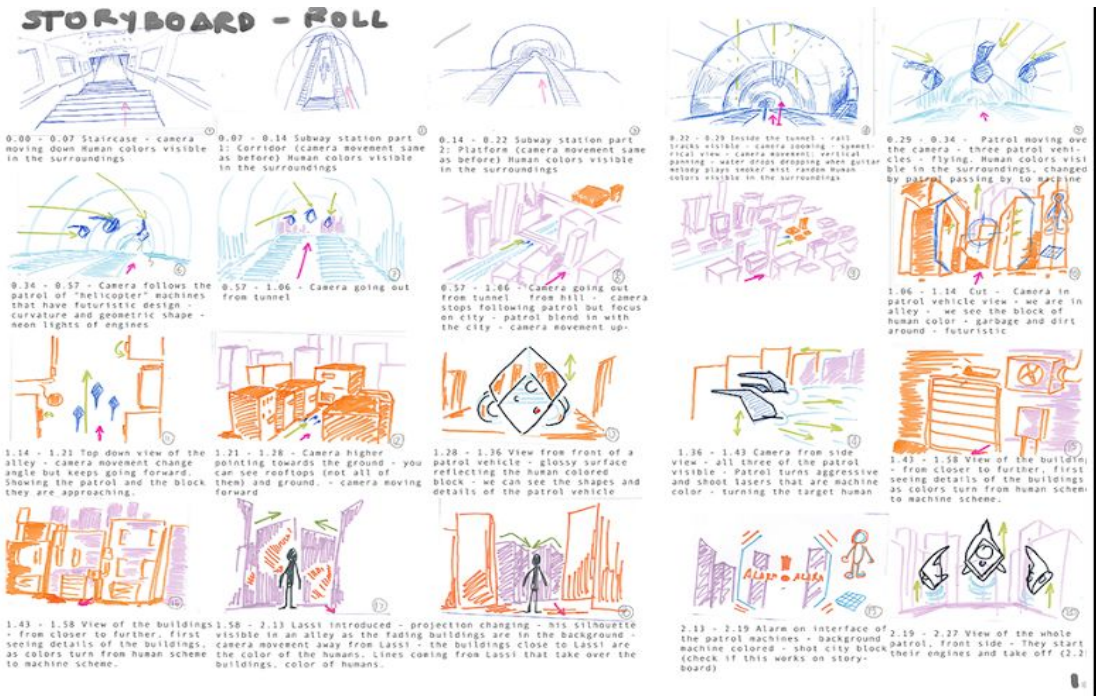
The story was based on a post apocalyptic event, where the artist was the last survivor. The machines (white color) were in control of the city, searching for the last human survivors. They followed human light (Red) and converted it into machine light. At the end, the machines are destroyed by the power of human, represented by a gigantic human face.

The next step was to create a **project plan** , which is fundamental to have an outline of the project. In this phase the basic information is listed, for instance the team members, production schedule, list of tasks, the resources (equipment, media formats, cars, premises, insurances, material storage), contracts and budget.

5.1.2 Designing

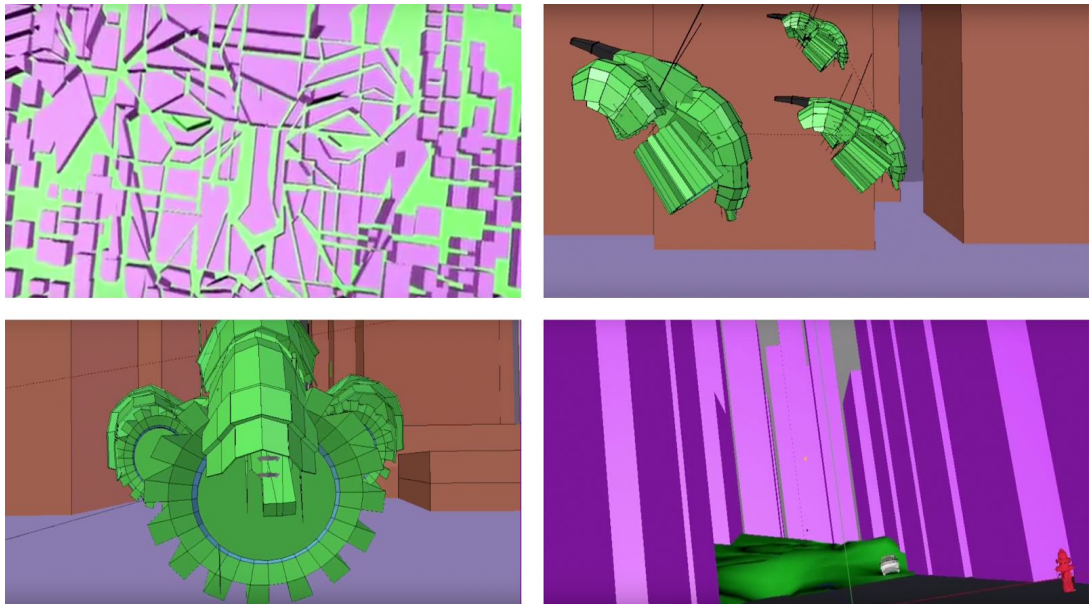
In the designing part, everything that is related to the look of the final content needs to be decided. In the case of live cinema, this section determinates the content aesthetics and the stage design. (Beane 2012, 30-33)

The **storyboard** is a rough visualization of the story, most of the times based on the script. (Beane,2012) The storyboard is created in thumbnails cells where the storyboarder sketches the story step by step (Picture 27).



