THE NEW MATERIALITY OF THE SOCIAL
ANDERS HOLDEN DELEURAN 10.SEM DIGITAL DESIGN 2008

TITLE SHEET_

This report has been prepared in fulfilment of the 10th Semester Master's Thesis in Digital Design. The project extends upon the previous semesters in which a digitally conceived, interactive pavilion as well as a covered urban square based on the concept of performative architecture were designed, and in the case of the pavilion, constructed. Furthering this theme of performance the project at hand seeks to examine the deeper humanistic and phenomenological processes involved when environments and objects begin to perform.

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Title: The New Materiality of the Social

SYNOPSIS_

The thesis is developed as a contribution to the research project "Performative Urban Environments, Amagerbrogade, Copenhagen" conducted by PHD student Bo Stjerne Thomsen in cooperation with amongst others the municipality of Copenhagen. Based on the experiences and knowledge gained on the 9th semester individual project, the thesis seeks to further explore the concept of environments and object which "perform".

Through an extensive site analysis it is concluded that the project site on Amagerbrogade currently exists as a "non-place" - a place marked by a lack of humanity. This consequently leads to a principal study of the humanistic and phenomenological aspects of "place" as a concept. From this study a number of conclusions are made which suggests an approach to how we might generate an increased sense of social awareness and interaction in "non-places" by introducing material object into the city which holds the capacity to "perform" in certain ways. Following this, a process of design exploration is conducted by employing a range of both formative and simulation-driven digital design techniques which all seek to inflect the material capacity to "perform" into the design proposals which emerge as the result of this process.

READING DIRECTIONS_

The report will be divided into five overall parts:

Part 01 shall introduce the project through the program which was written in the first part of the semester, here subjects related to the background and framing of the thesis will be elaborated upon, as well as a problem statement and the setting up of project goals will be described.

Part 02 begins the process of exploring the project site on Amagerbrogade through the description of an extensive site registration and subsequent analysis, following this, findings and conclusions are made that lead to the suggestion of a theoretical approach.

Part 03 will describe this theoretical framework in employing a range of humanistic and phenomenological aspects of "place" in order to determine how we might design towards an increased social awareness and interaction through the notion of environments and objects that "perform".

Part 04 shall begin to employ the findings made in this theoretical approach, while simultaneously proposing a structured approach to digital design techniques based on emergence, system-design, responsive environments and prototyping strategies.

Part 05 shall describe two suggested design proposals (approaches) which embody the findings and conclusion made through the report.

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01PROGRAM

INTRO_

The program was written in the first half of the project in order to outline the course of the semester and adopt a general project approach. It is comprised of several sections covering such issues as clarifying the motivation behind the project, framing a design brief, formulating a problem statement and so forth. In the following the program is presented in an unaltered version to that which was handed in late march. The only difference is the exclusion of a content list and approach description which instead have been moved to their respective chapters in the final report to serve as introductory paragraphs.

STUDY GUIDE_

The study guide for the 10th semester master's thesis in Digital Design describes the semester as an opportunity for the student to prepare a project individually, demonstrating the student's ability to work independently with a central problem within the subject area. This takes place with the reflected inclusion of relevant theories and methods on the basis of acquired skills and competences through the entire study course within the specialisation in Digital Design. A project report is handed in the form of a written report, sheets, and electronic presentation product.

The general theme of the master thesis is chosen individually by each student in collaboration with the supervisor and the semester coordinator. The semester structure is different from all other semesters as there is only one project – the master thesis.

The project will be assessed on the 17/06-2008 in an external oral test with point of departure in the project report. Marks will be given in accordance to the 12-point marking scale.

BACKGROUND/MOTIVATION_

This 10th semester thesis project will be the conclusion of my last six years of study at respectively the institute of Architecture & Design, Aalborg University, Denmark and the Umeå Institute of Design, Sweden. A period in which I have been exposed to and involved in projects spanning an extremely wide field of discourse within the Architectural and Design related realm. From Urban Design, Architecture, Industrial Design, Websites, Interaction Design, Video Games, Exhibitions, Motion Graphics, 3D-animation and more. Consequently this field has touched a broad number of possible scales, design problems, approaches and solutions. Combined with a consistent interest and fascination in the more digital aspects of each project, the decision to eventually select Digital Design as the specialization for my master's degree has been a direct product of this broad design spectrum.

Being a part of the first batch of Digital Designers the initial focus on the specialization was figuring out exactly what Digital Design is all about, in effect developing a specific, applicable and thriving profile for the specialization. From day one this process has led to much debate and speculation into what exactly a Digital Designer at Architecture & Design does. With an ideological offset in late cyberpunk culture combined with the visions of the future in the internet revolution of the 1990's, the early steps on its way towards becoming a specialization had Digital Design dealing with distant virtual utopias firmly rooted in the space behind the computer screen. Concepts and projects dealing with online worlds, science fiction, storytelling and interactive entertainment were the main areas of interests and reference. This focus had the Digital Designer eventually working within videogame development, the movie industry and so on. Although the skills acquired during the course of the bachelor's education definitely could be applied in this context, this focus to some extent neglected the existing design foundation already established on the bachelor's course with regards to problem solving and design proposals for the "real world".

During the past three years Digital Design has been drastically changing its focus to accommodate exactly that. This has been the result of our decision to focus our efforts by building on top of the existing specializations in combination with intense research into the current discourse centring on how digital media is affecting and changing design as a whole. The projects developed in this period have therefore resulted in an entirely different field of reference. Instead of focusing on the digital as something stuck in the binary space behind the monitor, we now see an entire movement of designers, researchers and artists' experimenting with the consequences of what happens when the digital bursts through the threshold of the monitor and starts to inhabit our physical environment. Here at Digital Design this new paradigm can be said to have has manifested itself on two overall levels:

One: *The implementation of digital tools and techniques in the generation, development and production of form.*

Two: *The augmentation of physical space via the integration of digital technology.*

From a comprehension-wise standpoint it is important to note that these levels are certainly anything but mutually exclusive, and in fact, the most interesting projects and ideas might arise when there is deep coherence between the two levels. In the last two projects I have carried out here at Digital Design this coherence and overlap between the two levels has been a predominant factor both on a conceptual as well as a more practical level.

NORA_

The pavilion NoRA, which was designed collectively as part of my 8th main semester project, marks one of our first efforts towards understanding and experimenting with architectural structures that are a product of **site-specific factors and processes**. Understood in the way that the parameters that defined the design process as well as the resulting structure and interactive sound/light system were centred on concepts of flow and interaction as well as site-specific characteristics such as available space, sun/shade etc. In hindsight the theoretical framework, concepts and general knowledge at this point were still rather rudimentary and to some extent unfounded. In spite of this, we had a great learning experience elaborating the project and it turned out to become a great success for Architecture & Design as the pavilion eventually was constructed and displayed at the **Venice Architectural Biennale 2006**.
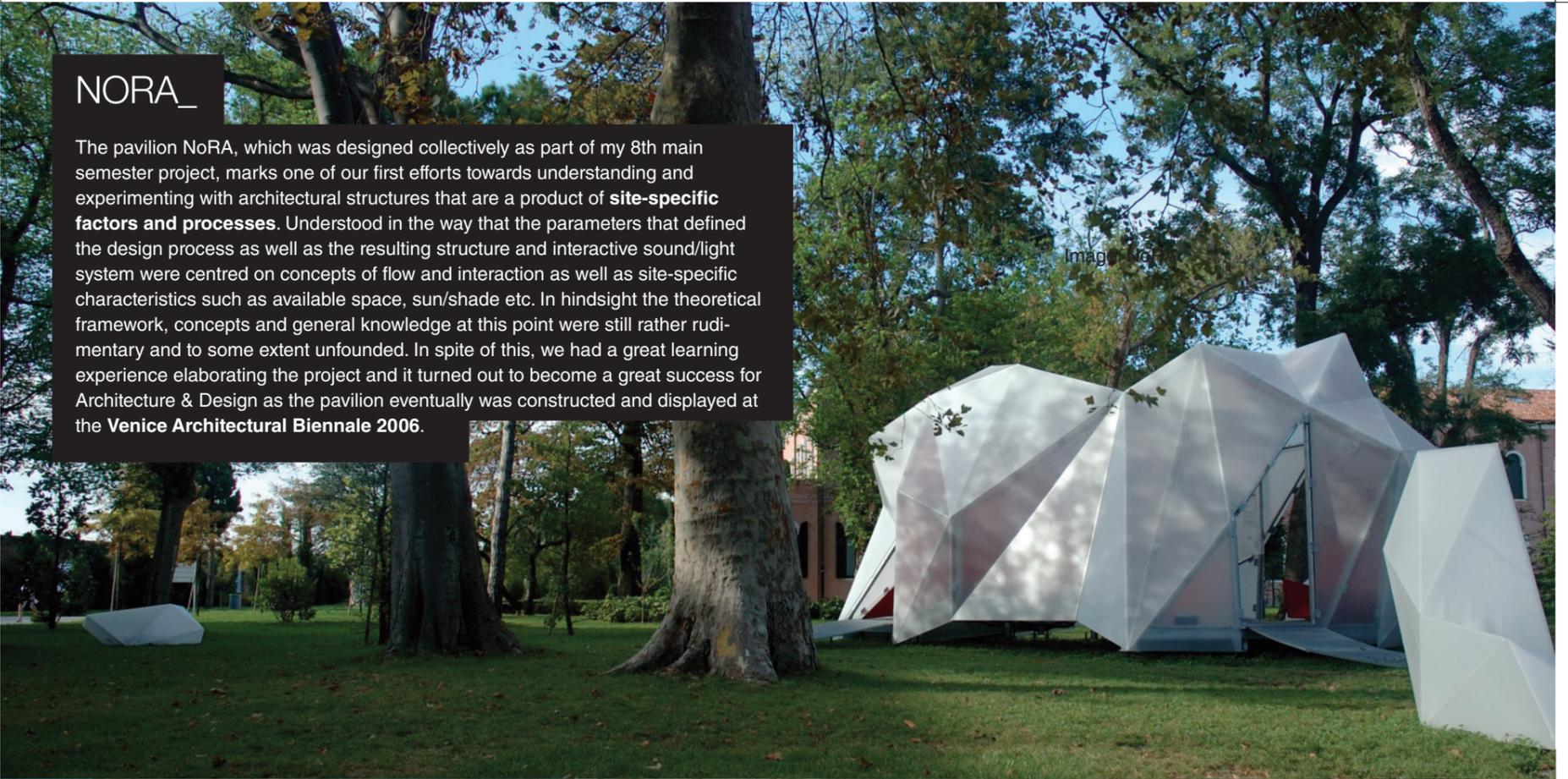
SPACEFRAMING_

The experience with NoRA led to a personal desire for a deeper **understanding and knowledge** into concepts and techniques of digital form generation (conceptually and technically) as well as the more **phenomenological aspects** of what exactly these complex geometries and responsive environments yield with regards to how we perceive and interact with them. From this grew the foundation for my individual 9th semester main project: *SpaceFraming - A Performative approach to Musiktorvet Amager*. The title SpaceFraming holds an intentional double entendre; encompassing both the final design proposal (which structurally is a giant spaceframe) while simultaneously describing the design strategy (which could be described as focusing on setting up the spatial framework so as to encourage and catalyse social activity while simultaneously supporting the desired programmatic functions). In the following I will briefly dwell on the notion of *Performative Architecture*, which was used as the theoretical point of origin in the project and consequently will act as the initial foundation for this thesis project.

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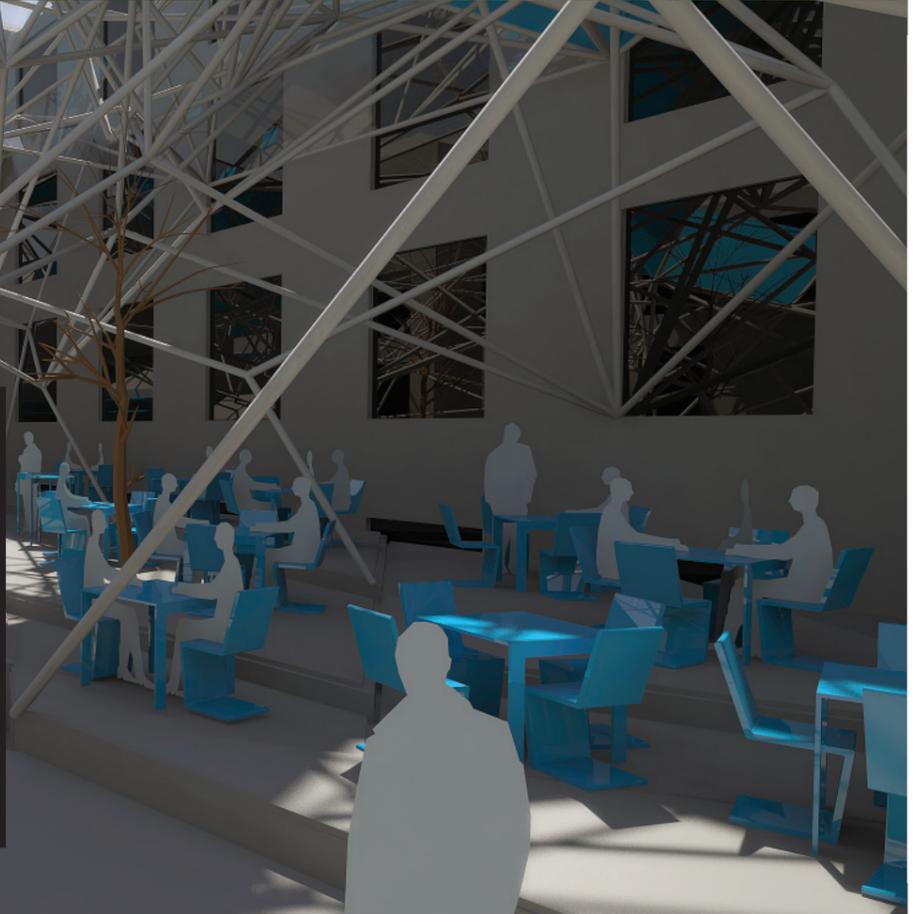
PERFORMATIVE ARCHITECTURE_

The past couple of years have seen several practitioners and theorists within architectural discourse exploring the emerging concept of *"performative"* architecture and design on a number of different levels and fields of application. This process has sparked many different attempts at defining the term in an architectural context, as well as brought new and innovative perspectives into how architecture, design and the built environment can *"perform"*. It is important to note that the term in this context is not to be confused with performance in the sense of a show, a concert or a play etc. Essentially performative architecture could be described as placing the emphasis on **what architecture does, as opposed to what it is** (Kolarevic 2005). In this sense one could say that the performative approach to some extent frees itself from the classic struggle between form and function by suggesting *"performance"* as the leading parameter in an integrated design approach that doesn't discriminate between use, organization and form. Obviously the ambiguity of this emphasis unfolds a broad spectrum of possible interpretations and as such the adjective indicates several different as well as and intertwined meanings spanning multiple realms, from spatial, social and cultural to purely technical.

In my research and analysis I found that the performative discourse, roughly, can be divided into two overall schools of thought; an operative approach and a conceptual approach. The operative approach focuses on tangible engineering and scientific goals that can be clearly quantified, and thus connects to a mainly positivistic philosophy. On the other end of the scale the conceptual approach encompasses dealing with intangible, artistic and humanistic issues into how we inhabit and affect our environment and vice versa, thus leaning towards the aforementioned more phenomenological issues. In the *SpaceFraming* project I was primarily engaged with the latter category. Through the study of theoretical texts and backed by a range of case studies I attempted to further classify the attributes of conceptual performance by describing it on a number of similar, yet, quite different levels.

Frank Gehry's Guggenheim museum in Bilbao, Spain (Google: Images search)

Architect and Professor David Leatherbarrow suggests that the building itself could be seen as a performance piece, with a life of its own beyond our intentions for it. As such he sees the greatest promise of performative architecture as a new way of understanding buildings apart from their functionality and programmatic composition. Here lies, he suggests, a space of inherent potentialities that cannot be described by program or function, what he describes as *"architecture's unscripted performance"* (Kolarevic 2005). As a theoretical approach this perspective entails a range of interpretations into the built environment's ability to catalyze cultural processes and social dynamics. This then implies shifting the perception of architectural performance into what effectively could be described as catalytic i.e. architecture accelerating processes. In the *SpaceFraming* project I attempted to describe this ability on a number of different levels. For instance architecture's ability to generate local identity and promote locality, thereby catalyzing social, cultural and economic growth. Describing what is now widely known as the Bilbao effect (referring to Frank Gehry's Guggenheim museum in Bilbao, Spain). Another level dealt with architecture that literally and actively performs (kinetically, digitally augmented etc.), thus becoming in itself dynamic performance pieces.

