Method through motion – structuring theory and practice for motion graphics in spatial contexts

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ABSTRACT

Contemporary scenography often consists of video-projected motion graphics. The field is lacking in academic methods and rigour: descriptions and models relevant for the creation as well as in the analysis of existing works. In order to understand the phenomenon of motion graphics in a scenographic context, I have been conducting a practice-led research project. Central to the project is construction of a design model describing sets of procedures, concepts and terminology relevant for design and studies of motion graphics in spatial contexts.

The focus of this paper is the role of model construction as a support to working systematically practice-led research project. The design model is being developed through design laboratories and workshops with students and professionals who provide feedback that lead to incremental improvements. Working with this model construction-as-method reveals aspects of the tension between theory and praxis.

KEYWORDS
Motion graphics, spatial, design model, theory, praxis

1. Introduction and background
The experience of contemporary scenography increasingly includes elements that involve digital technologies. Digitally created or manipulated visual content that is video-projected on (or emitted from) screens contribute to the narrative and add to the drama of performances. These projections consist of images (either still images or images changing over time) that appear interconnected to the physical three-dimensional setting. I shall refer to images-changing-over-time as *motion graphics*. The term *motion graphics* covers an extensive variety of visual expressions and techniques which can be experienced in a broad array of scenographic settings ranging from experimental dance performances, opera, pop-, rock- and classical music concerts to TV shows like X-factor and the Eurovision Song Contest.

It was my curiosity as to the nature of motion graphics in spatial and scenographic contexts that led me to investigate the phenomenon in a systematic way. A *design model* serves as a fulcrum for the project and later it could be used to structure academic design studies, as well as function as an organisational tool for creation of visual design. The field of motion graphics itself is expanding into new venues and new forms are evolving, as is the role of the designer within the production team. Christine White, media and performance researcher, wrote about this change: 'The director ... no longer [is] a specialist in every area ... S/he has begun to work more collaboratively with the other artists in the production team in a much more democratic process of production' (2008, 1). To enable a designer to work creatively and efficiently in this form of collaborative teamwork around

developing and coordinating visual elements in an intricate technological environment new communication tools are necessary.

Due to the complexity of motion graphics, I decided to map out the field and establish terminology[1]. For this purpose I developed the *design model* as a representation of the field. It became central to the practice-led research project, revealing questions and uncertainties. In order to build an applicable theoretical framework, I found relevant theory and terminology from the fields of film, design, theatre, performance, visual perception, aesthetics and cognitive neuroscience. To gain input from professional practitioners and students I decided upon establishing design laboratories (Koskinen et al 2011) and workshops constructed to provide a framework for investigation, research and principles of related design issues through praxis. The design lab and workshops, presented in section 3) of this paper, have also functioned as a forum for discussion of relevant existing theories, definitions, descriptions and assumptions. Working with the model enables a 'discourse' of relevant theories and design praxis. The research project investigates motion graphics and its scenographic context, and attempts to represent both of theses aspects in the model. In order to identify valid existing theories and concepts, I will briefly outline terms linked to motion graphics as well as those associated with scenography.

1.1 Motion graphics

Various historical visual phenomena have contributed to the term *motion graphics*. I will name two. One is from the art of *title design* and the other from the field of *visual music*. Both deal with composed images changing over time that are experienced as cohesive sequences. An essential technical concept behind motion graphics is *compositing*; combin[ing] (two or more images) to make a single picture (Oxford Dictionary 2015). In the 1990´s when affordable and powerful hard- and software with animation- and compositing packages such as After Effects became available, compositing became both easy and fast. This development initiated 'a new hybrid visual language of moving images during the period of 1993-1998' according to Lev Manovich (2006, 1). The use of the term *motion graphics* has become common, and is 'often used to refer to moving image sequences that combine moving type and design elements' (Manovich 2013, 255). Inspired by the descriptions related to *motion graphics* by Manovich (2013), Matt Frantz (2003)[2], Brian Wells (2011)[3] and Garson Yu (2006)[4], as well as the ongoing development of 3D modelling, animation and compositing software, I will use the following definition of *motion graphics*: Compositions of 2D imagery, (textured) 3D models and renderings, typography, drawings, photos etc. changing over time, potentially driven by a narrative.[5]

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[1] Design researcher, Per Galle, notes: 'design researchers … have good reasons for showing interest in how knowledge, developed in praxis by professional designers or design students … might be expressed as applied design theory and at the same time be consolidated in respect to the requirements of research in order to achieve entitled recognition.' (2010, 70). Translated from Danish.