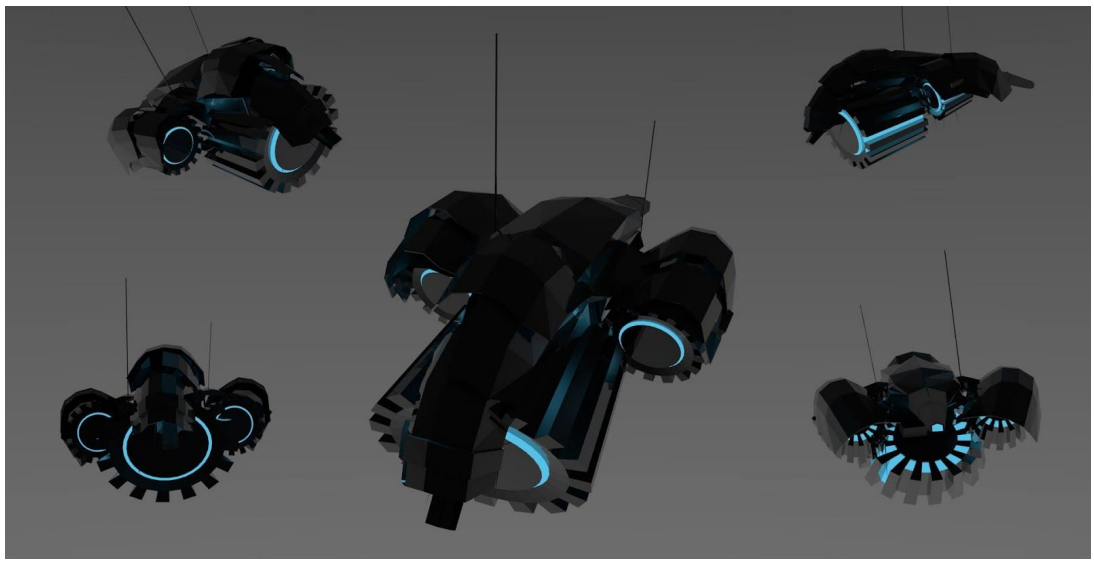
PICTURE 27. First page of "Roll" storyboard. (Giraldo & Laskujärvi 2016)

To help understand the timings and the actions, it is essential to create a **2D animatic**. An animatic is a moving pre-visualization of the story. Another helpful way to preview the content is to create a **3D layout,** i.e. a 3D version of the animatic **(**Picture 28). It is at this point that the important changes to the story are made.



PICTURE 28. 3D layout created for “Roll” (Giraldo & Laskujärvi 2016)

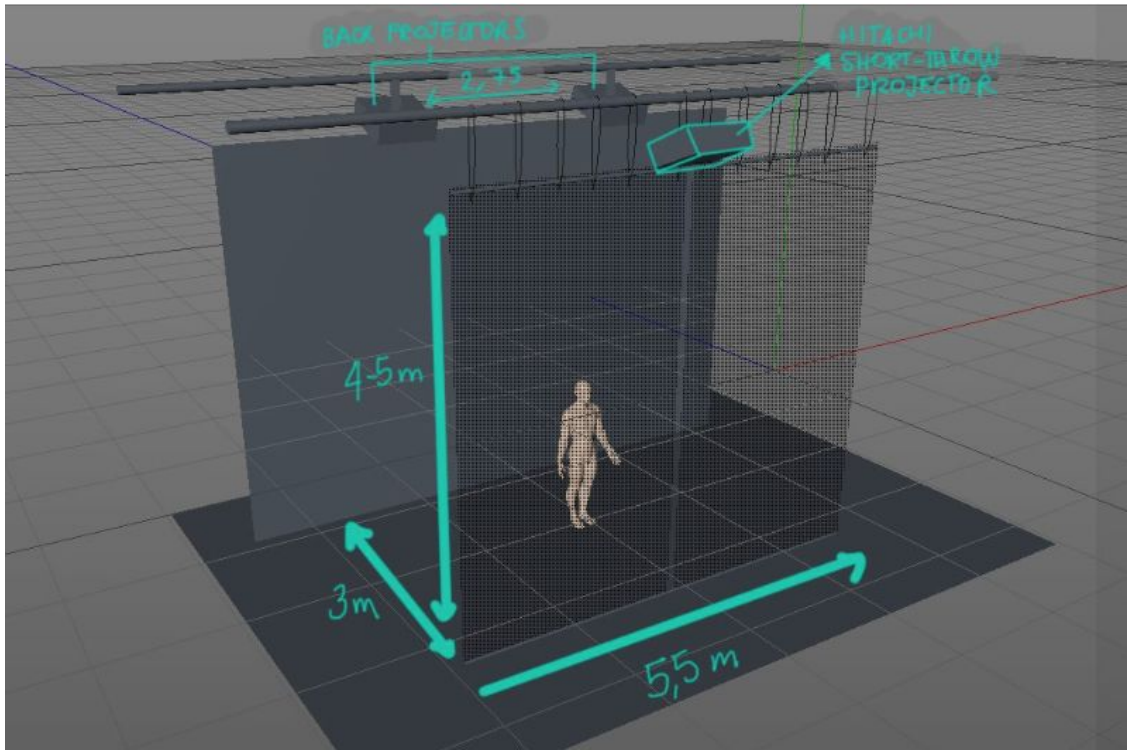
The following step was to work on the **concept art** (Picture 29)**.** In this part, all the inspirational material gathered during the brainstorming turns out to be useful. The purpose of the concept art is to settle a general idea of the final look, through the colour palette and the style. (Wyatt 2010, 34 - 43)



PICTURE 29. First concept art of the machines (Laskujärvi 2016)

The **Stage Design** is the process to create a scenery idea, with the purpose to immerse the viewer in the performance (Picture 30) .