Exactly that, experience and perception, became an important part of the project. From the case studies it could be deduced that it is often the movement of people in and around buildings or installations that give them their performative capacity (as a catalyst for human behaviour). This was for instance exemplified through NOX's Maison Folie and the moiré patterns generated by moving in relation to it. Here the performative effect is a direct result of the structure's physical attributes. In order to experience the visual phenomena you have to move around, and thereby, in a sense, perform. This observation suggests that there is a strong performative relationship between physical appearance and behaviour. That is, how people behave or act in relation to form, geometry and materiality. This subject-to-object and individual-to-group relationship is also closely related to Leatherbarrow's "unscripted performance" concept.

Similar to Lars Spuybroek of NOX, the Architect and teacher Ali Rahim is an exponent of a group of practitioners that have been exploring the relationship between form and behaviour extensively. In his works and theories Rahim intentionally attempts to generate forms and topologies that hold a certain level of ambiguity and fluidity. This approach has several intentional outcomes. Firstly it aims to loosen the concept of program and typology, thereby creating spaces that are more open and flexible. Secondly, as with Maison Folie, it attempts to generate emergent social effects by affecting the way people perceive and thereby behave in the space.

By applying geometries where any notion of floor, roof and wall, inside and outside, become completely fluent and intertwined, Rahim's theory is that people and architecture can engage in a sort of behavioural "feedback loop" capable of catalyzing social and cultural effects. In order for this to happen Rahim suggests that a design has to generate as many "affordances" as possible. In Rahim's terminology affordances are properties of an architectural form that indicate how one can interface it. Properties such as the empty space within an open doorway would be considered an affordance as it indicates the possibility of moving across the threshold. In Rahim's word s affordances are essentially "all the action possibilities latent in the environment; they are objectively measurable, and exists independently of an individual's ability to recognize those possibilities". Effects caused by affordances could be exemplified by using a set of stairs for sitting or a skateboarder grinding a street curb. Rahim's agenda might be said to be a bit more complex than that. He suggests that by intentionally offering affordances in architecture we might be able to create new social and cultural patterns by affecting how people relate to each other:

"Each individual can be said to contain his or her own affects, which interact differently with the affects contained in the formation. As each person responds uniquely to a formation, he or she activates certain affordances within the object. His or her behaviour than influences the reactions of adjacent users. Once one person has sat, others may sit – or they may be prevented from doing so. Small groups may form; some people may find themselves perched on a surface that is higher than is customary, others sitting on areas that are much lower than normal. Individuals may find themselves in new relationships with others. The affective formation instigates inventive modes of habitation by users, perhaps changing their conceptions about what constitutes an appropriate surface for sitting, or what it means to sit in a group." (Rahim 2006)

In the quote Rahim explains how affordances might instigate and catalyze certain behaviours in people inhabiting what he calls "formations". This term refers to the aforementioned break from the conventional notion of program and typology, and basically describes architecture with changeable uses. Beyond this, formations also denote a way of viewing buildings as containing elements of the virtual,

both in the sense of containing properties from the process in which they were designed, but also by focusing on the dynamism of users' movement and interactions in space. Hence formations are a break with any conventional notion of architecture, instead of defining function or use, formations lets them develop in response to their occupants and contexts. In the quote he also describes how both people and formations contain different "affects". This refers to the notion of the feedback loop between architecture and people. Rahim explains affects as "the capacity both to affect and be affected". It is important to notice that affects differ from effects, which generally imply a one-way direction of causality. Affects on the other hand suggests a two-way transfer of information or influence between architecture and its users.

Rahim's hypothesis, probably more than any, exemplify a design approach towards David Leatherbarrow's understanding of performative architecture i.e. tapping into architecture's inherent potentialities that cannot be described by program or function, what Leatherbarrow described as architecture's unscripted performance. Another approach to this can be described by Umberto Eco's concept of "open works" (Leach 2004). Eco describes an open work as characterized by a deliberate ambiguity in meaning. According to Eco, open works must leave some of its defining elements to the public or to chance, thus giving these works a number of possible interpretations rather than a single definite one. Although this theory was originally conceived with regards to disciplines such as literature, film and music, it seems very appropriate in relation to performative architecture. It is certainly quite similar to what Rahim suggests in his hypothesis.

With regards to the application of these theories both Eco and Rahim are quick to point out that this is not a quest for a totally open approach without any design directions. Rather there must be some guiding principles from the designer that structures the process and sets up a framework in some way:

"The goal for the designer is not to fully comprehend and control all the complexities of affects and affordances but, rather, to inflect formations with affects, coaxing forms and occupations in useful directions" (Rahim 2006)

This was in essence what the SpaceFraming project was about. It was however also bound by a number of strict demands and requirements as it was developed in response to the preliminary proceedings for an architectural contest. The project opened a lot of doors and shed light on a number of questions; however there is still plenty more to be explored within this realm of architectural discourse and that is the main motivation behind this 10th semester master's thesis project. Particularly with regards to the deeper understanding of how these processes occur on a humanistic level.

Besides these more theoretical considerations, the SpaceFraming project also served as an opportunity for further experimentation with concepts and technologies related to digital form generation. In the following this will briefly be elaborated upon.

DIGITAL DESIGN TECHNIQUES_

The experimentation and development of digital design techniques in the Space-Framing project was to some extent quite arbitrary and fluid, but, also always 100% investigative and experimental. The intentionality behind this approach was to let consecutive discoveries and experiments guide the process and thereby let the final proposal emerge as the unforeseen result of a process, instead of letting it be determined by a prescribed formative language or intention. This approach is at the core of many technology-driven architectural practices today and can be described as central to the pursuit of getting beyond the notion of architectural typology, repetition and stale archetypes. In the SpaceFraming project this process was based on the research and experimentation with a number of different applications focusing on uncovering their potential in various design scenarios. By continuous experimentation and evaluation combined with sketches as well as theoretical findings, a specific design strategy combining several techniques was slowly developed and subsequently applied iteratively in the context of Musiktorvet Amager.

The design techniques that were developed contain aspects of a number of different approaches to generating form using digital technologies, these included:

- Explicit modelling: *The direct manual manipulation of objects.*

- Emergence: *The concept of small parts of a system together forming coherent and complex organisations.*

- Dynamic simulation: *Using tools that simulate various dynamic behaviours to generate form.*

- Parametric modelling: *Setting up interdependent components by describing their relation parametrically.*

- Script based: *Generating form by writing or using code.*

The majority of these experiments were performed in the 3D modelling and animation package Maya released by Autodesk. However most of the concepts and principles applied most likely could be mirrored in similar software such as 3D Studio Max, Xsi, Houdini or Lightwave. The reason for choosing Maya is because of its very open and configurable node-based environment as well as the scripting facilities provided by Maya Embedded Language (or MEL). Besides using Maya a few other experiments were performed using the applications Generative Components, TopMod and K3dsurf.

The background for these experiments furthermore served as an attempt to de-mystify the digital design techniques applied by contemporary technology-driven practices such as for instance Gregg Lynn and Ali Rahim. It is often quite hard to descramble the design process behind their works just by observing the architecture, the experimentation performed during the project helped in understanding some of these formative techniques a lot better and thereby served as a great inspiration. Within the framework of the thesis project these aspects will be a key part of the theoretical and technical research work and act as the foundation for the development of appropriate digital design techniques.

NOX's Maison Folie (Google: Images search)

DESIGN BRIEF_

As described in the previous chapter the thesis project will be carried out in continuation of the 9th semester project. To focus the thesis' subject it will be developed as a contribution to the research project *"Performative Urban Environments, Amagerbrogade, Copenhagen"* conducted by PHD student Bo Stjerne Thomsen in cooperation with amongst others the municipality of Copenhagen. This provides the thesis with a concrete design scenario in which the relevant theories, concepts, design strategies and techniques can be explored.

The collaborative research project has mainly been focused on research and concept development into the integration of various technologies in urban spaces with the agenda of increased social interaction, urban life as well as generating new perspectives on urban habitation in general. The main theoretical background here lies in how the ever-increasing amount of digital and net-worked technology such as wireless networks, sensors and mobile information technology is drastically altering our environment and the ways in which we inhabit it. With a focus on the actor-network relationships that is established when technology, people and the city converge, the project has set down three main objectives as its focal point for research and development:

1) Test out the potentials for recreational and interactive spaces that support urban life and local identity using performative urban interior (furniture, light, pavements etc.)

2) Recognize the local resources in Amagerbrogade to strengthen a collective consciousness and individual responsibilities for the environment.

3) Exemplify new potentials for street life acting in synergy with traffic spaces.

In the fall of 2007 the research project has been focused on the entire stretch spanning Amagerbrogade. In order to generate more specific ideas, and in dialogue with the Copenhagen Municipality, the focus has now been narrowed to the pedestrian crossing on Amagerbrogade between Blekingegade and Tovværksgade and at the location of the street entrances at Blekingegade and Brigadevej on the other side. The scale of implementation will be that of an urban furniture placed adjacent to the side walk at the end of a closed road. However for the purpose of this thesis the entire area in question will be employed as the basis for concept development and design experimentation. From this, ideas and design strategies might be lifted and implemented in on a smaller scale design for the urban furniture.

PROBLEM STATEMENT_

In the design brief the main objectives for the research project were described quite clearly. For the purpose of the thesis this will be narrowed down further to focus mainly on the issues regarding design strategies capable of supporting urban life and local identity in a traffic heavy context. From this the following problem statement is deduced:

How can a site-specific design strategy be developed with the agenda of engaging a heavy traffic urban transit space and transform it into a new public place that supports and catalyzes social and cultural activities acting in synergy with traffic?

How can digital design techniques and technologies support this objective from a theoretical standpoint, as tools in the design process and as technologies embedded in the actual design proposal itself?

With an offset in the theories described in the previous sections the thesis' contribution to the research project will focus mainly on physical structure's ability to affect, facilitate and catalyze these collective and social interactions in and with the cityscape. To further support the research project the thesis also should generate insight into the integration and prototyping of digital technologies embedded in physical structures. Thus the overall areas of design for the thesis can be divided into the following:

a) An overall formative **design strategy** based on site-specific parameters such as local actor-network relationships, transitional zones and flow, programmatic volumes, local functions etc. This will be addressed through **concept development and experimentation** with formative digital design techniques.

b) The **integration of appropriate technologies** (light, sound, actuators, projectors, sensors etc.) into physical structures. This includes primarily incorporating these as a part of the design process, as well as developing techniques for the **simulation** of how the technology and responsive system might behave and appear (i.e. digital prototyping).

c) The digital processing of form with regards to **detailing, structure and production**. This includes the experimentation with the production of physical scale models and possible full-scale prototypes of various concepts.

PROJECT GOALS_

With the problem statement in mind the overall goal for the thesis will be the documentation of a design process in which novel design strategies and techniques have been produced and applied in a concrete design proposal which fulfils the established objectives and thereby produces new insight into the subjects described in the previous sections.

Following this, the ideal goal for the thesis will be if some, or all, of the design proposals sub-elements are selected to be realized as part of the Copenhagen municipality's recently released plans for the urban renewal of Amagerbrogade. Beyond this it is imagined that the final project might act as a catalogue of general concepts, ideas and designs that can support the Copenhagen Municipality in the development of their plans.

On a more personal level the project goals include gaining a deeper insight into the concept of performative spaces and the relational aspects associated with architecture and design in general. Furthermore the thesis is also considered an opportunity to achieve a higher degree of technical and creative sufficiency in digital modelling and generation of form as well simulation of scenarios via digital prototyping.

Beyond this the following lists a number of concrete goals with regards to the production of models, prototypes etc. in order of priority:

1) The production of a digital prototype for the simulation of a performative system.

2) The production of physical scale models (experiments as well as the project proposal).

3) The production of a detailed digital model of the project proposal.

4) The production of full-scale prototypes.

DELIMITATIONS_

Because of the thesis' aims and its conduction under the Digital Design specialization a number of delimitations are put down.

Although economy does play a part in the thesis due to its development as a contribution to the research project and therefore the possible realisation of certain aspects, it will not be taken into account as such, only to the extent of fairly obvious considerations of different manufacturing technologies related to realizing certain geometries. The same applies to structural, climatic and handicap friendly concerns.

The thesis is to be considered a research orientated, experimental and conceptual approach to design, demonstrated in the execution of a design proposal for the Amagerbrogade project.

Diagram by Bo Stjerne Thomsen
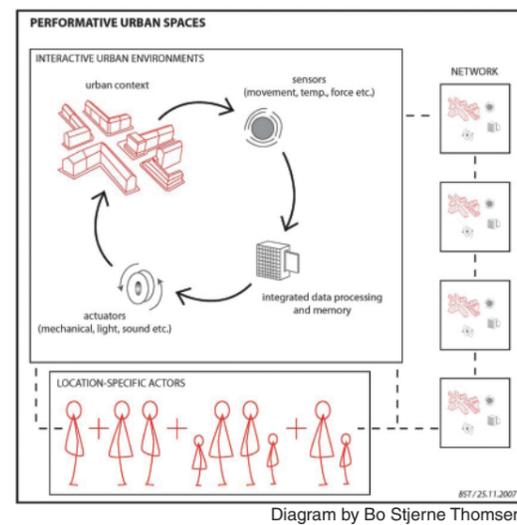
O2 SITE EXPLORATION

INTRODUCTION_

In this part of the report the site on Amagerbrogade will be explored through a range of different approaches ranging from somewhat phenomenological first-hand impressions to hardcore mappings of traffic. The main objective here is to further determine how to approach the main objectives of the projects as set up in the design brief. This includes for instance the objective of recognizing locale resources which may be employed in a design context. Such objectives require a deep sense of the site, therefore a two-day excursion to the site was performed, which act as the basis for the site exploration as it exist here in the report. First though we will briefly link the initiative of the research project - which the thesis is a contribution to - with the SpaceFraming project and a number of other initiatives which are currently taking place on Amager.

(politiken.dk)

(politiken.dk)

REDEFINING AMAGER_

In the last couple of years Amager has been undergoing drastic changes as it tries to redefine itself as a central part of the Øresund region which is in rapid development. With the establishment of Ørestaden triggering a range of corporate, educational and public institutions such as Danish Radio and Copenhagen University to place themselves on Amager, it is quickly becoming a innovative part of Copenhagen appealing particularly to the knowledge- and information society.

Furthermore a number of distinctive residential projects are being planned and built, encouraging increasingly more people to settle down on Amager. The residents of Amager have traditionally been known by their variety and a blue-collar attitude. Lately a large amount of individuals from the so-called "new creative class" also have found Amager attractive as a place of residence to, adding even further to the diversity. From the elderly to the immigrants to musicians and artists, Amager is becoming a cultural melting pot, which is slowly shaping a new identity.

All these new elements are providing Amager with a much needed and revitalizing boost. However when compared to the rest of Copenhagen, in particular the inner city, Amager is seriously behind when it comes to attractions, cultural offers and appealing public spaces in general. Due to this people almost only travel to Amager when visiting Amager Strandpark or to attend a concert at Amager Bio. In order to make Amager more attractive, beyond when the weather promotes hanging out at the beach, a more focused effort is needed.

This process of redefining Amager and its identity has a lot to do with the ability to generate an increased sense of belonging and affiliation with the place. It is one thing to have your address, workplace or education located a specific place; however that does not necessarily dictate a cultural and mental bond with it. For this to happen any district, quarter or neighbourhood needs public spaces that can facilitate the activities and experiences that binds a community together. These kinds of places are very sparse on Amager and one of the main ambitions behind the initiatives currently taking place, such as the development of Musiktorvet at Amagerbio (the SpaceFraming project) and the general urban renewal project of Amagerbrogade, is to generate a much higher degree of public "togetherness" in the local community.

The project at hand is a direct extension of this thought and shares the same ambitions. In the following chapters the site will be explored with the underlying aim of determining how the project might help to contribute to the redefinition of Amager.

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SITE LOCALITY_

As described in the design brief the specifications of the site have been somewhat fluctuating during the course of the last six to eight months or so, this has been mainly due to negotiations with the Copenhagen municipality and the determination of an appropriate location that would work for them. However the overall site in question has been quite consistent during the course of the project. Specifically it is located on the first half of **Amagerbrogade** right by the primary **Metro station** on Amager, pretty much in the centre of what would be considered inner Amager.