[2] Mixed-media artist Matt Frantz describes motion graphics as 'designed non-narrative, non-figurative based visuals that change over time' (2003, 2).

[3] Animator and researcher Brian Wells, in his work towards a definition of animation, notes that motion graphics meet all of the criteria defining it as animation, except that it does not posses a vitality of 'aliveness' (2011, 15).

[4] In one of the many handbooks dealing with the process of motion graphics creation, Garson Yu, who worked as a co-creative director alongside motion graphics designer Kyle Cooper, describes a distinction between cinema- and television- motion graphics. 'Television motion graphics tend to have in-your-face visuals and eye-catching layouts ... intended for fast reading. Cinema motion graphics are more about image-making and storytelling ... encouraging the contemplation of a story that unfolds slowly' (2006, 21). Understood boldly, small (TV) screens: fast, and large (cinema) screens: slow.

[5] For more history, techniques and theory on motion graphics, see Steijn's chapter in 'Staged Experiences' (2014, 45-53).

1.2 Scenographic spaces

The term *scenography* is of Greek origin, described in the online version of the Merriam Webster dictionary as 'skēnographia: painting of scenery' (2015) and defined as 'the art of perspective representation especially as applied to the design and painting of stage scenery' (2015). Recent research point out that contemporary *scenography* is not being defined by 'a particular set of processes or materials; [but] rather cluster around approaches which prioritize "the dynamic role design plays upon stage, orchestring the visual and sensory environment" (Dorita Hannah, in Howard 2002, xv)' (Joslin McKinney and Helen Ibal 2011, 112). Over and above the traditional context of theatre, scenography design is becoming increasingly prevalent in other areas, such as concert halls, TV studios and exhibition spaces. According to Atelier Brückner 'scenography is concerned with orientation and insight' (2010, 12). Regarding the 'emotion of the addressees and their willing submission to the illusion … [there needs to be] a certainty that what is shown is nothing other than what is perceived' (2010, 12).

Throughout history, fine examples of theatre scenography in which light and screen(s) are applied in conjunction with physical sets built to create convincing illusions that seem magical are plentiful. Historical examples range from *Wayang kulit* shadow play theatre to the early use of electric lightning in the late 19th century theatre. The concept of 'black box theatre', introduced in the 1950's, amplified the potential for creating scenographic illusions within its anonymous empty space using advanced lightning techniques. One example of this evolution was seen in 1996, where the Danish production company Holland House contributed to 'the new hybrid visual language of moving images'. A large video projected backdrop, was the main scenographic element for 'Nuit des Hommes'; an opera in which motion graphics were synchronised and composited with live, *closed circuit video*[6] of the performers singing selected poems by Guillaume Apollinaire.[7]

2. Constructing a design model

As the project is primarily guided by questions arising from my own design experience, the model is from a perspective of searching for applicable ideas. In order to evaluate and incorporate these into a workable motion graphics design context, the core of the design model unfolded in this section is actually a process of defining terminology and mapping concepts and sets of procedural elements.

Partly based on the survey of motion graphics and theatre described in the previous section, I list concepts and terms that seem appropriate in describing those fields. Relevant to the field of motion graphics are terms such as: synchronisation, compositing, two-dimensional space and three-dimensional space, narrative and non- narrative, story-telling, moving type and moving image sequences, visuals, small (TV) screens and large (cinema) screens. Connected to scenography, terms and concepts as: painting of scenery, perspective representation, visual and sensory environment, orientation, illusion, lighting, black box, transformable spaces, live and pre-recorded are mentioned.

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[6] *Closed circuit video* in scenographic, performance contexts refers to on-stage video recordings that can be monitored on screen in real-time by the audience.
[7] The opera was restaged in 1997, with 2D and 3D motion graphics designed, created and composited by the author of this paper.

2.1 Identifying design elements and components

The *design model* is the result of a) discussions of existing relevant theories, definitions, descriptions, inventions and concepts as described in the survey. Cases studies b) in which digitally projected and/or on screen motion graphics applied in spatial, scenographic contexts are examined. In order to support the theoretical discussion c) design laboratories (Koskinen et al 2011) and workshops related to a) and b) are constructed to provide a framework for investigation, research and theorization of related design issues and concepts through praxis involving students, professionals and audiences.