We decided to have the artist located in the middle of the stage, being the main character, and the environments projected on the background. Later the idea developed into using a second layer, located in front of the artist.



PICTURE 30. Stage design created for “Roll” (Giraldo & Laskujärvi 2016)

5.1.3 Researching

The **research and development (R&D)** is a technical analysis of many different components of a project. (Beane 2012, 36) This step helps to figure out ways to produce something that might appear hard first.

During “Roll” project, we spent a substantial amount of time in testing the technical side. The main research topics were:

- ***Material for the front layer and back layer:*** The solution was to use Tulli fabric as front layer and white thick fabric as background. The final result was not perfect, in fact, according to the 23.1% of feedback after “Roll” performance, the back layer was brighter than the front layer.
- ***Vj tools testing :*** We used Blender game engine for the back layer and Quartz composer for the front layer.
- ***Share files from Cinema 4D to Blender*** : FBX (Filmbox) is a proprietary file format that allows to transfer digital content between applications.
  According to our experience exporting this format from Cinema 4D to Blender, the animation data, the light position and the morphing settings worked correctly, but the materials, light positions and colors did not appear properly.
  COLLADA (a XML-based schema with similar function as Fbx), instead, deliver right camera, light position and also right materials, but did not carry animation data or morphing settings.
  At the end, we used an OBJ file (file containing object information) to import the 3D model and apply the animation and materials if needed.
- ***Blender game engine:*** The first idea was to use Blender game engine to navigate into the 3D environment in real time. It end up being laggy when the size of polygons increased, so the solution was to switch to video layers.
- ***Stage set-up:***
  The first problem was to figure out how to hang the fabrics. At first we used some strings to attach it to the roof pipes, later the fabrics were sewed together

by Senni Salmi, attached on a woodstick with hooks with the help of Jonna Rautala, which were connected through zip ties to the roof pipes.

The next step was to find the right distance between the back layer, the artist and the front layer, in a manner that shadows do not interfere with the projections and the resolution, i.e. the size of the image, stays quite big. The distance we chose was 3 meter between the front and the back layer.

The lumens and resolution were the next problems. Lumen is the amount of light emitted per second from a source. If the projector is brought far away from the canvas, the resolution would appear big, but less bright. If the projector is too close to the canvas, the result would be smaller resolution but brighter image. We had to find a good balance. The use of a short-throw projector was our solution. It allows us to position the beamers quite close to the canvases, without obtaining a small resolution. For the final performance, we used Hitachi CP-A100 Short-throw projector and Epson EB-585W, both having around 4000 lumens each.

To connect laptops to the projectors we used VGA cables (video graphics array) instead of HDMI (High-Definition Multimedia Interface), mostly because after several attempts, some HDMI cables did not work properly.

Another problem came up during the first performance at International week 2016, when couple minutes before the performance started, the Matrox TripleHead2go, an external multi-display adapter, stopped working. This tool allowed us to mirrorize and synchronize the visual content to the front layer. The solution was to map two video results in one screen and import the visual content one at the time, causing a delay for the synchronization. We decided to not use it in the next performance.

- ***Simulate liquid in 3D (Cinema 4D and Blender 3D):*** One scene of our storyboard included liquid invading the environment. With Cinema 4D, a fluid simulation appeared too complex without the use of an external plug-in. The test made in Cinema 4D without plug-in was quite good, but the render times were too long. The solution was to use Blender 3D.

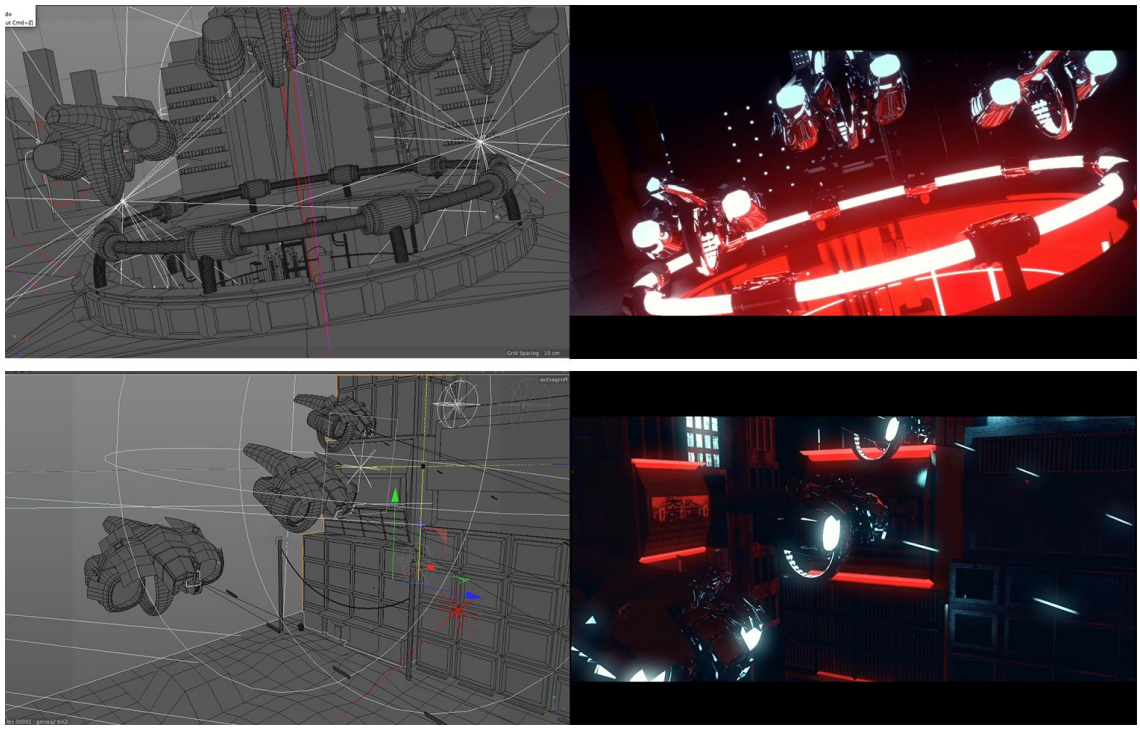
- ***Kinect face :*** The idea of using motion capture in a live sequence was cancelled, after understanding the time limits due to the long rendering times and deadlines getting closer.