At this locality an area consisting of three T junctions leading up to Amagerbrogade was selected to act as the **initial zones for concept development** and possible implementation of designs. These zones are defined by the **pedestrian crossing** on Amagerbrogade between **Blekingegade** and **Tovværksgade** and at the locations of the street entrances at Blekingegade and **Brigadevej** on the other side.

It should be noted that during the progression of the semester the zone located at the end of Blekingegade has been given particular attention. This focus has primarily been the result of the collaborative sessions performed with Bo Stjerne Thomsen and Esben Skouboe Poulsen. As the work performed during these sessions was under a fairly tight time schedule combined with a number of economic and practical restraints, decisions were made intuitively and on the fly. This mode of operation eventually led to the selection of the zone at Blekingegade.

(maps.google.dk)

BLEKINGEGADE

METRO STATION

PEDESTRIAN CROSSING

BRIGADEVEJ

TOVVÆRKSGADE

AMAGERBROGADE

------- zones of possible design implementation
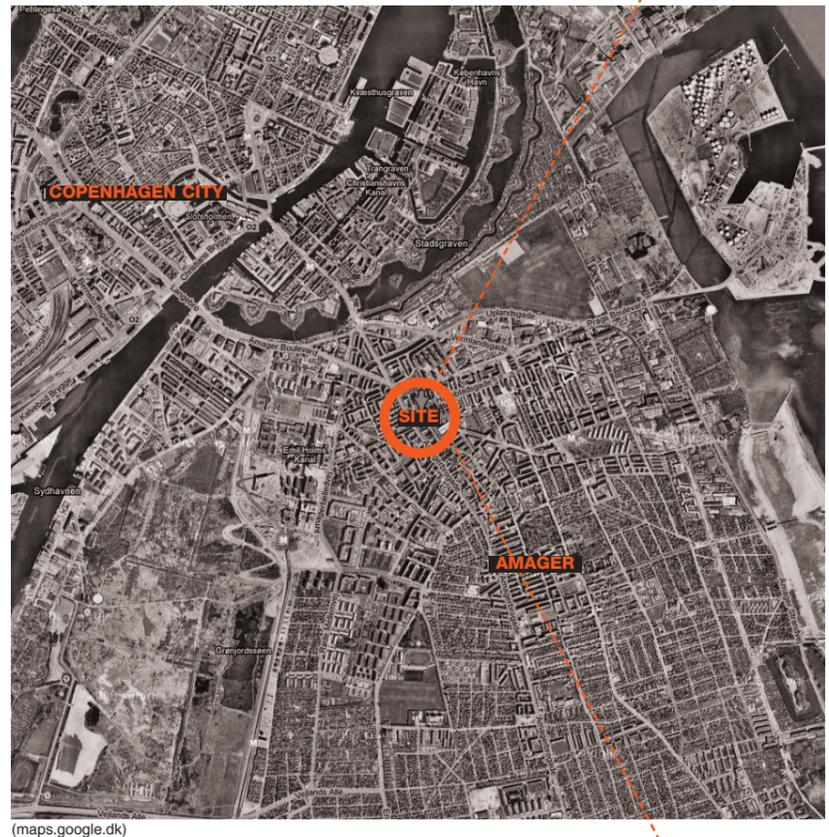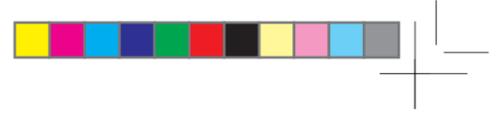
SITE REGISTRATION AND ANALYSIS_

In order to gain a sufficient **understanding and appreciation** for the site at Amagerbrogade an excursion to the site was performed. Based on a fairly **phenomenological approach** the first-hand experience of the site acted as a basis for examining its specific characteristics and qualities and thereby also discovering its inherent potentialities. The excursion also served to uncover and map several site specific issues, constraints and parameters which overall can be categorized into being either **stationary**, or, **dependent on time and movement**.

The stationary subjects include defining and mapping for instance programmatic functions and amenities. Basically this entailed describing the constants that make up the site and eventually acted as the background for both developing a spatial 3D-model of the site as well as acted as an off-set for understanding the **relations in the site** based on the functions that are located in the area.

By visiting the site on different days, as well as different time of day, it was possible to further examine how the **site-specific phenomena** fluctuates and alters over time, thereby enabling the design process to take into account time and time-dependent issues as possible design parameters. This included mapping and experiencing such issues as flow, accumulation, rhythm and intensity with regards to how people move, behave and use the space. Beyond this the excursion obviously also served as an opportunity for **photographic registration** and specific mappings of for instance the functions and layout of the area.

The site registration was performed over the course of two days in early March 2008. During this period the site was explored and mapped in three discrete sessions:

Friday 07/03/08_10.30-13.00   = Initial orientation, feel for the place and photographic registration.

Friday 07/03/08_19.00-21.30   = Experiencing night-time phenomena and photographic registration.

Saturday 08/03/08_ 14.00-18.00   = Registration of site-specific phenomena and deep mapping.

In the following the results of this registration and subsequent analysis will be presented in the form of initial impressions of the site, in-depth mappings and photographic registrations.

FIRST IMPRESSIONS_

I arrived at the site the first time by Metro. An experience that cleverly stripped away the usual first time experience of a place by removing the sequentially updating image of the site which usually builds up as one gets closer to it. This provided a completely undisturbed perspective, which ultimately proved to be an excellent background for the site registration.

The initial experience of the entire site in general was that of an overwhelming amount of traffic and people moving in and out of the area. This was in particular true of the stretch of Amagerbrogade running through the site. This also led to a very visceral auditory experience where the combined noise of people and traffic became the dominant factors.

By observing the general public in the area a pattern of diversity began to appear quite quickly. Spanning old, young, wealthy, poor and all types of ethnicities, the inhabitants in the area gave the impression of a very broad section of the Danish population. This however was to some extent overshadowed by a rather substantial presence of what might be described as streets bums, drunks and suspicious characters.

After spending time at the site for a couple of hours the need for a break presented itself, this however proved to be less than easy as the site basically has a total lack of outdoor recreational possibilities. Luckily this was countered by a visit to the local coffee shop, which also provided an opportunity to reflect on the experiences obtained during the course of the registration.

From this initial registration of the site the overall impression was that of a typical heavily crowded urban area in somewhat rundown part of town. This may sound somewhat negative, but as always such notions depend on the eye of the beholder. For some reason or the other the area certainly slowly began to appear almost agreeable, perhaps because of the intensity with which it was explored!

NIGHT TIME LIGHTS AND ANXIETIES_

After an afternoon of architectural tourism and general frolicking I returned to the site once the sun went down in order to experience the site during its darker hours. Not surprisingly the traffic once again walked away with the main attention.

Where the experience of Amagerbrogade during the day best could be described as a somewhat grey mass of cars, this experience was now completely altered due to the visual impact of the numerous head- and taillights passing through the area. It now presented an almost ephemeral visual and auditory experience, in which the vista of moving lights now composed what could be described as an illuminating river of lights.

Illumination and lights in general had now transformed the site in its entirety. From the many streetlights to the lights emanating from the shop facades to the illumi-nation of a local bell-tower, there was now a very different atmosphere than earlier in the day. This also seemed to have a positive impact on the sense of nightlife unfolding in the area such as by the late-night grocery store, the coffee shop and the local eateries, which all now appeared more appealing than earlier in the day.

However the night-time site exploration was not an entirely positive experience. During the Friday night spent at the site there was a certain tension in the area, caused by the presence of the aforementioned drunks and shady characters rummaging the area. This led to a hint of anxiety and uncomfortableness while logging around an expensive camera and tripod for the photographic registration, an impression that was not exactly turned around by the encounter with a rather hostile hot dog vendor!

GETTING SPECIFIC_

On the second and final day at the site it was time to get specific, see through the noise if you will, and begin to really understand the site. This objective was pursued by vigorously mapping and registering everything that sprung to mind as being of a defining characteristic to the site. This process led to a jam-packed memory card in the camera and a vast number of A3 prints of the area mapping a diverse and very detailed number of subjects and phenomena characteristic of the site.

The material and data gathered here comprised what essentially became the backbone of the mappings and site analysis which will be presented over the following spreads. These mappings and photographic presentations are conducted as an extension of the site excursion. Here the site is further explored, examined and classified through words and images. In the end the goal here is to recognize and understand the site on a deeper and almost fundamental level in order to obtain a fresh and unbiased perspective on the site and its inner workings. Hopefully this approach might also lead to a likewise novel and potentially useful approach to conceptualization and design of urban spaces.

LOCAL CONSUMER OUTLETS_

Any urban setting is to a large extent defined by the quantity and type of its local consumer outlets. That is, to which extent any given district offers the city dweller a range of opportunities for consumer behaivour such as shopping, eating out, leisure activities, and other various service offers. By mapping these consumer outlets one can begin to discover behavioural patterns related to why people might come to a specific district in the first place, why they might return and why they might stay there for extended periods at a time.

THE VILLAGES OF AMAGER_

The proposed project site is occupied by four to five story housing blocks with the ground floor levels predominantly used for the accommodation of a range of consumer outlets. These range from very busy and crowded outlets such as Fakta (grocery store), Baresso (coffee shop), UFO Kiosk (convenient store) and the Hot Dog stand located on Blekingegade, to slow-paced specialty stores and service businesses such as Saint Tropez (women's clothing), Stof 2000 (fabric store), RF/Max (realtor) and Kofit (electronic repair shop).

As with the entire stretch of Amagerbrogade, the character and composition of these outlets could be described as resulting in an almost "village-esque" feel. This could be due to the fact that you can acquire basically all your everyday necessities and consumer goods within a relatively small radius, combined with the fact that the outlets providing these goods are often small, independent and carry a relatively narrow and specialized assortment.

In taking this observation even further one could claim that Amagerbrogade is essentially two villages split down the middle, exemplified by the fact that each side of the street has the same types of consumer outlets in close proximity to each other. They come in pairs, one for each side of the street. At the site this is exemplified by for instance the traffic schools (Amager Trafikskole and Tip-Top Kørekort), the convenient stores (UFO Kiosk and BrigadeKiosken) and the shoe stores (Tøj & Sko and the unnamed shoe store on Tovværksgade).

CONSUMER PATTERNS_

As can be deduced from the above-mentioned observations the consumer outlets in the site primarily target people living in the immediate vicinity of the site or people passing through the area. This is especially true for the grocery and convenient stores located in the area, but also apply in the case of the cafés/eateries as well as the lifestyle services such as the hairdresser (Frisør Kunstleben) and tanning salon (Consol Solcenter).

This implies that the way people use the area on a consumer basis is largely defined by everyday trivial actions such as grocery shopping on the way home from work, going for a pack of cigarettes, grapping a quick meal or perhaps visiting one of the more specialized outlets for a bank appointment, a haircut, driving lessons and so on.

The only outlet that effectively circumvents this pattern of use is the coffee shop Baresso and to some extent the Hot Dog stand. At Baresso people congregate to relax, read, hang out with their friends and so on, thus making it the only real alternative when it comes to leisure in the area. Although not to the same degree, the Hot Dog stand too offers a small breathing space in the area, which combined with a certain sense of authenticity, certainly adds value to the general experience of the area.

Furthermore the Hot Dog stand is not a constant; it arrives to the site each morning and is wheeled away again each evening. A phenomenon which in itself is interesting as it starts to speak of programmatic temporality and the notion of urban environments that shift over time to adapt to (in this case) consumer behaviour.

Despite these patterns of consumer use, the site is however primarily an area of transit, a topic which will be explored more extensively in the following mappings.

AMAGER
TRAFIKSKOLE

MATAS

UFO
KIOSK

HOT DOG STAND

SAINT
TROPEZ

TIP-TOP
KØREKORT

FAKTA

STOF2000

JOHANSENS
KONDITORI

GOLDSMITH

KOFIT

FRISØR
KUNSTLEBEN

BRIGADEKIOSKEN

KEBABLAND 2

CONSOL
SOLCENTER

BARESSO
COFFEE SHOP

LAN OG SPAR
BANK

RF/MAX
REALTOR

UN-NAMED
SHOE STORE

TØJ & SKO

LEGEND:
RETAIL/SHOPPING
RESTAURANT/CAFÉ/EATERY
OTHER SERVICE BUSINESS

Plan_1:500 23

KEBABLAND 2
restaurant/fast food
11.30-22.00

BRIGADE KIOSKEN
convenient store
10.00-22.00

KEBAB LAND

BICYCLE AGGREGATION

BELL TOWER

FRISØR KUNSTLEBEN
hairdresser
10.00-17.30

CONSOL SOLCENTER
tanning salon
10.00-22.00

BARESSO
coffee shop/café
08.30-22.00

CASH POINT

PHONE BOOTH

BUS STOP

04-06-2008   07:23:44

LÅN & SPAR BANK
bank
10.00-16.30

Brigadevej
1-7

BICYCLE AGGREGATION

YU 57974

PROGRAMMATIC FUNCTIONS_

Although the previous mapping of consumer outlets could be construed as the programmatic layout of the site it does not take into account, as such, the functions located in the actual open spaces in between the buildings and their potential effect on how people behave in and use the site. Clearly the layout and types of functions and amenities offered in an urban context has a great influence on how people might engage it. By mapping these functions one can begin to identify fixed nodes which attract and determine certain behaviours related to how the site is networked into to the larger constellation of the city, as well as local zones and objects that affect and determine the transitional flow and tendencies towards accumulation.

OK COMMUTER_

As described in the previous mapping the site and its surrounds are predominantly defined by a very high degree of transit and traffic. This is off course most noticeable by the fact that Amagerbrogade runs straight through the site, and with it; a three lane road (incl. bus lanes) flanked by bicycle paths and pedestrian pavements on each side. In the vicinity of the site the only method of crossing this veritable river of motor traffic is provided by the pedestrian crossing located between Blekingegade and Tovværksgade. Naturally this makes the pedestrian crossing a very important node; consequently it is clearly marked with blinking orange lit sign posts.

Other than the pedestrian crossing, the two most significant nodes on Amagerbrogade are constituted by the bus stops located in each end of the site. They service a number of important bus routes including the very frequent 5A, which runs all the way through Copenhagen City to the outer limits of Nørrebro. In the daytime the bus-stops and number of routes running through them combined generate a frequency of bus arrivals in either direction every 2-3 minutes or so. This makes bus traffic an extremely characteristic and describing phenomenon in the area.

Another important node with regards to public transport is defined by the stairway connecting the site to the underground Metro station. The Metro connects most major transit spaces in the Copenhagen area and the station located at the project site is in all probability the busiest on Amager, not counting the end station at Ørestaden right by the massive shopping mall Fields. The location and passenger pressure of the Metro thereby generate an almost anthill-like phenomenon; people emerging from within the ground and scattering out in all directions with a frequency equal to the busses travelling along Amagerbrogade.

By performing this mapping of public transport nodes it is easily deducible that the site basically is overrun by commuters, wholly supporting the observations made with regards to consumer outlets and the behavioural patterns related to these. Furthermore the mapping also begins to suggest the nature of connectivity and the overall associative network and urban system in which the site is connected.

PARKING ZONES AND OTHER URBAN AMENITIES_

Besides commuters the site is, as mentioned above, extremely dominated by the general traffic of Amagerbrogade. With vehicles and modes of transportation ranging from cars, trucks and motorcycles to mopeds and bicycles a very broad variety of transit is present. Combined they do however share two things; they all pass through Amagerbrogade and they all need places to park. In the vicinity of the site this is evident by mapping the amount of space used for parking zones in the area. The by-streets leading up to Amagerbrogade all have their perimeter zones leading up to the pedestrian pavement allotted for the parking of cars. Due to the probable high demand for parking spaces most of these parking zones are not free and thus require a ticket from one of the parking meters located in the area. The inclusion of parking meters in the urban context is quite interesting on a conceptual level, firstly it introduces the notion of objects with which you have to interface in order to perform a certain task (another example of this could be for instance the button-operated traffic light), secondly it opens up the issue of temporality and the notion of being under time pressure while operating in the city, both issues that could potentially be applicable in the design of new urban concepts.

Beyond motor vehicles the site also provides numerous zones in which bicycles can be placed in steel bicycle stands. These are located at the end of each by-street as well as in large constellations in the open area connected to the Metro station. This suggests that a lot of people ride their bicycle to the Metro and commute from there and vice versa, another potentially useful observation that demonstrates the level with which the modern urban commuter navigates the city and employ the amenities which it provide.