Several *sets of design elements*, relevant for studying as well as for the creation of motion graphics in spatial and scenographic contexts, are included. The expansive *design model* initially had three sets of *design elements*. Set 1) Visual design elements relating to the pictorial or 2D-screen space. Set 2) Time-based design elements. Set 3) Design elements on the relation between 2D-screen space and the 3D-physical space. Image 1 depicts a 'workflow chart' of working with the design model.
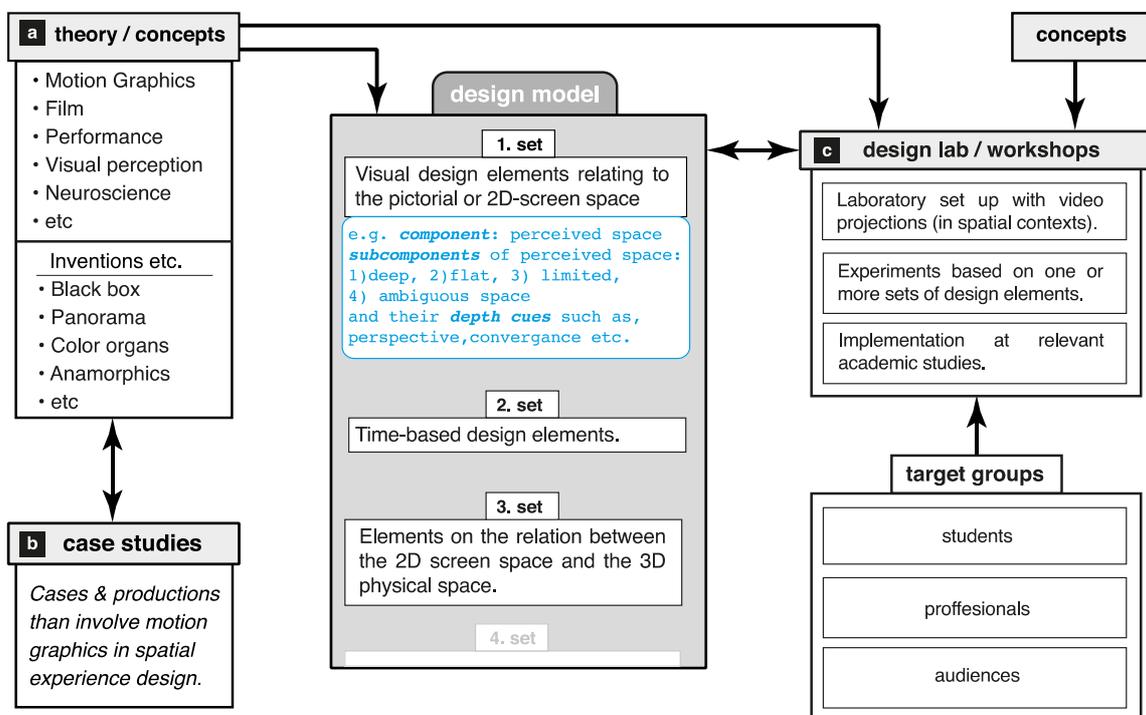
Image 1: A workflow chart of the design model, consisting of sets of design elements, surrounded by inputs from a) theory/concepts, b) case studies and c) design labs/workshops. See table 1. for a preliminary overview of sets in the core of the model

Space is often used in connection with *motion graphics*. *Motion graphics* are most frequently designed to be either video-projected on screen or emitted from a TV and therefore the term *space* (set 1) in this context refers to 'pictorial space' (J.J. Gibson 1950, 6) or 2D (two-dimensional) space. When designing for 2D screen space, motion graphics techniques can be used to create illusions of depth, many of which are based on principles found in art history like the invention of the linear perspective. 'Space is a complex visual component' Bruce Block identifies 'four types of space; deep space, flat space, limited space and ambiguous space.' (2008, 14-57). I decided upon adapting this hierarchy for the sets of design elements. If we 'zoom in' on the first set, related components,

sub-components and terms linked to the latter, in this case some depth cues[8] are revealed, noted in blue in image 1.