5.2 PRODUCTION

The production step is where the final visual content is generated. The characters and environment are designed, and the vj software compositions are organized.

5.2.1 2D - 3D production

The usual steps for the 3D production are ***modelling, texturing, rigging, animating, visual effects, lighting*** and ***rendering***. In big production, each step is made by a specialist. (Beane 2012, 21 - 52) In a team of 2, each of us had to work equally and create the content as fast as possible (Picture 31).



PICTURE 31. At left: wireframe scene . At left: final render (Giraldo & Laskujärvi 2016)

Markku and I shared the list of models and environment in half. Besides creating some environment in 3D and animate some scenes, I also was in charge to create some motion graphics content in 2D.

The scenes I worked on were :

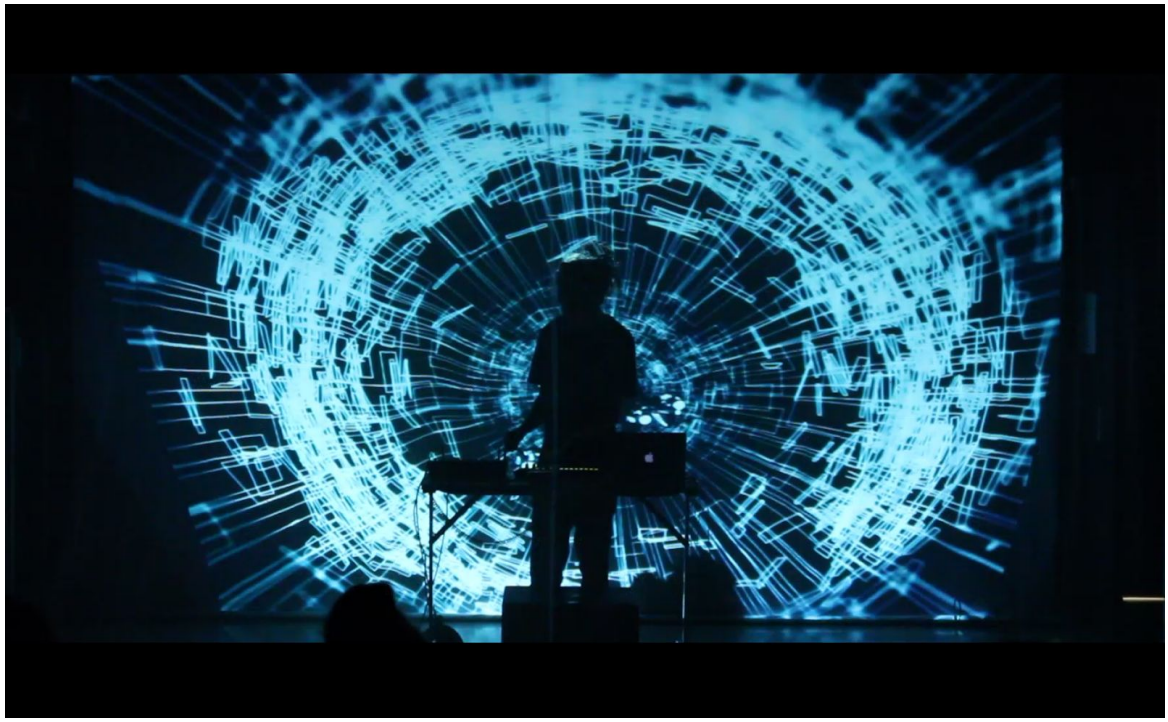
- *Alley scenes*: During this scene, the flying patrols are directed towards some buildings, going through abandoned alleys. My task was to design the alleys and animate the whole scene. After importing couple buildings created by Markku, I modeled additional buildings, adding details such as windows, signs, boards, wires and more. The next step was to import the patrols and animate them, following the camera. I added some smoke effect using environment and Pyrocluster in Cinema 4D (Picture 32) . After that, I added the materials and textures, added lighting to the scene and animating the light transitions needed.

PICTURE 32 . Smoke tests for the alley scene. (Giraldo 2016)

- *Storm drain scene*: During this scene, the patrols crammed inside a huge storm drain. Starting from a cylinder, I modeled the storm drain, add details such as machinery, doors, light bulbs and more. I added a simple animation to the doors and add the materials to each detail. I created light areas with inverted fall-off to follow the camera movement, so that the light illuminates the nearest walls, giving a sense of depth.

- *wireframe scene:* In this scene, the patrols enter into an abstract environment. This scene was made by using the storm drain edges and points and add them to an atom array effector in Cinema 4D, which creates the wireframe effect of the

storm drain 3D model. The idea was to render it out in alpha, ie with a transparent background, in a manner to work it out in the compositing phase (Picture 33).