Although the programmatic functions in the site primarily relate to transit and commuting, the site also provides amenities for other trivial, yet, quite important everyday functions. Specifically these include the ATM machine located at the corner of Brigadevej and Amagerbrogade as well as the (somewhat of a relic in the age of mobile communication) phone booth adjacent to it.

When viewing the mentioned programmatic functions and amenities as a whole, the most striking observation is most likely not so much the specific functionality or the behaviour which it dictates in itself. Instead the complete lack of certain amenities which would greatly contribute to site as a whole is in all probability the most important observation of the mapping. The entire area in question, as represented by the map, does not provide a single intentional attempt at generating any sort of recreational activity. Not even a measly bench by the hot dog stand! The only somewhat recreational elements are represented by the trees planted on Blekingegade. This is of course an issue which needs to be addressed in the design of any new concept related to both the project at hand as well as the other initiatives taking place on Amager.

BUSSTOP

5A	2A
78	350S
19	250S

PARKING METER

PARKING METER

BICYCLE STAND

BICYCLE STAND

METRO

BICYCLE STANDS

PEDESTRIAN CROSSING

BICYCLE STAND

ATM MACHINE

PHONE BOOTH

BICYCLE STANDS

PARKING METER

BUSSTOP

5A	2A
78	350S
19	250S

N

Plan_1:500

LÅN & SPAR BANK
bank
10.00-16.30

KEBABLAND 2
restaurant/fast food
11.30-22.00

BUS STOP

BICYCLE AGGREGATION

KOFIT ELEKTRONIK
electronic repair shop
10.00-17.00

JOHANSENS KONDITORI
bakery
07.00-17.30

GULDSMED ERIK BAGGE
goldsmith/jeweller
10.00-17.30

STOF 2000
fabric store
10.00-16.30

PEDESTRIAN CROSSING

BELL TOWER

FAKTA
grocery store
10.00-22.00

BUS STOP

PEDESTRIAN CROSSING

FRISØR KUNSTLEBEN
hairdresser
10.00-17.30

CONSOL SOLCENTER
tanning salon
10.00-22.00

BARESSO
coffee shop/café
08.30-22.00

BUS STOP

TRANSITIONAL FLOW_

The previous mapping explored and defined the programmatic nodes and functions in the site, from this it was deduced that the site predominantly functions as an area of transit with a high degree of traffic and commuting. The nodes and amenities organizing the transit were mapped and described as fixed points and zones in which the transitional flow in the area is contained. In this follow up mapping these transitional flows acting within the programmatic layout are examined further by visually tracing the lines of movement generated from the transit. This enables the observation of emergent transitional patterns which clarify more specifically how the flow and intensity of movement is present in the site.

TRACING INTENSITY_

The tracings are categorized into subgroups based on level of intensity (intensity used here as a measure of velocity, loudness and possible hazard). These sub-groups range from high intensity flow (heavy motor traffic such as cars, trucks, busses, motorcycles) to medium intensity flow (low speed vehicles such as mopeds, bicycles and skateboarders) to low intensity flow (slow paced movement such as pedestrians and joggers).

As described earlier the penetration of Amagerbrogade directly through the site makes it predominantly function as a "pass-through /drop-off" zone. The high intensity tracings running along Amagerbrogade, comprising cars, taxis, trucks and busses consequently represent the most dominating transitional flow in the area both visually and auditory. This observation is supported by a car counting session performed at the site Saturday 08/03-08 from 17.10-17.40. In this timeframe of 30 minutes the number of cars passing the Baresso coffee shop along Amagerbrogade totalled in at 639. This makes for a very high frequency and density of motor traffic. The same also applies for the medium intensity tracings along the bicycles paths of Amagerbrogade. Another interesting phenomenon related to this is how the daily rhythm hardly fluctuates with regards to intensity and frequency. They are exceedingly consistent, even during the weekend.

Beyond generating a highly noticeable presence in the area, the combination of high and medium flow in the same transit system furthermore depend on a very fragile balance between order and complete mayhem. Any failure to abide by the rules governing the traffic code can at any point result in severe accidents. During the time spent at the site this observation was demonstrated by a number of emergency responses from the police department, paramedic units as well as the firebrigade (four times on Friday alone).This notion of overlapping intensities of flow of course also apply with regards to the low intensity flow in the site. As the mapping clearly illustrate there are numerous zones where overlapping of this nature occurs such as for instance at the pedestrian crossing.

FLOW CONSTRAINTS_

Apart from sheer intensity the mapping furthermore aids in identifying the directionality and scattering of the transitional flow. By observing the physical constraints within which the flow occurs it becomes possible to further specify patterns of movement. Most notable is of course the fact that all heavy and medium flow transit must travel in the right-hand lane. Thereby a northbound flow is generated in the traffic lane of Amagerbrogade adjacent to Blekingegade and Tovværksgade, and, a southbound flow in the lane adjacent to Brigadevej. Furthermore the constraints applied at the T-junctions where each by-street connects to Amagerbrogade significantly contribute to the general flow in the area. This contribution is largely dependent on whether or not the by-street is one-way, two-way or completely closed off to traffic. In the case of site the two by-streets to the west of Amagerbrogade both have two-way traffic, the junction at Tovværksgade is one-way in the direction leading up to Amagerbrogade and finally the junction by Blekingegade is shut off directly from Amagerbrogade. This means that the only zone not directly affected by heavy and medium intensity is the junction at Blekingegade by the hot dog stand.

Besides the physical features and rules constraining heavy and medium flow the site also attempts to organize the low intensity flow of movement. This is mainly regulated by the pedestrian pavements placed along the sides of the buildings in the area; this layout generates basically the same linear patterns as seen with the heavier flows, though in this case flowing in both directions in the same lane, meaning that pedestrians have to swerve and adjust their walking paths while navigating the city. An exception to these somewhat linear patterns generated on Amagerbrogade is exemplified at the open area by the Metro, the zone which was previously described using the analogy of an anthill. In the mapping this is visualized by the tracings emitting from the Metro station going in numerous overlapping and seemingly random directions, thereby generating patterns displaying a higher degree of complexity and randomness.

Overall the transitional flow in the site can be said to be quite typical for a main road running through a heavily connected urban context. It is heavy, abundant and adheres to a certain set of organizational rules in order to function. Beyond this the mapping is interesting as it visually explores emergent patterns of movement which are generated as a result of the physical boundaries and constraints which are imposed on the site. This is interesting as it sheds light on how physical layout, objects and signage can be designed, intentionally or un-intentionally, to affect flow by triggering certain behaviours in the people passing through the site, something that should definitely be considered with regards to the design of urban environments that aim at recreational and social activity.
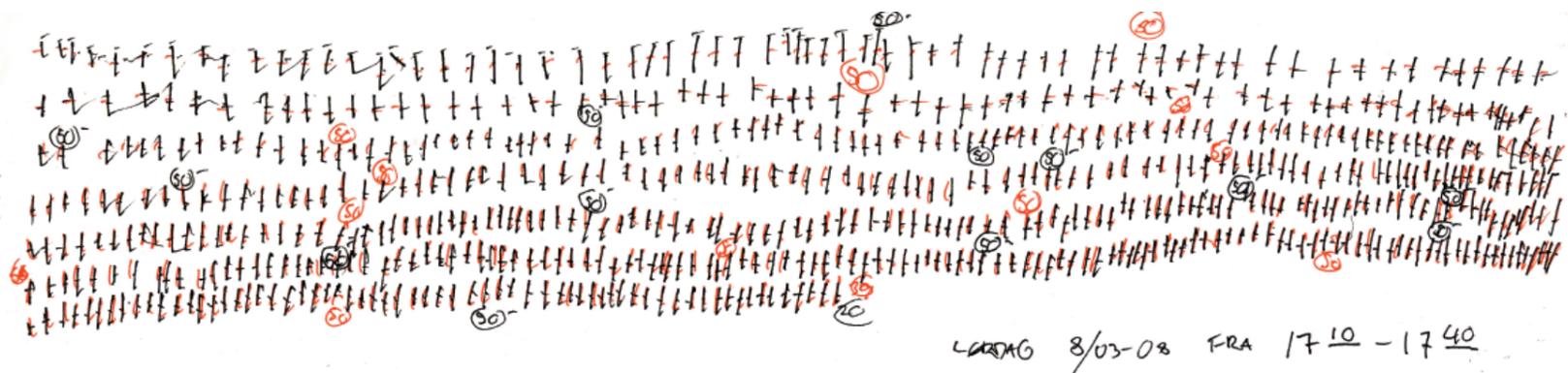
LØRDAG 8/03-08 FRA 17 10 - 17 40

Plan_1:500

N

SAINT TROPEZ
women's clothing store
10.00-17.30

AMAGER TRAFIKSKOLE
driving school

BUS STOP

PARKING METER

MATAS
cosmetic/drug store
10.00-17.30

UFO KIOSK
convenient store
10.00-24.00

METRO
07.00-05.00

LOCATION OF HOT DOG STAND

PARKING METER

BICYCLE AGGREGATION

METRO
07.00-05.00

FAKTA
grocery store
10.00-22.00

BICYCLE AGGREGATION

SAINT TROPEZ
women's clothing store
10.00-17.30

JOHANSENS KONDITORI
bakery
07.00-17.30

STOF 2000
fabric store
10.00-16.30

BUS STOP
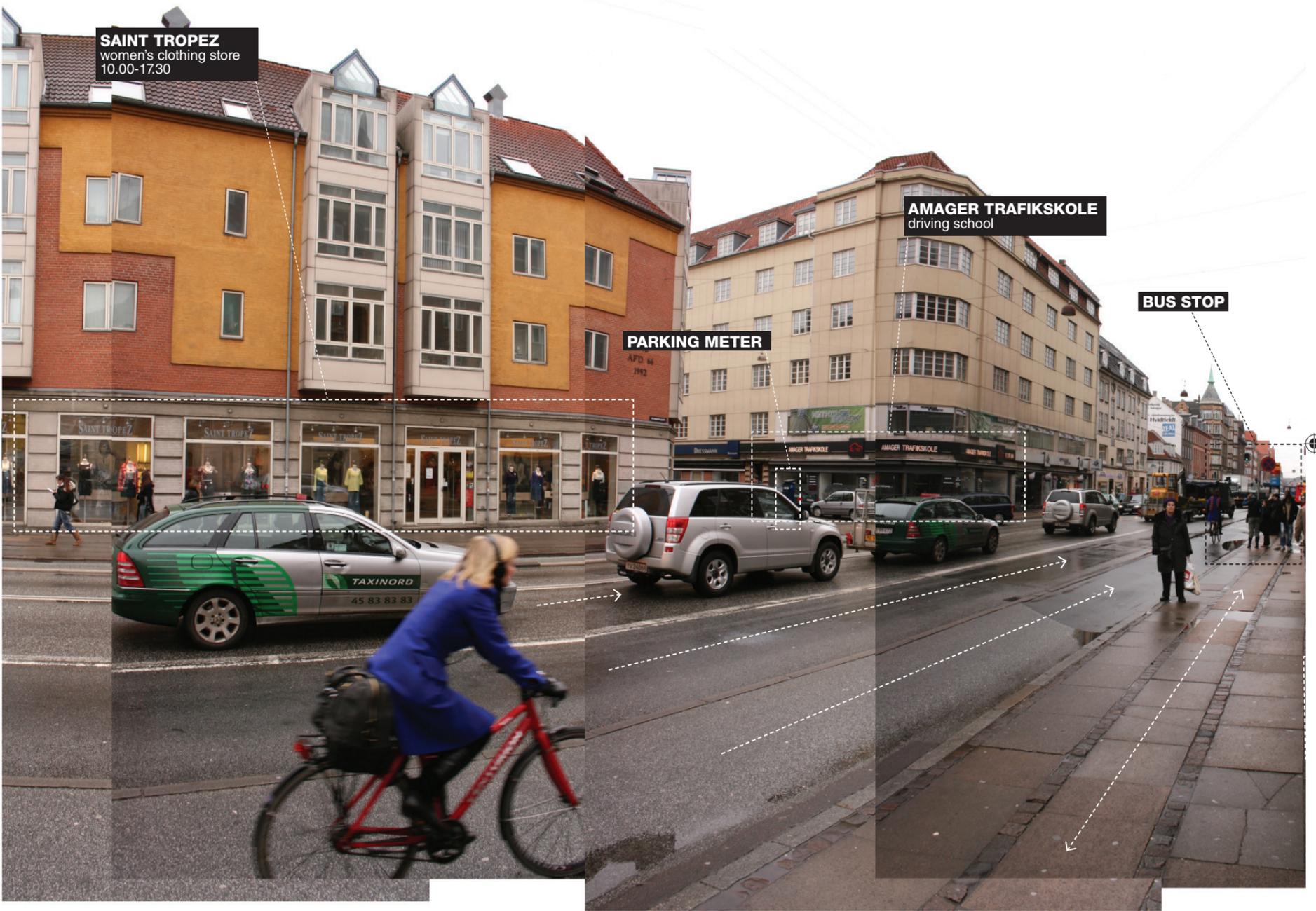
04-06-2008   07:26:30
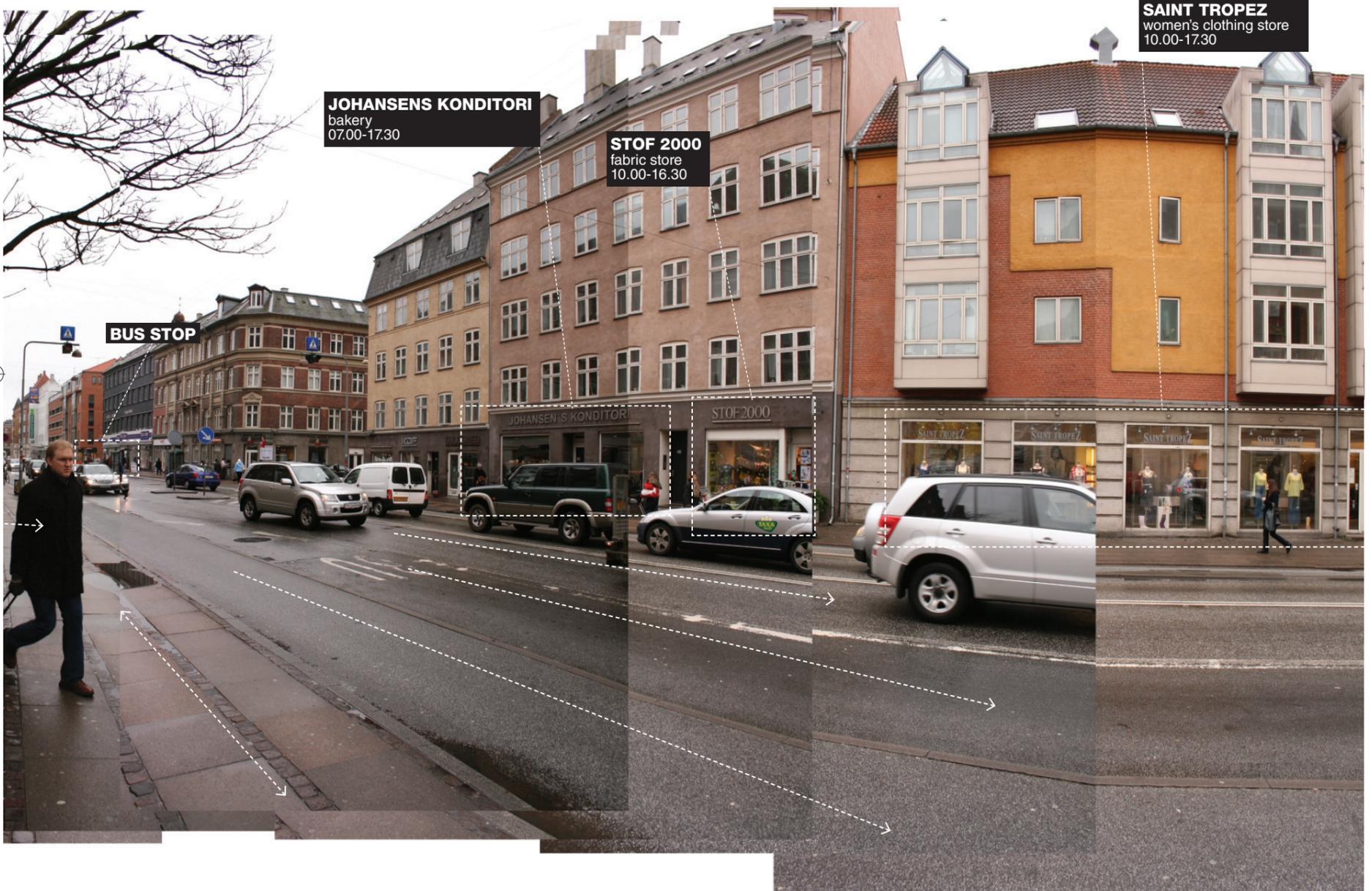
ACCUMULATION ZONES_

In the three previous spreads the site has been explored through a number of mappings focusing on a range of programmatic functions, their layout and how the transitional flows occurs in the area as a result of them. In this last mapping the observations and findings from these preceding mappings are brought together in order to determine zones of specific significance which can be described as being of a higher density due to their tendency towards the accumulation of people and objects.