Since motion is an essential element, set 2) Time-based design elements, is added. I have looked into timing and synchronisation between motion graphic sequences and other related actions or expressions; for example that the visual content is experienced as connected to music. I have identified three types of cues that are used and listed them as subcomponents of the component sound cues. One type, the '*click-track*' stems from early animation history, another, the '*signalled cue*' is derived from live performed classical music, and a third I named the '*interactive (real time) cue*' (Steijn 2013, 748). *Click track* is an established technique that is described as 'a taped series of metronome beats synchronized with the final cut' by David Bordwell and Kirsten Thomsen (2001, 28). The click track is also often used to synchronize *motion graphics* with a piece of recorded audio. This type of sound cueing was further investigated in one of the design labs, described in section 3) Design labs & workshops.

2.2 More design elements
As mentioned, the design model initially contained three sets of design elements. During this project I added two more suitable categories.

Set number 4 provides concepts and terminology for describing aesthetic qualities of motion graphics in spatial contexts. I found the field of new aesthetics applicable, specifically the concept of '*atmospheres* [understood] as a concept of [these] new aesthetics' by philosopher Gernot Böhme (1993, 113-127). Böhme refers to '*atmospheres* as related to the experience of images, paintings, sculptures, architecture and stage design' (Steijn 2013, 2).

Liveness is a term regularly used to express 'the audience's affective experience' (Auslander 2008, loc 1329 of 5581). It mostly refers to the performer-audience relation. Since video projected motion graphics, scenography and performance are often intended to be experienced as interconnected, the concept *liveness* is relevant. Design elements reflecting properties of the concept of *liveness*, as found in the writings and theories by Nick Couldry (2004) and Philip Auslander (2008) are placed in set 5) of the design model.

A preliminary overview of the sets of design elements, a selection of related components, supplemented with a number of sub-components, are collected in table 1.

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[8] Depth cues are defined by film producer Bruce Block: (as)...visual elements that make the audience feel they're seeing depth when there is no real depth at all.'(2008, 14)

Set	Design element(s)	Selected components	Selected sub-components
1.	Visual design elements relating to the pictorial or 2D-screen space	Space	Deep, flat, limited, ambiguous
		Tone, colour	Colour interaction
		Remix	Extended, selective, reflexive, regenerative
2.	Time-based design elements	Sound cues	Signalled, interactive, click track
		Sound vs. image	Sound delay vs. moving image
		Rhythm	Image vs. sound
3.	Design elements on the relation between the 2D-screen space and the 3D-physical space	Scale	2D vs. 3D
		Light	Ambient
4.	Design elements dealing with aesthetics	Atmospheres	Generators (light, sound)
		Neuro-aesthetics	Eight laws of artistic experience
5.	Design elements reflecting properties of liveness	(Passive) liveness	Classic, live broadcast, live recording
		Interactive liveness	Internet, social media, mobile, other

Table 1: A preliminary overview of design elements, with selected components and related sub-components.

3. Design labs & workshops
In this section I shall describe a design lab and two workshops that have been completed during this practice-led research project. I will use the term *design lab* (short for *design laboratory*) as described by professor Thomas Binder[9]. The design lab focuses on studying specific components and sub-components of the design model in theory and practice individually and in relation to each other. *Workshops* were conducted around design projects with a wider scope than the *design labs.* Many of these projects resulted in full-scale productions, including attending audiences. Both the *design lab* and the *workshops* received input from students, professionals and audiences.

3.1 Space within a design lab
The questions posed as focus for this early design lab, which was embedded in one of the courses of academic design studies, arose from two theoretical concepts. The first relates to the task of motion graphics designers, described by Manovich as 'working on a composition in 2D or a 3D space that consists from a number of separate objects. [Where] the spatial dimension became as important as the temporal dimension' (2013, 296). The other stems from the descriptions by Bruce Block, on the component *space* and its sub-components *deep, flat, limited,* and *ambiguous space* (from set 1).
Students were given an assignment to create a motion graphics concept to a piece of music lasting 25-seconds. The motion graphics sequence was to include at least two types of space considered appropriate for the piece of music.

An unlimited number squares; of various sizes without outlines, with greyscale fillings (ranging from white to black), were allowed. The motion graphics sequences were produced on computers using the compositing/animation software After Effects. In order to observe the effects of the transition from the computer screen to simulate the *spatiality* of a realistic setting, a large PVC-screen for back-projection, similar to the one in image 3, was built (see image 2).

The students were asked to use the terminology from the model critically and to work consciously with the timing of the music as it is connected to how the motion graphics are perceived.