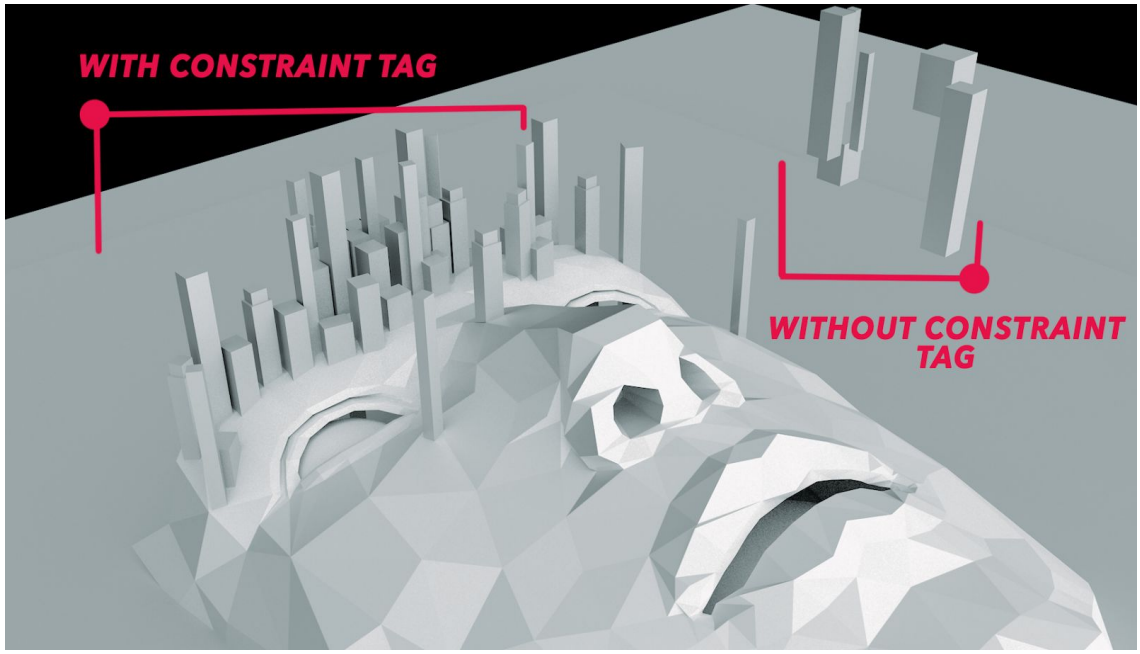


PICTURE 33. Wireframe scene during “Roll” performance (Valta 2016)

- *patrol shooting scene*: This scene consisted of 3 patrols shooting at buildings, which changed colors to machine color palette. I used 3D models of the buildings previously created , animate the patrols and add particle system for the shooting part. For the camera movement I add a motion camera feature , aligned to a circular spline, targeting the null object located in the middle of the patrol group. The color change was made in the post production stage.

- *face talking scene* : Starting from a plain object, I modeled a low poly face, apply a melt effector and set selections to the groups of polygons I needed to move. After that, I applied a pose morph tag to create different faces and mouth expressions by moving the selections already set. The next step was to synchronize the mouth movement according the lyrics of the audio track. Later,

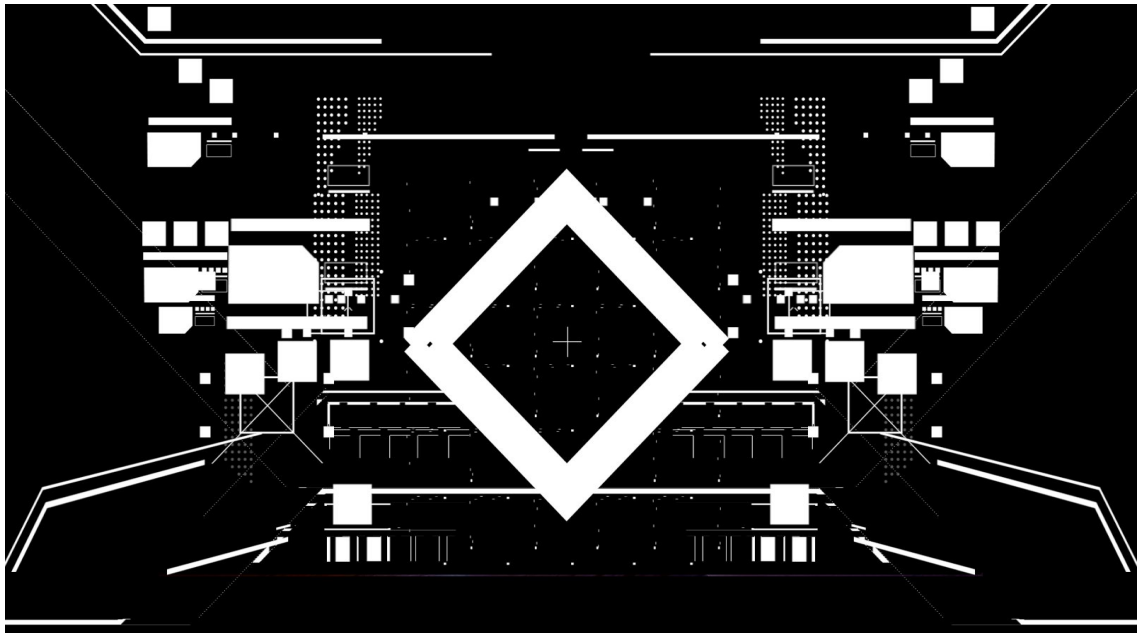
I arranged cloners of buildings above the face surface. To keep the buildings following the movement of the face, I applied a constraint tag to the cloners of the buildings, which kept them attached to the face surface (Picture 34).