TRAFFIC LOCKS_

Amagerbrogade is the main traffic vein leading in and out of Copenhagen from Amager and as previously described this of course puts the site under a tremendous amount of traffic pressure. Adding to this intensity is the fact that the site is located in between two intersections both of which are equipped with traffic lights. Effectively this means that a red light in either end of the site can accumulate a queue of motor vehicles on the entire stretch of road laid out between the two intersections, thereby forming what essentially could be described as a "traffic lock".

This leads to a time based phenomenon in which the site constantly fills up and then empties as soon as the traffic light changes to green, generating an "ebb and tide-like" flow of accumulation. More simply speaking this basically implies a situation in which traffic is temporarily put on hold while awaiting feedback which allows it to continue, such as for instance the green signal of a traffic light. In the site this phenomenon is also present on a more local scale, namely in the stretches of road leading up to respectively the pedestrian crossing as well as the T-junctions connecting Amagerbrogade to the by-streets in the area. As a phenomenon this is probably most interesting in the case of the pedestrian crossing. As a pedestrian there is definitely something inherently intriguing by forcing the flow of tons of metal on wheels to a full stop, simply by walking out on an array of painted white stripes.

PROGRAMMATIC ACCUMULATION_

An additional form of accumulation directly linked to the transitional flow is generated at the programmatic functions in the area associated with public transport. Although the frequency of the busses and the Metro running through the site is very high, the large amount of commuters present in the area still continuously accumulate in clusters waiting at the public transport nodes. This leads to a phenomenon similar to the continuously fluctuating filling and emptying of the traffic locks. The only difference here being that the commuters actively seek a specific node, waits on the arrival of his or her mode of transport, and is picked up and swept away again. As opposed to being put on hold on by a more random action such as a crossing pedestrian or a red light. This brings up issues related to causality, choice and forced action while navigating the city, something that might potentially be explored when thinking of new urban concepts.

In the analysis of programmatic functions a number of zones allotted for parking were mapped and categorized; naturally these zones also represent areas of high density as they accumulate both cars and bicycles. Due to the prospect of being fined these zones are largely respected when it comes to motor vehicles, thus the accumulation of parked cars in the site never reach a point of being overly dense. This on the other hand is not the case when it comes to the parking of bicycles. From the time spent at the site it appears that the amount of cyclists and commut-ers in the area vastly outweigh the amount of bicycle stands available. Basically this means that the site becomes overloaded with an abundance of bicycles resulting in a situation where bicycles are literally thrown everywhere. This phenomenon is evident all over the site. Most of the building walls in the area are for instance scattered with bicycles, particularly in the vicinity around Fakta.

In the mapping this aggregation of bicycles has been confined to the zones which display the highest density of bicycle accumulation. As it can be read from the mapping this involves the zones by the bicycle stand at the end of Blekinge-gade and the entire open area by the Metro Station.

URBAN PRESENCE_

Besides the accumulation zones generated from transitional flow the site furthermore contains zones of accumulation occurring as a result of the behavioural patterns associated with the consumer outlets described in the first mapping. Here it was observed that both the hot dog stand and the Baresso coffee shop act as zones accumulating people by their capacity for recreational activity and the possibility of catching a quick break or a snack. In the mapping these zones of accumulation have been marked to the extent in which their respective outdoor serving zones and general field of density reaches.

As it can be read from the mapping this furthermore bring into light situations where several zones of accumulation begin to overlap. Specifically this phenomenon occurs at the hot dog stand where the serving zone overlaps the bicycle parking zone, as well as at the outdoor serving zone at Baresso which is overlapped by two transit holding zones.

This is interesting as it opens up for considerations into how different states of urban presence, if you will, can begin to exist in the same continuum. In the context of the project this notion of "urban presence" is simply an attempt to classify an overall umbrella term which adequately can encompass any and all transient states that might occur as people occupy the city. Simply put this refers to any state of presence which one might find in an urban context such as waiting for the bus, driving a car, listening to music on an IPod, having a cigarette break, walking the dog, killing time etc. By observing and classifying these transient states one can furthermore begin to explore issues such as level of attention and engagement. For instance the level of attention to traffic would be a lot higher while driving a car than having a cup of coffee at the Baresso. Similarly one might engage a lot deeper in conversation while drinking coffee with a friend than one would while driving a car.

This of course in turn leads to even more considerations such as; how might these overlapping zones of accumulation affect each other? And similarly, what does it mean when multiple states of urban presence begin to engage each other? By bringing such considerations into the design process we might successfully begin to generate new perspectives into how we, intentionally or un-intentionally, affect the people occupying the urban spaces we design, an observation that should definitely be considered with regards to the projects on Amagerbrogade.

PUBLIC TRANSPORT NODES
BICYCLE AGGREGATION
TRANSIT HOLDING ZONES
SERVING ZONES
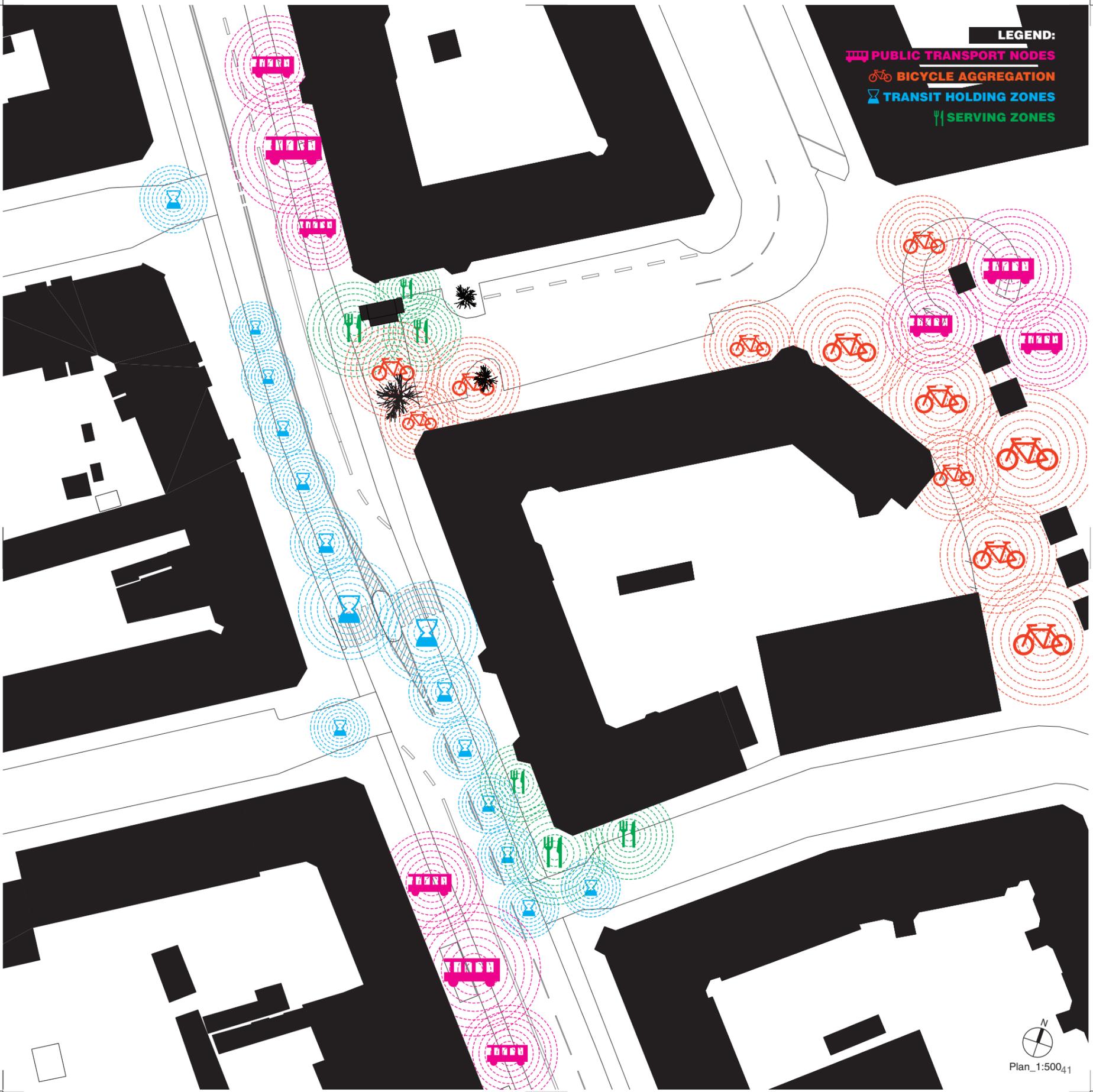
Plan_1:500 41

FINDING AND CONCLUSIONS_

In the following text the preceding chapters of this part of the report briefly will be summarized and connected in order to extract findings and conclusions which may be developed further or seen as being of particular relevance to the specific project at hand, as well as the overall development and redefinition of Amager in general as stated in the beginning of this part of the report.

Per the design brief the aims of the project are to test out the potentials for recreational and interactive spaces which support urban life and local identity, to recognize the local resources in Amagerbrogade and utilize them to strengthen the collective consciousness, and finally to exemplify new potentials for street life acting in synergy with traffic spaces. After having extensively explored and analyzed the site on a number of different subjects and approaches, it is now possible to further conclude on what is "wrong " with the site and how the project might help to explore possible solutions and approaches for reaching the goals set out in the design brief.

NON-PLACE_

As described over the past couple of chapters the site's primary characteristic is defined by the overwhelming amount of traffic passing through the area, and its functionality as a significant node for commuters travelling to and from Amager. Combined with its general lack of recreational capacities and social interaction, this makes the site a perfect example of what the French anthropologist Marc Augé refers to as non-places:

"The multiplication of what we may call empirical non-places is characteristic of the contemporary world. Spaces of circulation (freeways, airways), consumption (department stores, supermarkets), and communication (telephones, faxes, television, cable, networks) are taking up more room all over the earth today. They are spaces where people coexist or cohabit without living together." (Augé in Cresswell 2004)

This conclusion is furthermore supported by the observations made in relation to the local consumer outlets, programmatic functions and the behavioural patterns associated with these. Here the concept of "urban presence" was coined in order to describe an overall term which would encompass the many transient states present in the city (walking, driving a car, waiting at a stoplight, shopping etc). According to Augé non-places are marked by exactly this; their transience. Or put in another way; their predominance and tendency towards mobility (Augé in Cresswell 2004). This implies sites of a fleeting, temporary and ephemeral nature, the exact same type of adjectives which were used in the site analysis to describe observations made with regards to for instance the transitional flow and zones of accumulation. Augé suggest that this is problematic as the site becomes essentially un-rooted, a space where histories, traditions and community are no longer relevant; a non-place (Cresswell 2004). The problem with non-places thus lies somewhere in the region of not taking into account humans in the context of transit and thus creating spaces with very little humanity or social interaction, where people are not *living together*.

This thus becomes one of the major problems with the site as it exists in its current state. It has no sense of place or defining characteristics enabling people to "live together" so to speak. Consequently the main challenge for the project lies in exploring how to generate this sense of place, a subject which will be explored more thoroughly in the next part of the report. For the purpose of this conclusion of the site exploration, it will however also be briefly discussed in the following paragraphs.

MOBILE THINKING_

Although the notion of the site as a non-place may hold a primarily negative connotation, it does however also force one to reconsider the notion of place as something fixed and static, in doing so it guides the designer towards a possible theoretical approach to designing in the context of non-places. Augé suggests that *"conventionally figured places demand thoughts which reflect assumed boundaries and traditions, non-places demand new mobile ways of thinking"* (*Augé in Cresswell 2004*). This statement unfolds an approach to place which resonates strongly with the observations and findings made in the analysis of programmatic functions, transitional flow and accumulation zones.

Here it was found that the site on Amager plays an important role in a much larger transitional network connecting it to the greater Copenhagen area. This led to a number of observations and findings which all, to some degree, dealt with the issue of mobility. Whether these was related to commuting, rules governing traffic, urban amenities, degrees of frequency or the flows of movement which emerge a result of these, they all led to modes of thinking which involved temporality, movement and connectedness, the way of thinking which Augé would refer to as *mobile*. Such findings all very convincingly affirm that mobility might be addressed as a key parameter in the development of new design concepts for the site. In the following parts of the projects this subject will therefore be addressed further.

RELATIONAL PARAMETERS_

Beyond acting on a large scale level the issues of mobility and the networked nature of the site furthermore gave rise to a number of considerations and findings related to *connectedness* on a more local scale. By mapping and analyzing the transitional nodes and flow in the site, as well as the overlap of different programmatic zones and states of urban presence, a distinct pattern of connectivity and inter-relational dependency began to emerge.

This was for instance exemplified by the anthill analogy of the Metro station end the emergent patterns of movement emanating from it, the fragile rule based balance governing the traffic system, the emergent aggregation of bicycles, and the relational conditions generated when several states of urban presence begin to overlap. Such findings begin to suggest that the properties of non-places might be utilized as positive assets and inherent potentials which might be engaged in creative and constructive ways in order to rethink the site and fulfil the goals of the design brief.

Thus they clearly point towards the relational aspects of urban spaces as another key parameter for concept development, in particularly with regards to the goal of strengthening the collective consciousness in the area. Consequently the idea of place generated through relations and relational thinking as an approach to design undoubtedly should be examined further and studied on both a theoretical and practical level.
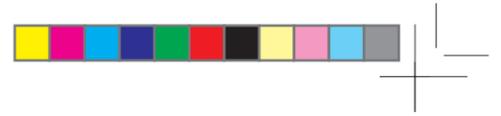
INTRODUCTION_

As the result of the site exploration and analysis it was concluded that the site currently exists as a non-place. From here it was further deduced that a potentially prolific approach to solving the problematic issues characteristic of the site might be pursued by engaging the very properties which define non-places such as circulation, consumption and the lack of social interaction. This led to the realization of the significance that mobile and relational thinking might yield as key parameters in the dichotomic place/non-place approach to urban spaces.

In this follow up process these issues will be explored further with the intention of developing a design strategy capable of strengthening the collective consciousness and social interactions in the site by employing mobile and relational thinking as the initial offset.

A proven methodology for generating new perspectives, and thus possibly also new design concepts and ideas, is to approach a subject from several different academic and professional points of view. Such an approach inherently implies obtaining different ideas, concepts and findings on the same subject, which following can be correlated and processed in order to generate new perspectives on the subject, perspectives which arise as the product of the accumulative knowledge acquired.

In the following this methodology will be applied in order to uncover exactly how mobile and relational thinking might be used as key parameters in a design strategy aimed at catalyzing the collective consciousness and social interactions in the site on Amagerbrogade.

O3 THEORETICAL APPROACH

PLACE

FROM NON-PLACE TO PLACE_

As we have already learned through the optic of Marc Augé the site currently exists as a non-place; a place marked by mobility and travel with very little sense of social interaction. With Augé being an anthropologist the concept of non-place is fundamentally based on the study of humanity and the practices of humankind in the broadest sense (Wikipedia). As a result of this optic, the concept of non-place helped us to determine problematic characteristics of contemporary life caused by our increasingly connected and mobile modes of living; what as a whole essentially could be described as a decrease of humanity in our everyday lives.

While the concept of non-place is useful for pointing out the problems of the site and the contemporary world at large, it can also be employed to indicate how one might begin to counteract the mentioned side-effects of modern life. By looking at the characteristics of non-places, such as the pronounced presence of transit and the lack of human interaction, it also simultaneously begins to indirectly point towards its antithesis; spaces characterized by a high degree of humanity and social interaction. In a simply process of deduction such an antithesis would logically have to originate in the obvious concept of place. Although it is far without the reach of this report to completely cover the deeper ramifications of place, the study of principal aspects of place may prove to be an effective point of departure in understanding the characteristics of places which are marked by a high degree of social consciousness and interaction, as per the goals of the design brief.