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[9] Professor Thomas Binder describes the laboratory metaphor within the field of practice-led design studies 'as both suitable and useful, as it puts emphasis on a transparent, delimited process that is potentially scalable' (2007, 1).
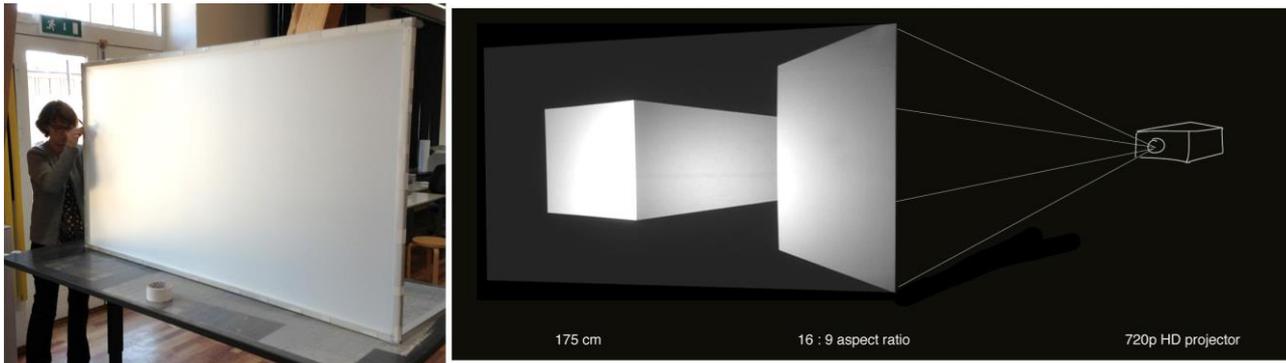
Image 2: Back projection PVC mounted on an aluminium frame. The illustration depicts a 'square-motion graphics' on the PVC screen and the projector position placed in a studio.
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During the design lab several questions were asked. The first question was asked while the students were working with the production on the computer screen and again *after* viewing results video-projected on the large PVC screen in a studio.

Answers from nine participating students on the first question (Q1): 'Which "types of space" did you consider for the sequence?' depended according to varying levels of expertise in After Effects. Most students found using the concepts of various types of space useful, for example as means for structuring the motion graphics with the arrangement of the music. Some students concentrated on two, and others on more types of space. Different spatial dimensionalities were achieved through various means. Some students used the X, Y and Z-axis available in After Effects, whereas others used scaling and/or grey tones to achieve visual depth. 'Due to the use of abstract forms, a sense of scale is lacking, and therefore a horizon is important', one of the students noted. Some students did not always find the four types of space sufficient or relevant. One student introduced the term 'empty space', in case of total blackness.

Students also responded to question 2 (Q2): 'In what ways did you time the visual elements with the music?' in various ways. After the audio was analyzed, several students used 'markers' to indicate key-points and structures in the music. Automated audio-amplitude linking [10] was also tested, but found inappropriate. One of the students reflects upon this technique by noticing that 'audio-amplitude linking often "feels" wrong'. Thereafter he finds that 'timed "by hand" is perceived as more natural because it is 'better when images appear a few frames ahead of music.' Another student 'decided to off-set it' and another preferred '(visual) movement before music'.

After these observations, the motion graphics sequences could be adjusted and then showcased in a studio back projected on the large PVC screen, as depicted in image 2. New questions were asked. A selection of these Q/A's are listed in table 2.

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[10] Audio-amplitude linking in After Effects converts the volume of an audio layer to keyframes that can be used to control properties like size, scale, transparency etc. of other visual layers (in this case the squares).

Q3: Difference in how you look at this space between the small and big screen?
A1: Here [big screen] you are more in the space, more related to the space. (Jf)
A2: Comes closer here, because it is bigger, deep space has more effect because it is bigger. (Jo)
A3: We are now sharing the same space as the [composition] squares, the same darkness, makes it more intense. (Sv)
Q4: Can you talk about timing, sound relation to image? *Related to Sölvi's adjusted sequences titled: 02.4 and 02.5*
A1: I show 02.4 because I noticed that the large projection screen means something for the motion graphics at the edges. Because we know what the squares look like, we expect them to move/go over the edge, since we exist in the same room as the animated squares. So if they do move over the edge, and disappear we get somewhat disappointed. In 02.5 I tried to work with the screen in mind. (Sv)
Students actively involved: Anne (An), Josephine (Jf), Joy (Jo), Maria (Mr), Mette (Mt), Sarah (Sr), Suzy (Sz), Sölvi (Sv)

Table 2: Q/A's, observations and reflections when viewed on the large back-projected PVC screen.