PICTURE 34. Example of the use of constraint tag (Giraldo 2016)

- *2D motion graphics for the front layer:* The first stage was to design the vector graphics, import them to Adobe After effects and animate them. In this case I created loops, i.e. seamless animations, that can be played during the performance at any time and loops that can be played at specific times, such as the interfaces layouts (Picture 35) .

  I personally found the use of the graphics in the front layer invasive at some moments. I should have established moments where they could appear and others where the audience could concentrate to the content behind.



PICTURE 35. Motion graphics created “Roll” front layer (Giraldo 2016)

Due the decision to use VGA cable and the size of our canvases, we render out images at 1024 × 768.

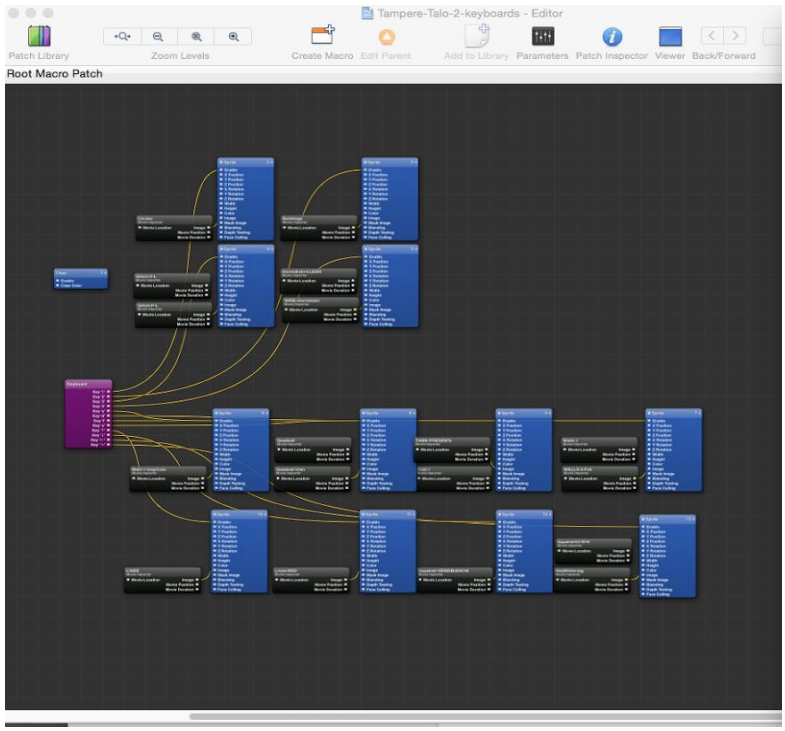
5.2.2 Mapping and mixing

According to Ciufo T. , *Linking* describes the connection between sound and image, which can deal with tempo, density, texture, dynamics and other qualities. *Mapping* deals with how these connections can be associate to each other, for example, if the audio amplitude is mapped to the image brightness, higher the amplitude, brighter the image, depending on the chosen configuration. (Ciufo n.d., 2-3)

Nowadays, most softwares simplify the mapping by using a modular system, which make easy to reconfigure the connections between sound and image. (Ciufo n.d. - 2-3) Because of the strong vj community, there is increased amount of software and coding material available on the internet. Besides performing, some vjs develop their own software and write own code, sharing them with others. (Jaeger 2015, 5)

Another possibility during live cinema is to mix video material simultaneously. Timothy Jaeger states in his book “Handbook for live visual performance” that ***mixing*** is the combination of different sources, allowing for an infinite number of image variations, by which both Vjs and audience are seduced. (Jaeger 2015,15)

The video material created for the back layer was handed to Markku and controlled by him in Blender game engine. The motion graphics projected on the front layer were controlled by me in Quartz Composer. Quartz Composer is a node-based visual programming language for processing and rendering graphical data (Picture 36). (Mac Developer Library)



PICTURE 36. Quartz final Patch (Giraldo 2016)

By connecting patches (or also called pre-existing modules) we were able to control different parameters and create graphical compositions. (Mac Developer Library) The Quartz composition created, allowed to use the AKAI LPD8 laptop pad controller to regulate the opacity of each video clip (Picture 37) . Due to the small amount of controlling wheels available in my pad controller, I used a composition that linked

selected keyboard keys to video clips. That means for example, when pressing the key "A" in my keyboard, the picture viewer (the preview area) would play the video connected to that specific key, programmed earlier in the patch composition. However, the use of the pad controller would have been a better choice for the final performance, mostly to be able to fade in and fade out easily, without rough cuts.

PICTURE 37. AKAI LPD8 laptop pad controller (Akai)

The laptop I used handled about 16 clips inside the composition and about 3 or 4 playing simultaneously in the picture viewer.

During the performance at International Week 2016, we programmed a ***3D mapping*** to avoid the distortion of the image , caused by the projection angle.

5.3 Post production

Post-production is the completion of the project, where the finish touches happen and the final look appear. (Beane 2012, 43 - 45)

It is important to get ***client feedback*** before continuing, principally to apply the changes required and to fix the technical problems.

5.3.1 Content

Compositing is an important aspect of digital animation. With compositing, it is possible to merge different animation styles and match them into a singular style, for instance, have a 3D model with 2D background. (Wyatt 2010, 118 -121)

During the creation of the alleys scenes, I had to apply compositing techniques to reduce the render times, in fact, I rendered out an alpha channel for the alley and apply a still image behind it in a compositing software.

Color correction , also called color timing or color grading, is the adjustment of colors of the whole animation, to make sure it is consistent. (Beane 2012, 44)
I used mostly Adobe After Effects for changing the color temperatures, using mixing color effect, curves effect and color balance effect.