DEFINING PLACE_

The geographer Tim Cresswell outlines an effective approach to the understanding of place based on a study of its genealogy (the tracing and study of a topic made to establish lineage and kinship based on historical records, Wikipedia). In this study Cresswell states that human geography is essentially the study of places. As previously mentioned this makes place an extraordinarily broad and fundamental subject with implications in basically all aspects of human life. Adding to this is the almost inherent perplexity and vague nature of the concept. As a result of this Cresswell is quick to point out that such a broad spectrum of description gives rise to a very little considered understanding of what the word 'place' actually means, and, that it is *"a word that seems to speak for itself"* (Cresswell 2004). In order to focus the definition of place according to the agenda of determining how places of social consciousness and interaction arise, we will condense Cresswell's studies to the most relevant in this context.

PLACE MAKING_

Cresswell instigates his genealogy of place by studying various uses and contexts where place appears either directly or indirectly. These all include observations that to some extent are defined by some act of human involvement and description, such as for instance the suggestion of ownership (my place or your place), a specific location (where is Amager?), a certain event (New York was marked as a place by the events of 9/11), a characteristic appearance (Paris is the city of lights), a special use or function (the church is a place of worship). As mentioned these uses of place all originate in some either intentional or unintentional act of human involvement. For Cresswell such acts constitute what he describes as place-making activity, he writes:

"All over the world people are engaged in place-making activities. Homeowners redecorate, build additions, manicure the lawn. Neighbourhood organizations put pressure on people up tidy their yards; city governments legislate for new public buildings to express the spirit of particulars places. Nations project themselves to the rest of the world through postage stamps, money, parliament buildings, national stadia, tourist brochures, etc. Within nation-states oppressed groups attempt to assert their own identities. Just as the new student climb on the bed to put the poster on the wall so the Kosovan Muslim flies a new flag, erects a new monument and redraws the map. Graffiti artists write their tags in flowing script on the walls of the city. This is their place too" (Cresswell 2004)

Place-making activities thus become acts which, intentionally or unintentionally, in some way transform the perception, experience and identity of a location. Naturally this concept resonates strongly with the intentions for the site on Amager, as it clarifies that what we are trying to do with the project is in fact an act of place-making.

However place-making as an act does not in itself explain what constitutes place. It merely suggest the process of becoming place, not what or why place is. To explain this, Cresswell suggests looking at what links acts of place-making together, what their common properties are. From this he elegantly and profoundly simplistic deduces that *"they are all spaces people are attached to in one way or another. This is the most straightforward and common definition of place - a meaningful location"* (Cresswell 2004). Thus the act of place-making ultimately is to generate meaning. Arguably this is an almost equally broad and diffuse definition as the concept of place in itself. However, this definition also indirectly points back to the project and the site on Amager by elaborating on its existence as a non-place, which now could be described as a space which suffers from a loss of meaning, a location that is meaningless (by its loss of humanity and social interaction as per the conclusions of the site exploration).

GENERATING MEANING

ASPECTS OF PLACE_

In the previous we have determined that it is the presence of meaning generated through the human attachment to a location which constitute place and indirectly separates it from non-place. Furthermore it was established that the project's overall agenda could be seen as an intentional act of place-making aimed at an increased presence of collective consciousness and social interaction in the site. In order to suggest how we might employ these theories operatively in the context of architecture and urban design, the following will attempt to clarify the notion of place as a "meaningful location" and how it applies to the concrete act of designing. For this purpose we will employ a more operational approach conceived by the geographer John Agnew. He suggests an approach in which he outlines three fundamental aspects of place as a "meaningful location" (Agnew in Cresswell 2004):

1. Location
2. Locale
3. Sense of place

In these following these aspects will be subjected to further scrutiny.

1_LOCATION_

The first aspect, location, refers to the perhaps most obvious aspect of places; their objective coordinates as a reference to the notion of "where", such as for instance degree of longitude/latitude or simply the indication of "here" or "there". In this aspect meaning is generated through the establishment of a collective reference to location. For instance we all know where New York is located, it is an established communal reference that makes sense to us by its very name - it has meaning to us. In the context of the project, this aspect's primary relevance is represented by the networked nature of the site through its role as a place of commuting. The 5A, 2A, 350S, 250S, M2 and M1 all make sense as reference to location for people commuting via the site's public transportation nodes. However as per the definition of non-place this sense of meaning is almost counterproductive to what Marc Augé referred to as "living together". This means that location applies to the goal of an increased collective consciousness, but does not directly shed any light on meaning in relation to strengthening the social interactions in the site.

2_LOCALE_

Agnew's second aspect on the other hand does. By "locale" Agnew means *"the material setting for social relations – the actual shape of place within which people conduct their lives.."* (Agnew in Cresswell 2004). Here Agnew really hits a central nerve in what we are trying to accomplish with the project. Even though it is fairly clear that places almost always have a concrete form, the aspect of locale as a parameter in the generation of meaning is quite profound as it aptly links the notions of material constructs (architecture, infrastructure etc.) and social relations (human activity, interaction, "living together"-ness). With this realization of places as material things, Agnew thus points to the direct connection between the act of designing/building and the social interactions which emerge as a result. Although this observation is very general and does not offer any specifics into how one would go about designing with the explicit goal of increased social interaction, it does however begin to explain how meaning (through social interaction) might arise as a result of materiality.

3_SENSE OF PLACE_

This indirectly leads to Agnew's final aspect of place as a meaningful location. By "sense of place" he means *"the subjective and emotional attachment that people have to place"* (Agnew in Cresswell 2004). This aspect thus links back to what has already been defined by Cresswell, that places are spaces which people are attached to in one way or another. He adds to this by suggesting that *"as well as being located and having a materiel visual form, places must have some relationship to humans and the human capacity to produce and consume meaning"* (Cresswell 2004). In the context of design and the goals of the project, this citation gives a potentially vital clue to how we might engage people in processes which may generate the desired presence of a collective consciousness and increased social interaction. By suggesting that places must have a relationship to the human capacity to both produce and consume meaning, Cresswell implies a two-way direction of causality. Thereby suggesting that it is not only places that affect people, but also people that affect places, and that meaning thereby arises in this feedback loop between the two. In relation to the project, this suggests that the design of place as a social entity should be approached not only by focusing on the relations between people, but also the relations between people and objects.

Cloud Gate_ Chicago USA_ Anish Kapoor_2006
The giant sculpture Cloud Gate by British artist Anish Kapoor has quickly become an important landmark and tourist attraction since its opening in 2006. Residents of Chicago and tourist alike flock at the sculpture to reflect themselves in its chrome surface and bean-like shape. The mirrored surface on the skyline of Chicago thereby generates social conditions in which people are made aware of each other as well as the city. This makes Cloud Gate a perfect example of an act of place-making encompassing all the aspects of John Agnew's approach to place as a meaningful location. With a final price tag of $23 million one has to wonder though if this was worth it.
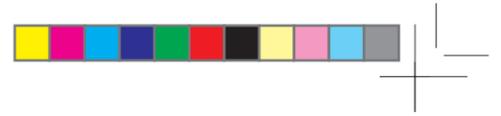
OPERATIONALIZING PLACE_

Based on the findings and conclusions made in the clarification of Agnew's three fundamental aspects of place as a meaningful location, and their particular relevance to the project, the following will attempt to deduce these so as to extract a foundation for the further development of a design approach.

In the context of the concrete act of architectural and urban design Agnew's aspects of place thus suggest the following:

1) That meaning (in the social sense) arise as people engage in relational processes which, through a two-way direction of causality, forms a feedback loop between people, as well as between people and objects.

2) That we as designers by our influence on the aspect of "locale" directly can affect these relations and processes through the materiality of the constructs we design, thereby enabling us to design directly towards the goal of increased social interaction.

3) That such designed constructs through their affect on people might lead to an increased collective awareness of the site as a "location", thereby strengthening the site's identity in the collective consciousness.

These conclusions now form a foundation for understanding how we might approach the design of meaningful places marked by a high degree of social consciousness and interaction. In order to extract a design strategy from this foundation, two key issues still need to be explored and clarified:

1) Which relational processes should be addressed and how should we address them in order to generate increased social interaction and awareness?

2) How exactly do we design constructs which hold the capacity to do this, in other words, how can materiality and spatial conditions be designed to facilitate and catalyze these social processes?

In order to answer these question we will first look back to the conclusions of the site exploration and apply theories related to mobility and relational thinking. Consequently a range of architectural theories related to materiality and approaches to designing in the field of relations will be explored.

RELATIONAL PROCESSES

PATTERNS OF BODILY MOBILITY_

In order to establish which relational processes to address and how to address them, we will employ the phenomenological optic of the humanistic geographer David Seamon. Among other things phenomenology is about the exploration of phenomena as it presents itself to us in conscious experience, that is to say essentially how we experience the world and what that means to our "being in the world" (referring to Heidegger's concept of Dasein). Naturally this means that phenomenology is profoundly rooted and intertwined with the understanding and definition of place.

Whereas the previously described approaches to place to some extent all have been rooted in a sense of locality and identity, Seamon suggests bodily mobility as the key factor to the understanding of place; *"any spatial displacement of the body or bodily part initiated by the person himself"* (Seamon 2000). Consequently this approach sheds light on something entirely fundamental to aspects of place which involve mobile and relational thinking: *The everyday movement in space*. This involve essentially the study of what other people might think of as trivial things such as walking to the mailbox, driving home from work, waiting in queue at the grocery store and so on, essentially what was referred to as the transient states coined "urban presence" in the mappings of the site exploration. For Seamon however, such behaviours show the *"essential experiential character of place through movement"* (Cresswell 2004). This characterization of place thus refers to the deeply phenomenological way of generating meaning through first-hand experience. This notion therefore also holds a critical importance to the issue of addressing relational processes, Seamon writes:

"Phenomenology asks if from the variety of ways which men and women behave in and experience their everyday world there are particular patterns which transcend specific empirical context and point to the essential human condition – the irreducible crux of people's life-situations which remains when all non-essentials – cultural context. Historical era, personal idiosyncrasies – are stripped bare through phenomenological procedures." (Seamon in Cresswell 2004)

Here Seamon begins to make the link between how the behaviour and experience of the individual can result in distinct patterns which emerge through the process of "being in the world". Although Seamon describes these patterns as essentially context-less, they logically must exist within some at least spatial condition in which the individual can experience and "displace his body" so to speak, as per Agnew's aspect of "locale". Accepting this, the question then becomes how these behavioural patterns emerge and how we might affect them through design.

THE ISSUE OF THE BODY-SUBJECT_

Seamon suggests that most everyday movement is the product of habit, and thus therefore also the behavioural patterns they generate. This is exemplified by for instance the commuters passing through the site at Amager. They navigate the city everyday using a complex network of public transport nodes without even thinking about it. It has become second nature. Such movements thus appear to be below the "level of conscious scrutiny" as Seamon would say. This observation implies that the individual subconsciously knows what he/she is doing while navigating the city. Seamon describes this as:

"an inherent capacity of the body to direct behaviours of the person intelligently, and thus function as a special kind of subject which expresses itself in a preconscious way usually described by such words as automatic, habitual, involuntary, and mechanical" (Seamon in Cresswell 2004)

Seamon thus suggest that this *special subject*, what he calls the "body-subject", acts on an autonomous basis subconsciously navigating us around the city. This body-subject is therefore obviously very practical in taking over what are in fact very complex tasks, such as for instance driving and navigating a car or walking in a flock of people in a crowded pedestrian zone. However this practicality does not come without a price. With Augé's theory of non-places in mind, the very definition of the body-subject must have an enormous contribution to the decrease of social interaction and awareness in contemporary urban society. If humans are subconsciously droning around in individual bubbles of automated behaivour this accounts exactly for the increasing lack of humanity in pretty much every major city around the world!

This is of course very counterproductive to our agenda. However the notion of the body-subject also indirectly point towards a solution to "popping the bubble" sort of speak. In theory this might actually be quite simple. If the body-subject is what is hindering the participation in social interaction and awareness we must find a way of somehow bypassing it, thereby engaging the conscious mind and thus increasing the individual's awareness. As Agnew's aspects of place suggested we as designers hold the direct influence over "locale" through the materiality of the constructs we design to potentially do this.

This means that if we can introduce objects into the urban context which hold the capacity to bypass the body-subject and catch the attention of the conscious mind, we might begin to affect the social behaivour of people through how they experience the object. This in turn links back to the subject of "performative architecture" (which was discussed in the program part of the report) as this capacity now can be employed as a performance criteria in a design strategy.

PLACE AS PERFORMANCE_

A slightly different, yet similar, notion of performance is employed by Seamon in his description of the processes which lead to the aforementioned behavioural patterns of habit. Here he brings into play the rather poetic metaphor of dance in order to describe the *"sequence of preconscious actions used to complete a particular task"* such as for instance getting on a bus or ordering a cup of coffee (Cresswell 2004). Seamon refers to the movements of such a sequence as a *"body-ballet".* In this sense it is not the performative capacity of the object which is in question, but rather the literal performance of humans moving through space. When such movements are sustained through a considerable amount of time they become what Seamon refers to as *"time-space routines",* describing the habits of a person as he/she move through a routine pattern of the day (Seamon in Cresswell 2004).

Time-space routines are thus exemplified by many of the patterns that were mapped in the site exploration such as the patterns of consumption (grocery shopping etc.) and transitional flow (driving a car through traffic, commuting, finding a parking space etc.). This however also makes time-space routines the concrete behavioural processes, which driven by the body-subject, accounts for the aforementioned increased lack of humanity in contemporary cities. In terms of a design strategy this suggest that in order to bypass the body-subject we need to somehow interfere or disrupt the preconscious processes of time-space routines.

A possible way of approaching how to instigate this interference is to look beyond individual behaviour towards group behaivour, thereby examining not only the time-space routines of the individual's relation to location, but also his relation to other individual's time-space routines. To further elaborate on this approach we will employ one final concept from Seamon's understanding of place through mobility.

In the case of group behaivour Seamon suggests that *"when many time-space routines are combined within a particular location a 'place-ballet' emerges which generates a strong sense of place"* (Seamon in Cresswell 2004). This theory aptly applies to the site at Amager on two levels. According to the description of "sense of place" which Seamon suggest here, the site does in fact have a strong sense of place as generated through the place-ballet composed by the many time-space routines present in the site (patterns of consumption and transitional flow). However *this* definition of "sense of place" does not account for any sense of social interaction or even awareness. The mere presence of many people "moving in the same space" thus not automatically generate social interaction or awareness, you might in fact feel like the loneliest person in the world in even the most crowded of rooms.

The theory of "sense of place" as the result of place-ballet thereby does not automatically generate social interaction and awareness. Place-ballet as a concept is however still a very suggestive metaphor for how we experience place through relational processes as it suggests that "places are performed on a daily basis through people living their everyday life" (Cresswell 2004). If we through design could make people aware of their role in the place-ballet and how they perform in it, this might prompt them to reflect on their own time-space routines, behavioural patterns and how they relate socially to other people and the materiality of the city. Ultimately such a reflection would have to lead to an increased sense of social awareness in the individual and thereby possibly strengthening the collective consciousness as a whole.

As mentioned earlier one thing that seems to be missing from Seamons's work is any notion of the constraints put on people's performances, in other words the actual built or natural environments in which we exist. Therefore he does not offer any direct insight into how we can design in the context of the relational processes which have been examined. However it is possibly to extract specific findings which can indirectly describe these spatial constraints based on the preceding texts.

FINDINGS AND CONCLUSIONS_

In this review of Seamon's theories put up against the agenda of the project, the findings and conclusions made now suggest how to address the relational processes in the site in order to strengthen the collective consciousness and social interactions. To operationalize these findings in a design strategy the following will suggest three specific criteria of performance, which if inflected in objects may lead to facilitating and catalyzing the relational processes which have been discussed:

1) If we can introduce objects into the urban context which hold the capacity to bypass the body-subject and catch the attention of the conscious mind, we might begin to affect the social behaviour of people through how they experience the object. This suggests the design of objects which holds a certain presence or somehow appears out of context. Basically form as performance capacity.

2) In order to bypass the body-subject we need to somehow interfere or disrupt the preconscious processes of time-space routines. This suggests the design of objects which can perform by reacting to the movement and presence of people and thereby generate this interference.