The still image from sequence 02.5 mentioned in Q4, is depicted in the illustration of image 2. The Q/A's and the related observations and reflections resulted in some interesting findings. One question that arose is how we might describe and design a perceived audio-visual link that is experienced as inter-connected. Another deals with the relation between the screen (its size and its edges) and the 'visual content and behaviour' of the motion graphics.

These questions arising from a practical production context lead back to seeking an appropriate theoretical framework e.g. from research in cognitive perception to explain each of the phenomena.

3.2 A workshop with a relevant cue

In this workshop we looked into 'time-based elements' from set 2). The workshop was part of a concept-development and pre-production period ahead of an experimental dance performance.[11] Since it was our ambition to use multiple video-projections on various screens that needed synchronization with both dance and acting throughout the performance, accurate timing was mandatory. The video could not be synchronized through a *click track* as the music was played live during the performance. Therefore other cues for synchronizing the video sequences with the performers were required. We found that variations of the *signalled cue* made good sense here. The *signalled cue* is mainly known in the context of live performed classical music, where a stage manager gives a sign (a signal) to the lightning technician based on a certain point in the musical score. For this performance we used cues *signalled* from various persons and sources. Sometimes a cue for video same from a point in the live performed music, and other times e.g. it was the dancer who initiated a cue through her movements, as illustrated in image 3.

Image 3: Paper cut feathers for shadow play, with additional video projected motion graphics.
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[11] This performance, 'i svanesøen' was produced in Denmark in 2013 as a collaboration between the companies *Aaben Dans* and *Odsherred Teater*. The author of this paper created the scenography and the video-design.

The dancer, casting a shadow on the screen with her left arm, gently drops paper feather cut-outs. The paper feathers produce dark shadows on the illuminated PVC-screen. Using the action of the dancer as a cue (*signalled cue*), a motion graphics sequence of multiple pre-rendered feathers falling in similar fashion is executed by a technician and projected on the same PVC-screen. These experiences also suggest that our design process could be optimized through more knowledge of recent psychological research on cognitive function in the brain in relation to perception of rhythm and timing.

3.3 Workshops for making and mistaking

Workshops for 'making and mistaking' focusing on two components were held. The first component introduced was the technique of *remix* (under set 1. visual design elements relating to the pictorial or 2D-screen space). The next one was the concept of *interactive liveness* (under set 5. design elements reflecting properties of liveness).

The workshops, involving students, professionals, audiences and myself were held within an EU Interreg funded project called *Classical Composition Music and Experience Design*. This project made it possible to experiment with full-scale projected motion graphics as a backdrop for live classical concerts. We were involved in the motion graphics and video-projection design for two concerts. For both concerts the audience was invited to arrive before the beginning of the concert to 'get closer to the music' during which time the partners involved in the project, students and professionals held workshops in which we focused on the two previously mentioned components and their sub-components.

At the first concert (1), a family concert, the orchestra performed Saint-Saëns' *The Carnival of the Animals* and Prokofiev's *Peter and the Wolf*. We decided upon creating a *shadow play* through various techniques, e.g. interactive with a Kinect (motion detector), to introduce relevant animals and characters in advance of the concert. During the concert itself, similar animals and characters composited with related painterly sceneries were projected on the large PVC backdrop located behind the orchestra. A VJ took care of live-mixing various layers containing pre-made stills and animal cut-out animations linked to the 'storyline' of the music. During the live concert, children who had been actively involved in the *shadow play* earlier, proclaimed loud and enthusiastically the appearance of 'their animal'. Due to technical limitations, the VJ mixed pre-rendered animal-sequences resembling those of the shadow play. After evaluating our experiences from this project, new insights led back to the design model. We found that set 5) design elements considering properties of *liveness*, needed to be expanded. The sub-components under the component *interactive liveness*: *internet, social media and mobile* as described by Nick Couldry (2004) and Philip Auslander (2008) did not cover the kind of *interactive liveness* we had experienced. Suggestions for relevant sub-components are mentioned in section 4.