As the patch composition was ready, the next step was just to substitute the clips changed and convert the ***video codecs*** to the needed one. The video codecs are different electronic circuits that allow the compression or decompression of a file. The one we used most of the time was H.264 compression format. (H264Info 2010)

5.3.2 Stage

The stage size is a meaningful element to not underestimate. The space, in the case of "Roll" performance mattered, mostly because we needed specific distance between the projectors. The location of the final performance was at TAMK filming studio (Picture 38).

PICTURE 38. Stage design at International Week (Fránkó 2016)

The position of our ***control station*** was located right next to the stage, in such a way to be able to see the stage and the content playing in real-time.

The ***choreography*** is the sequence of movement synchronized to the music. In our case, the performance was based on a timeline with couple moments that needed to be synchronized with music, but besides those, there were the possibility to improvise.

A ***rehearsal*** before the actual performance is relevant to monitor the last minute problems. "Roll" performance had couple adjustments right before the actual show started, in fact, some content such as the rain effect, was created couple minutes before the final performance started. Unfortunately, we did not have time to have a full rehearsal.

5.4 Execution

The content was created principally to fit the 4 minutes audio track Roll. In fact, all the concept and storyboard was focusing on that. During the planning of the event, we decided to extend the performance to 30 minutes, to give the opportunity to Inner to present a fully set of songs and to entertain the audience a longer time than 4 minutes.

During the performance, everything apparently worked as planned, the synchronization was correct and no technical issues appeared. (except for a brief freezing on markku´s computer, which did not distract the audience, and it solved in short time)

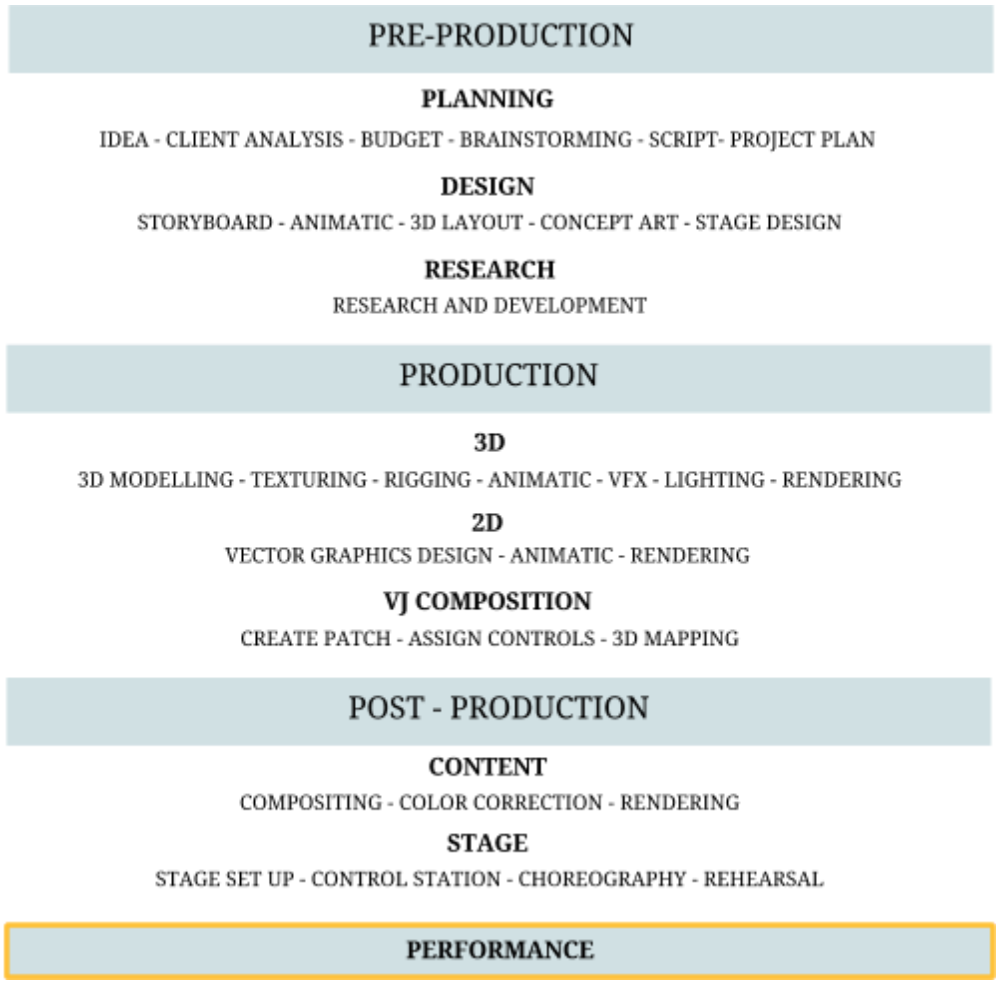
The performance was ***recorded***. This recording helped us study the final result and analyzing what could have go better. The last step for the project, besides starting to write the report about it, was to ***copy and archiving (backup)*** the material. I find it important to organize all the material afterwards, clean the files and delete the useless or duplicated material.

After the show, we asked to the audience to freely give us ***feedback*** by filling a short questionnaire online. We received about 13 feedback from the online questionnaire, which helped to understand the pros and cons of the project´s result.
According to the viewer´s experience, the animation´s style matched visually the music genre but it lacked of content alternation. The 76% of the audience found both front and back layer balanced, on the other hand, the 24% thought the back layer was brighter than the front one. According to the audience, the most outstanding elements were the talking red head, the hovercrafts, the far-eastern city environments and the red liquid scene. On the contrary, the repetition of elements, the tunnel, the timing of the performance and the storyline did not came across positively.
Besides that, the feedback was generally positive and the audience seemed to have enjoyed the performance, even some comments mentioned the wish to experience it once more.