3) If we through design can make people aware of their role in the place-ballet and how they perform in it, this might prompt them to reflect on their own time-space routines, behavioural patterns and how they relate socially to other people and the materiality of the city. Ultimately such a reflection would have to lead to an increased sense of social awareness in the individual and thereby possibly strengthening the collective consciousness as a whole. This suggests the design of objects which can perform by somehow orchestrating, exposing or visualizing the real-time place-ballet of the site.

THE PERFORMATIVE FEEDBACK LOOP_

In relation to these findings and suggestions it seems important to further define the two levels of performance which appear to exist in the aforementioned feedback-loop between people and objects. Namely the preconscious human performance (movement and behaviour guided by the body-subject) and the conscious performance of material objects (movement and behaviour guided by an intentional design intent). This understanding may seem basic, but it aptly encompasses exactly how and where we as designers might focus our efforts in order to design with performance as intent.

THE PRECONSCIOUS HUMAN PERFORMANCE
(movement and behaivour guided by the body-subject)

THE PERFORMATIVE FEEDBACK-LOOP

THE CONSCIOUS PERFORMANCE OF MATERIAL OBJECTS
(movement and behaivour guided through design intent)
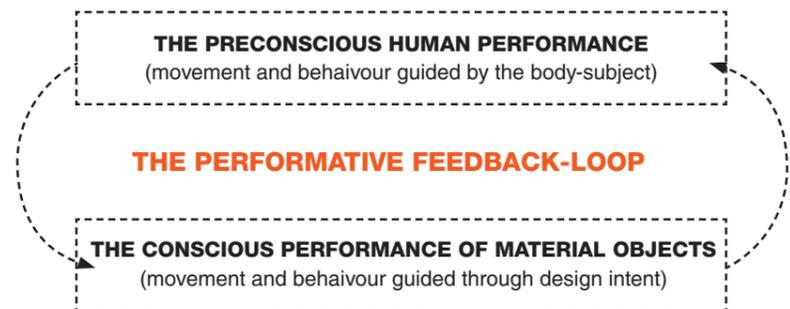
In the following we will briefly revisit the subject of performative architecture in a retrospective rambling which may help to inform the uninitiated.

PERFORMATIVE ENVIRONMENTS

INTRODUCTION_

The main question raised in the previous chapter was essentially how to inflect material objects with the capacity to consciously perform with the intent of disrupting time-space routines driven by the body-subject? What a mouthful! Luckily we broke this down into more digestible pieces of specific criteria which may be used to describe how we want the designs of the project to perform. Before diving into the process of exploring any specific design proposals based on these criteria, we will first clarify how exactly objects, architectures and environments might perform through a brief notation on how the performative relates to the material and the spatial. Please note here the avoidance to classify the specific nature of a possible design solution. As discovered during the "Space-Framing" project such classification is inherently a slippery slope down semantics-alley, which in the end will only obstruct the process of thinking in new ways/terms. The term "performative environment" is therefore used here to describe places fitted with material objects which hold the capacity for performing as per the description in the previous chapter.

THE NEW MATERIALITY_

As described earlier through Agnew´s aspect of "locale" the capacity for the performative lies in "the material setting for social relations - the actual shape of places within which people conduct their lives." Thus the performative capacity is inherently a material thing. When Agnew wrote his aspects of place he was most likely thinking of materiality the way most people would - as something static, something solid - physical constructs made of brick and mortar. Here in the year 2008 this way of thinking about materiality would only serve to limit us from the tremendous development in new technologies and applications made over the last 15-20 years or so. Combined with a previously unsurpassed level of accessibility to such technology this requires us to redefine or at least add to what constitutes materiality. As designers, architects and engineers we now hold the power of embedded digital and net-worked technology (such as wireless networks, sensors, actuators and mobile information technology) in the one hand and almost daily advances in CAD/CAM technologies (such as parametric design software, rapid prototyping/manufacturing and contour crafting) in the other. The existence of these technologies means that when now we talk about "the actual shape of places within which people conduct their lives" we can no longer limit ourselves to talking about static solid shape.

EMBEDDED TECHNOLOGIES_

We now live in a world where computing and technology in general has become ubiquitous - the internet is all around us via wireless networks, traffic lights tell us when we can and can't walk, cell phones makes us reachable around the clock, GPS navigation has become an extension of the body-subject itself. Although it is exactly these type of technologies that is indirectly to blame for the decrease of social interaction in our contemporary world (as per discussed earlier) they still prompt for a revision of the concept of materiality due to their influence on everyday lives. All this technology may initially seem negative for the state of social interaction and awareness, for the acute designers however they instead represent a source of endless possibilities. Particularly if he wishes to design with the intent of performance. If looking back at the diagram of the performative feedback-loop it is not hard to see how such embedded technologies may be applied to affect the "preconscious human performance" and thereby possible catalyze social interactions.

NEW TOOLS OF THE TRADE_

As computing and technology has crept in and become an integral factor in our everyday lives, so has it had a profound impact on the overall field of design, architecture and engineering. Through innovations in CAD/CAM (Computer-Aided Design/ Computer-Aided Manufacturing) we are now able to design and construct physical objects which by their complex shape-grammers or intricate surface effects hold an inherent performative capacity to generate emergent effects (visual or auditory) as one move in relation to them. Some designers take this approach of object-based performance one step further by adding digital technology into the mix. In design today we see numerous examples of buildings and installations that via digital technology (projectors, sensors, lights, speakers, etc.) become dynamic by adding a digital layer to a physical structure. Such design usually attempts to either emphasise intangible and virtual aspects such as flows of movement and information, or, function as a sort of mediator for participatory input such as opinions, feelings etc. In any case the resulting performance is defined by spaces and objects that become animated and are often responsive or interactive. In the extreme examples of this approach some designers take this even further by employing technologies borrowed from robotics to construct architectural objects that literally move.

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THE SPACE OF RELATIONS_

Along with this new materiality combined with a curiosity and sensitivity towards the complexity of relations also comes new spatial notations. Whereas the major part of the last century was caught in the chokehold of the Cartesian grid as dictated by the architectural granddaddies of modernism, what we are seeing now is a renewed interest in the inherent complexity that is generated in the space of relations. This interest is very much "en vogue" in most technologically driven practices and literally presents itself on all scales and levels of architecture and design. From attempting to facilitate or capture these relations (as in our case), to employing emergent systems borrowed from biology, mathematics and physics in order to parametrically design and construct intricate structures. Such approaches to some extent all employ the use of technology the capture the illusive nature of spatial conditions whether this is through "simple" tracings of movement or trying to describe the set of internal logics which essentially make up such systems.

CATALYTIC FORMATIONS_

As we – in the project at hand - have already defined how we want our design to perform in order to reach the goals of increased social interaction and awareness, and we potentially have access to a wide range of technologies and design tools to aid this performance, the only thing left is to figure out how we through the design playing field laid out here deliberately can design with the intent of affecting people's behaivour as per the conclusions of the previous chapter. In this context is seems obvious to look back to the theories of Ali Rahim as described in the program part of the report. In particular Rahim's ideas of inflecting the design with as many "affordances" as possible in order to engage the feed-back loop, how both people and affordances contain certain affects, and how the process in which the design was formed holds the capacity to inform these inherent formative affects. Thereby through the actualization process becoming catalytic -what Rahim calls Catalytic Formations.
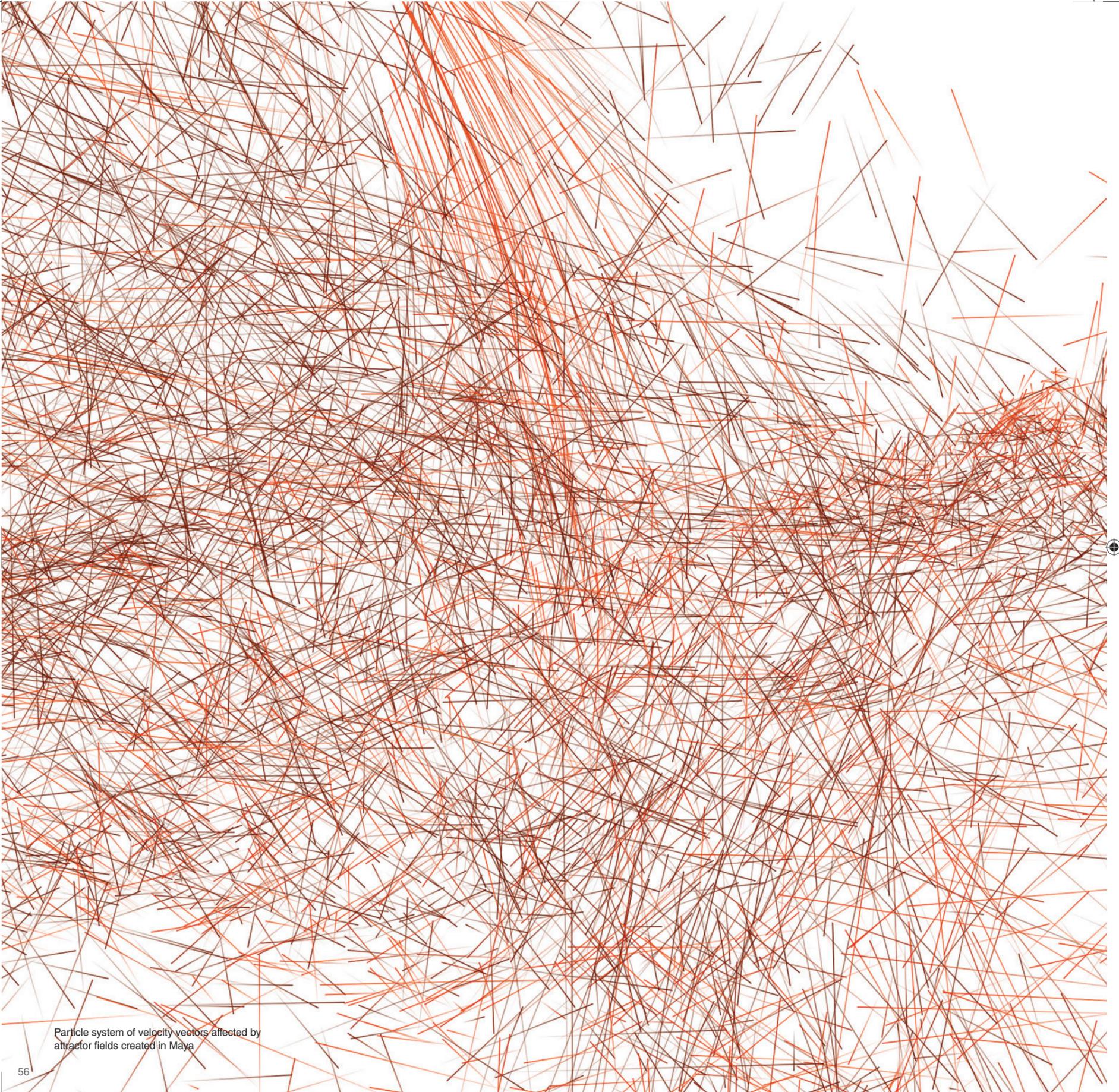
Particle system of velocity vectors affected by
attractor fields created in Maya

04 DESIGN EXPLORATION

INTRODUCTION_

The process of designing - what we by now would refer to as "performative material objects" - have been explored through what could be described as a *"model of discovery"* (Axel Killian in lecture). It has been a process whereby working on multiple levels and tools at the same time, has let consecutive discoveries and experiments guide the process and thereby letting the "final" proposals emerge as the unforeseen result of a process, instead of letting it be determined by prescribed interpretations.

During a lecture held at Architecture & Design in late March the German architect and all around good guy Norbert Palz referred to this approach as inherently described by "the potential of surprise, astonishment and novelty" thereby suggesting that the "new" lies somewhere in not trying to completely control or understand absolutely everything. This is supported by Robert Aish of Bentley (the creators of Generative Components). He adds to Palz' observation by suggesting that even though we should not try to completely control the process, we should have the technical and artistic knowhow to anticipate the results by knowing what you are doing in each step. However even this may not guarantee the occurrence of something completely unforeseen - a "happy accident" if you will.

When one goes into dialogue with computers and technology for the purpose of designing, it seems that there is in fact an agreement of "letting go of control", you are no longer the only author, the tools and techniques you employ are described by their specific coding to do certain things. This means that the resulting design of such a process emerges from your ability to employ the underlying procedures of the tool you choose to employ, and these tools in themselves. This is what Aish was referring to above, essentially the understanding and use of the tool which one choose to use.

In bringing this back to the issue of material performance Ali Rahim's particular terminology and approach to designing his "catalytic formations" suggests that:

"The goal for the designer is not to fully comprehend and control all the complexities of affects and affordances but, rather, to inflect formations with affects, coaxing forms and occupations in useful directions" (Rahim 2006)

In effect this implies that the design technique employed is directly linked to how the object performs (by generating affordances which may yield performative affects through its materiality). This might also be a good time to clarify the use of the terms "techniques" and "tools" in the context of this report:

- Tool refers to the specific software/technology and its inherent functions.
- Technique refers to how you use the tool or several tools in combination.

This might seem pedantic, but it is surprising how often these two concepts seem to get mixed up!

EMERGENCE AS A DESIGN PRINCIPLE_

During the course of the semester the thesis has sought to further explore a range of formative digital design techniques with the aim of applying and actualizing the findings and concepts which were developed as a result of both the subjects of working with place and performative environments. This process has continued from and builds on top of techniques initiated and developed in the SpaceFraming project. From this specifically the concept of emergence as a key formative design strategy has been explored.

This approach is based on a belief that the aforementioned constitution of place as a product of site-specific relations and phenomena is, in fact, itself an expression of emergent behaviour. That is, that place emerges, exists and constitutes itself only as a result of a process in which it is constantly *"constructed from parts operating as collectives"* (Wiscombe 2006). As implied previously this results in an optic in which the urban landscape no longer can be defined by its individual, separate parts, and as we have learned from the previous chapters, as something static:

"Emergence isn't interested in parts; it is the science of wholes. In architecture, it opens up a new way of thinking about how various independent agents and disciplines could begin to exhibit generative, collective behaviour. Rather than layering discreet systems, the aspiration would be to find points of flexibility and interaction in systems, and determine how the dynamics of one set of material flows can converge with other material flows to create not only improved combined fitness, but also unexpected qualitative effects." (Wiscombe 2006)

Obviously this agenda opens up an entirely new domain in design research. Specifically "It announces a paradigm shift from the design of inert spatial form to the design of systems" (Schumacher 2004) and by doing so also gives rise to the need for entirely new tools and techniques which can support this agenda. In the thesis this challenge has been pursued by experimenting with various digital design tools which contain a certain potential for the design of systems rather than merely inert form.

A Termite cathedral (google: image search)
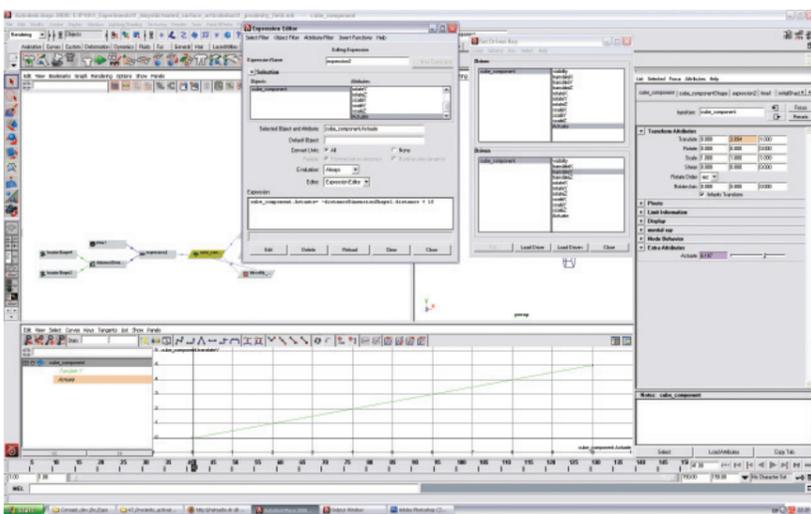
The Maya GUI

The Paracloud GUI

DESIGNING SYSTEMS_

As the backbone in this process of experimentation the application Maya (re-leased by Autodesk) has be used for the design of emergent system models. This has been pursued by employing Maya's built in resources such as particle systems, dynamics, animation constraints, inverse kinematics etc. Basically these tools allow the designer to set up complex systems of dynamic interactions in which any parameter of any object might be dynamically linked with any param-eter of any other object within the model, thereby enabling the design of emergent systems.