The second concert (2) was a performance of various percussion compositions. We decided on a concept based on visualizations of 'body sounds'. The station was linked directly to the computer of a VJ installed on the stage. The video footage was edited into sequences and projected to 'fit' the live performed composition. The initial intention was that a new musical work would be composed, incorporating the 'body sounds' and supplementing the images projected on stage in real time. Due to lack of time, this wasn't possible, and an existing musical composition was performed instead. Image 4 schematically illustrates the flow from recording to mixing and execution by the VJ, positioned on stage in close contact with the percussionists.
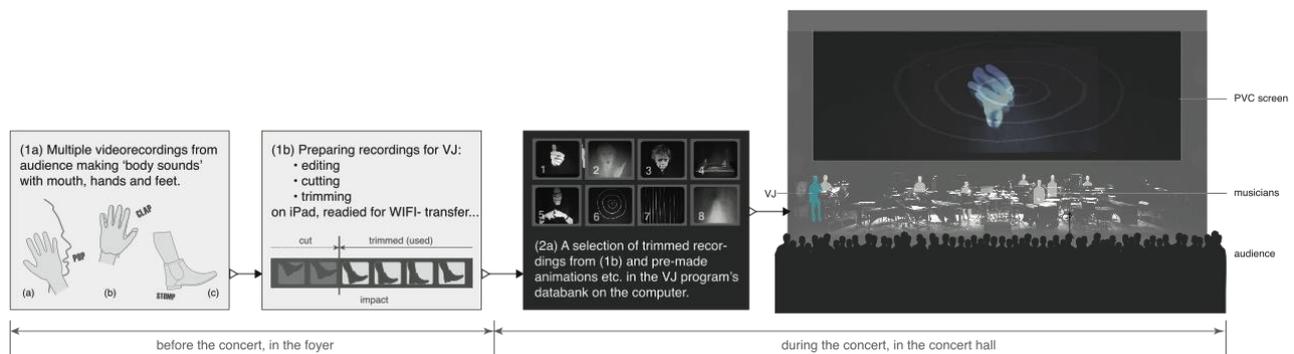
Image 4: Schematic flow from recordings before- to mixing these during the concert.
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During this workshop observations and comments made by performing musicians, students, the professional VJ (trained as a percussionist) and people who attended the concert were gathered and studied. The experiences gained through this workshop made us look into terminology for describing the various ways of (re-) mixing images. We also felt challenged in describing the perceived 'live'-link between the projected visuals controlled by the VJ and the performed music.

4. Findings, multiple dimensions and perspectives

Construction of a design model has enabled a systematic investigation of the phenomenon of motion graphics in spatial and scenographic contexts to be conducted within this research project. Using this model-as-method has supported the aim of structuring the discourse between praxis and theory. Through the design lab and the workshops, as described in section 3, relevant theory, terminology and concepts were introduced to function as a framework. These were then points of consideration during the design process, and were discussed and evaluated in plenum. Existing theory and concepts have been found useful and sometimes lacking, revealing aspects of tension between theory and praxis. Findings in section 3 contribute to relevant terminology

Through the design lab (section 3.1), we found that working with terminology in form of the four of space defined by Block was useful for most students. One student though, found that the term 'empty space' was also relevant for her work. Another student pointed at the fact that 'the large projection screen means something for the motion graphics at the edges' (table 2, Q4: A1). Therefore I will look into theories of visuality dealing with borders and/or edges in order to find relevant terminology related to this observation.

The aspect of timing (table 2, Q1) interestingly played a larger role than expected within this design lab. The remark that 'timed "by hand" is perceived as more *natural*' because it is 'better when images appear a few frames ahead of music', brought up the question on why this might be the case? We discussed if this might be caused through the natural difference between the speed of light and the speed of sound, but lack scientific evidence.

The workshops described in sections 3.2 and 3.3 focused on three aspects. 1) Terminology related to timing, 2) terminology and theory associated with re-mixing of images and 3) terminology related to properties of liveness. Regarding properties of liveness in section 3.2, we found that the existing sub-components: *internet, social media and mobile* under *interactive liveness* (see also

table 1) did not cover the kind of *liveness* we experienced during this workshop. After the workshop we discussed if we could think of other sub-components of *interactive liveness* that might provide with applicable terminology. We looked into two relevant concepts: one is *reactive*, the other *generative. Reactive* could describe various ways in which visuals are coordinated with sound cues. The term *generative* is a possible term for motion graphics generated through autonomous systems e.g. algorithms that might be linked to interactive sound cues.

Construction of the design model will continue as central in working with further aspects of this practice-led research project. In order to approach a theoretical framework specific to motion graphics we will continue the investigation of related fields and describe applicable concepts and define a nomenclature from a motion graphics perspective.

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