6 CONCLUSION

Besides coming from a digital animation background, I did not have vast knowledge in performative technology and in building up a stage. This made the construction of the performance a little harder for me, carrying out the project by learning at the same time. When creating a visual performance is it important to not underestimate the technical side, but trying to balance the time between the visual content creation and the building up of stage design.

The pipeline presented in the picture 39 was influenced by the results obtained through the questionnaire and by my experience in working for "Roll" visual performance. (Picture 39)



PICTURE 39. Digital animation pipeline for live cinema (Giraldo 2016)

This pipeline is based on digital animation production, including relevant performative aspects related to live cinema.

The *pre-production* stage contains the standard steps to plan creative content, for instance brainstorming and client analysis. In addition, the pre-production presents the design steps, where the content style is designed and the performance stage sketched. I found research and development a relevant step for the pre-production, in fact, it allows to study and analyze solutions for different problems related to animation and performance. In the case of "Roll", the time spent on the research and testing was substantial but necessary to accomplish the project.

During the *production* of digital animation for live cinema, the artist needs to focus not only on the digital animation side, but also acknowledge the visual performance requirements.
Some respondents from the interviews suggested to create seamless loop animations when working for live cinema, mostly to loop the clip without rough cuts.
In "Roll", I created a rain simulation loop, which was used as transition between one song to another. This loop was not seamless, and it did break the continuity of the animation while playing it multiple times. For this reason, I think that seamless loops works well while repeating and looping, without distracting much the audience.
In the production step, the artist needs to consider also the stage location, designing the visuals for the right surface size, including the distortion or mapping needed. It is important for the image to keep up the colors and brightness, overall when dealing with projector with low lumens and with partially transparent canvases.
During this stage, the patches and the assignment of controls are created and tested.

The *post-production* includes visual content and stage set up. At first, everything what is related to the visuals needs to be color corrected and rendered out. At this point, the content is ready to be imported in the vj compositions for the rehearsal. Before that, the stage is build, hanging canvases, rigging projectors and setting up the control station.
In the case of "Roll", it was important to reassign the controls before the performance,

mostly because , for some reason, Quartz Composer played the clip with couple seconds delay at the first try.
The choreography plays an essential role when dealing with timeline during a visual performance. In the matter of “Roll”, there were couple moments during the track that needed to match with the visuals. I personally think that the communication between the visual performer and the audio performer in this case is essential. A rehearsal also helps the choreography to be accomplished correctly and it also gives an idea of the performances timings.

The *performance* is the last step of the pipeline. According to my experience, it is important to be ready to improvise at any point and have a plan B in case something do not work as planned.

Live cinema is a composition between human action and technology, made to inspire audience. The main objective is to create a balance between the audio and visual, playing with the available environment, and in some cases, allowing the artists to fully improvise. This is a reason why some of the performers interviewed in my research claimed to not follow any kind of pipeline, but they just produce as much content as they can and use it during the performances. Most of this content, apparently, has no strict connection to the concept of the music, just aiming to accompany the sound. For other artist, the way to connect image to audio is by mapping parameters to the sound, creating autonomous live visual reaction. On the other hand, a large number of performers answered having a creative structure that often changes depending on the type of performance and budget.

The conclusion of this research confirmed that each artist have different visual approach, which, most of the times, depends on the budget, event theme, client, tools, software and personal knowledge. However, following a structure during production is a valid option, especially to ensure to not to forget some important steps during the making of a visual performance.

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PICTURE 24. Roland Analogue V4 and V-4Ex Digital video mixer (Roland)

APPENDICES

Appendix 1. Digital Animation Pipeline for visual performance:

- ***Do you use animation in your workflow? (if NO , specify why in "Other" section)***
- ***What type of animation do you usually create?***
- ***Why do you use animation as a visual tool?***
- ***In your opinion, what is a visual performance?***
- ***Your visuals are created for...***
- ***What type of content do you usually present in a visual performance?***
- ***How important is for you sound-reaction in your visuals?***
- ***During a visual performance, do you control the content in real-time?***
- ***What tools do you use to create animation?***
- ***What tools do you use to visually perform your content?***
- ***Does the budget usually affects your performance?***
- ***Usually, how long does it take to you to create the visual content for a performance?***
- ***What are the tools and equipment you need for a visual performance?***
- ***What do you suggest to consider when using animation for visual performance?***
- ***What is usually the workflow to create your visuals and the performance?***

Appendix 2. Interview Jessica Basso and Simona Quintini

Workflow pipeline and creative process

Appendix 3. Interview Vj Markko and Vj Veronika Maz

- ***Is Vj your only profession or do you do something else ?***
- ***In your opinion, what is the task of a Vj? What he/she does?***

- ***What is the biggest dream for a Vj? (In this case - you) Do you remember your first ever Vj gig - how went? What did you do?***
- ***Where and what gives you inspiration for your works?***
- ***Tell us something about your workflow as a Vj:***
- ***Do you usually do everything by yourself or do you have a team which can help you out? Do you build your stage design yourself? Or do you collaborate with stage designers?***
- ***How do you choose which software to use?***
- ***How do you determine the amount of real-time stuff versus footage in your sets?***
- ***How long does it take to prepare for a set, are there some shortcuts or back-up plans?***
- ***What is the role of audio reactivity in your sets?***
- ***How do you determine what kind of visuals you present?***
- ***What is your process like?***
- ***Do you think your ideas are expressed well enough with your current tools, or could the technology be somehow better?***