Furthermore Maya's open software architecture provides the opportunity of em-ploying a basically unlimited amount of external resources (via MEL scripts and plug-ins) which vastly extends Maya's capabilities by adding an unlimited range of diverse tools which may be useful for the design of emergent system. An example of this is Carsten Kolve's freeware plug-in "BrainBugz", a set of Maya nodes and commands developed for setting up and animating crowd behaviour in feature films such as The Lord of the Rings and Troy. In a design context this provides the designer with the possibility of adding agent based intelligence (interrelational logic) to particles, thereby making them capable of self-organizing (i.e. swarm intelligence) into essentially emergent design systems.
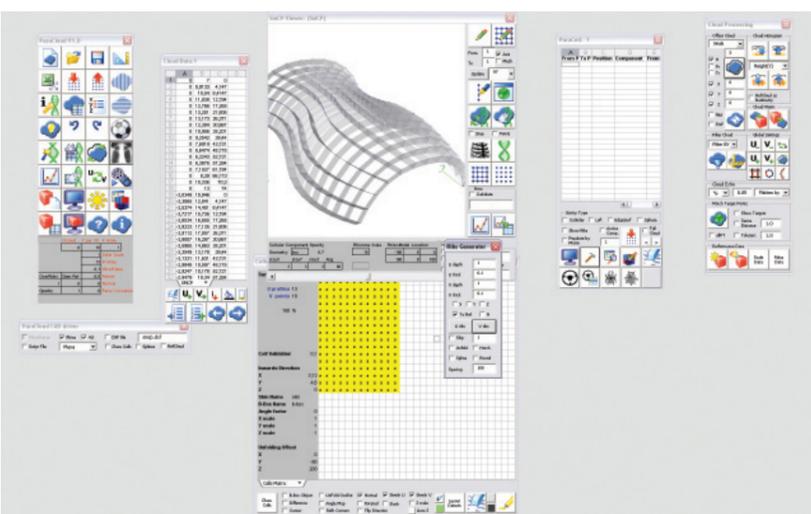
Going from design system to architectural form requires further creative and technical ingenuity combined with tools and techniques capable of "transforming" data from the emergent system (point-sets, vectors, curves, image sequences etc.) into actual geometry (surfaces, meshes etc.). This is what Rahim refers to as the process of "actualization" – the transition from the virtual to the actual – in the sense that the formation (object) now exists in metric space (Rahim 2006). Examples of such formative techniques that have been explored are for instance point-set reconstruction using the Voronoi or Delaunay algorithms which generate planar faceted meshes and an Isosurface method resulting in double-curvature and very complex topologies.

These processes - transformative procedures which in themselves display emergence - have been explored through the aforementioned application Maya in conjunction with the surface modeller Rhinoceros (released by Robert McNeel & Associates), the all-purpose package 3DS Max (released by Autodesk) and some rather rudimentary experiments in the parametric design tools Generative Compo-nents (released by Bentley) and ParaCloud (released by ParaCloud Ltd.) as well as the freeware Scherk-Collins Sculpture Generator.

PROTOTYPING STRATEGIES_

As described in the problem statement the thesis aims to support the overall research project by generating insight into respectively the integration of digital technologies embedded in physical structures as well as the issue of fabricating complex geometries. In order to explore, simulate and evaluate concepts related to this subject, prototypes had to be developed. Due to possibly very "real" nature of the thesis in its contribution to the overall research project, the concepts and proposals developed in this process have therefore been kept to relatively realistic and "cheap" solutions. Regarding the implementation of proposals in the site, this also accounts for the predominant focus on the possible implementation zone by Blekingegade.

DIGITAL PROTOTYPING OF RESPONSIVE ENVIRONMENTS_

With regards to concepts of interactive and responsive environments Maya have been employed for setting up parametric models which has acted as a basis for conceptualizing and simulating scenarios involving sensor technologies, lighting, kinetic furniture etc. This technique could be described as the digital prototyping of performative environments (real time feedback of responsive systems in a digital environment such as Maya or 3DS Max). As described in the previous section Maya contains a number of tools and has the extendibility (via scripting) to make this possible. In the course of the semester this has proved to be an effective tool in design situations where interaction and responsiveness is an issue.

RATIONALIZATION AND FABRICATION OF GEOMETRIES_

The issue of fabricating complex geometries is obviously directly linked to the previously described formative design techniques and the geometries generated from these. In order for these to be constructed the geometries need to be rationalized for fabrication, this could involve for instance rationalizing a double-curved surface by tessellating it into planar sub-surfaces which would be easily fabricated. Depending on the specific geometry (poly-mesh, NURBS, faceted, single curvature,

double curvature, high-genus etc.) and technique of rationalization different strategies of fabrication are available for processing and preparation of the geometry for production and assembly. In general these fabrication strategies in essence involve various combinations of CAD/CAM solutions for rapid prototyping/manufacturing such as CNC-milling, laser-cutting, waterjets, 3D-printing etc.

In the thesis work this subject has been explored using the technology readily available at Aalborg University, namely the CNC-milling machine located in the workshop of Architecture & Design. Furthermore certain software applications (Rhino and Pepakura) provide tools for unfolding and unrolling geometries so as to produce physical models from sheet material. Ideally a laser-cutter or waterjet would have been a great resource for cutting out sheet-material. This was instead done either by hand and attempted by milling, both methods that are laborious and almost defeat the purpose of rapid prototyping in the first place.

Specifically the following fabrication strategies have been examined:

- 3-axis milling (non-planar fabrication)
- 2,5-axis milling (planar fabrication)
- Developable surfaces/unrolling (planar fabrication)
- Contouring (planar fabrication)
- Unfolding (planar fabrication)

The majority of these techniques also include applying both nesting and assembly logics in order to organize the process and minimize production costs. Besides planar fabrication CNC-milling also opens up the opportunity for milling casts and moulds, another fabrication strategy which could be employed, although this would involve considerable cost when going to full-scale.

THE DEPENDENCY CHAIN OF TECHNIQUES_

As mentioned the experiments performed during the course of the semester all fall into specific categories ranging from the initial inception of a design system to the physicality of a rapid-prototyped model. These experiments are all based on the successive use of different tools in order to generate a form or simulate a responsive system. These are digital design techniques.

When several techniques are used in succession a dependency chain occurs. This means that the choice of tool and the way it is used will resonate all through the dependency chain and cause effects. In the diagram all the tools and techniques that have been used during the semester have been mapped to illustrate their specific place in the dependency chain. This makes the techniques developed during the course of the semester now function in the sense of cookbook. Understood in the way that by gaining an overview of these techniques and how to use them, you can pick and choose from them and generate as many combinations and iterations as you please, which all will generate different results and thus hold different performative capacities.

The dependency chain consists of a number of successive stages of transformation. Initially it starts out with a configurable static system which by internal or external influence mobilizes into another state (emergence). This now mobilized system is then by a technique of "meshing" actualized into a geometry. This geometry is then by applying techniques of "simplifying" or braking down into components rationalized so as to be constructed. This now rationalized geometry is then processed in order to be fabricated. The fabrication process then produces physical component which can be assembled into the final physical structure.

In the following the techniques and succession of techniques developed over the course of the semester will be presented in a process of dumpscreens and renders. This process will show a wide range of experiments that in the end will result in the selection of two specific chain of techniques on the basis of the performative capacity as per the findings and conclusion of the theoretical approach as well as their feasible construcability.

THE DEPENDENCY CHAIN OF TECHNIQUES

- Particle System
- Fluid Dynamics
- Ncloth
- Maya Hair
- Rigid/soft bodies
- IK-chains

- Fields
- Attractor
- Catenary
- Tracking
- Constraints
- NLGO
- Swarm
- Scripting
- Driven Keys

- Point set
- Curve
- Image
- Mesh
- Surface

- Particle Instancing
- Voronoi
- Tomography
- "Mesh from points"
- Poly-modelling
- Surfacing
- "SpaceFraming"

Setting up tool-paths
for milling/cutting:
- Visual Mill
- Rhino

File for Machining:
- PDF
- Visual Mill file

- CNC milling
- Printing
- Manual cutting

SYSTEM
(initial state)

MOBILIZATION

SYSTEM
(mobilized state)

ACTUALIZATION

ACTUALIZED GEOMETRY

RATIONALIZATION

RATIONALIZED GEOMETRY

PROGRAMMING

PRODUCTION FILE

FABRICATION

PHYSICAL COMPONENTS

ASSEMBLY

PHYSICAL CONSTRUCT

- Mesh
- Surface
- Sub-D surface

- Tessellation
- Contouring
- Developable surfaces
- Component propagation
- Parametricmodelling
- Unfolding
- Unrolling

Digital structural components:
- Mesh
- Surface
- Curve

- Unrolled surface
- Planer panel
- Planer section
- Milled Solid mass

- Interlocking
- Gluing
- Taping

MOBILIZATION_ PARTICLE SYSTEMS
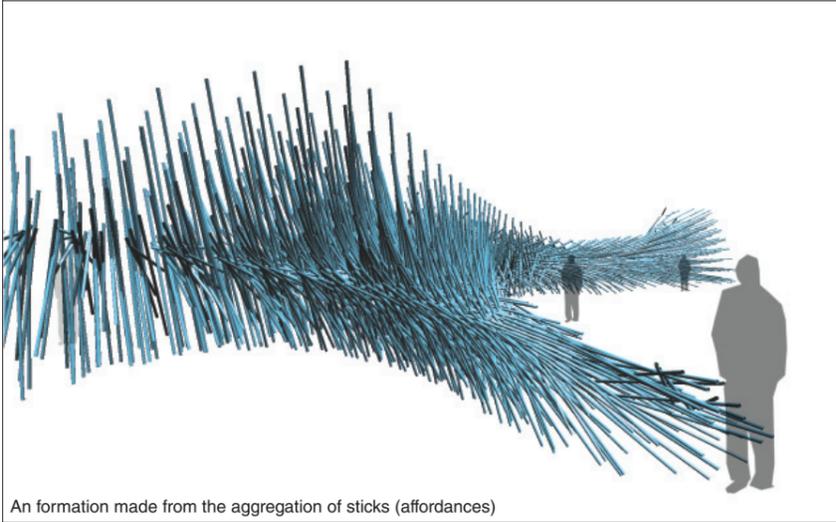
An formation made from the aggregation of sticks (affordances)

Particle systems are essentially sets of points in space. By connecting them to force fields, attractors or inflecting them with their own interrelational logic, they begin to display emergent pattern. These patterns can either be used to track over time to extract curves from the movement of the particles, or, to use the data from the point set once the particle system has mobilized. This can be done by (via scripting) extracting the coordinates of the particles and importing them into for instance Rhino.

In our agenda they might be used for setting up site-specific systems which use parameters such as flow to generate material objects.
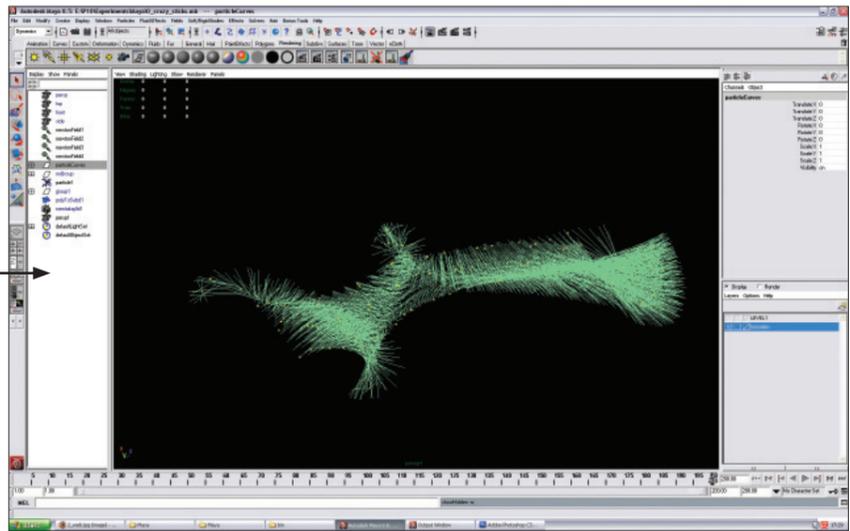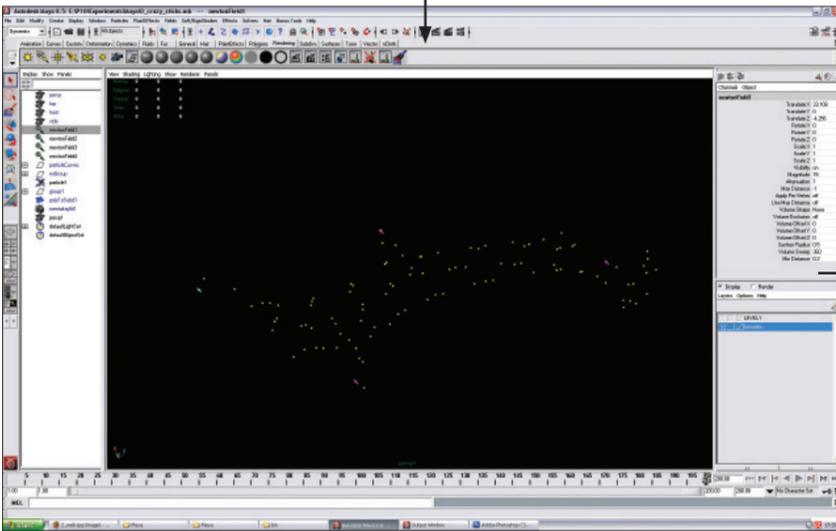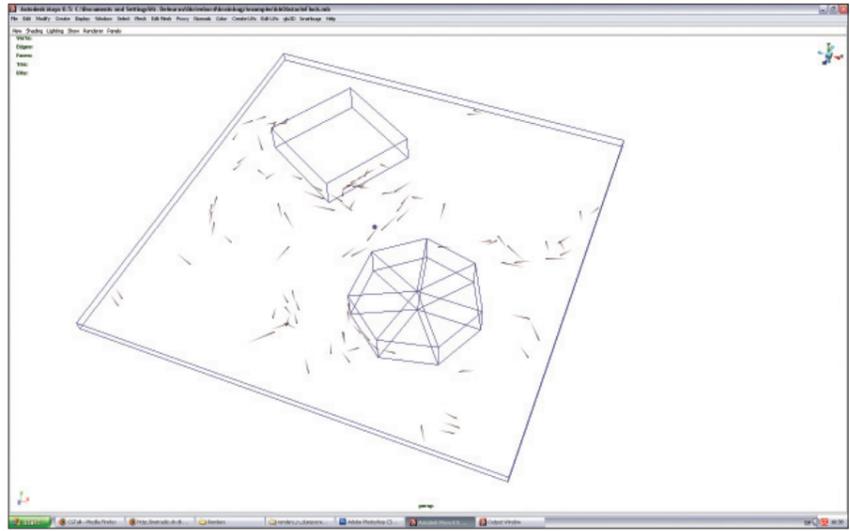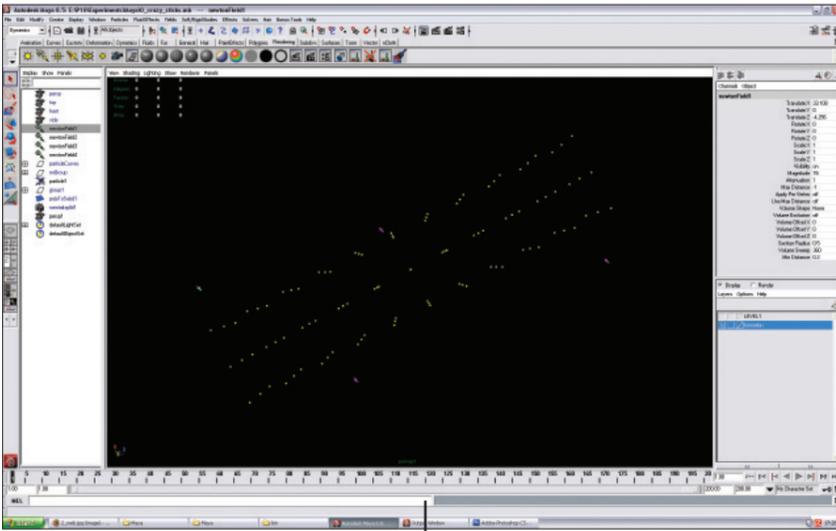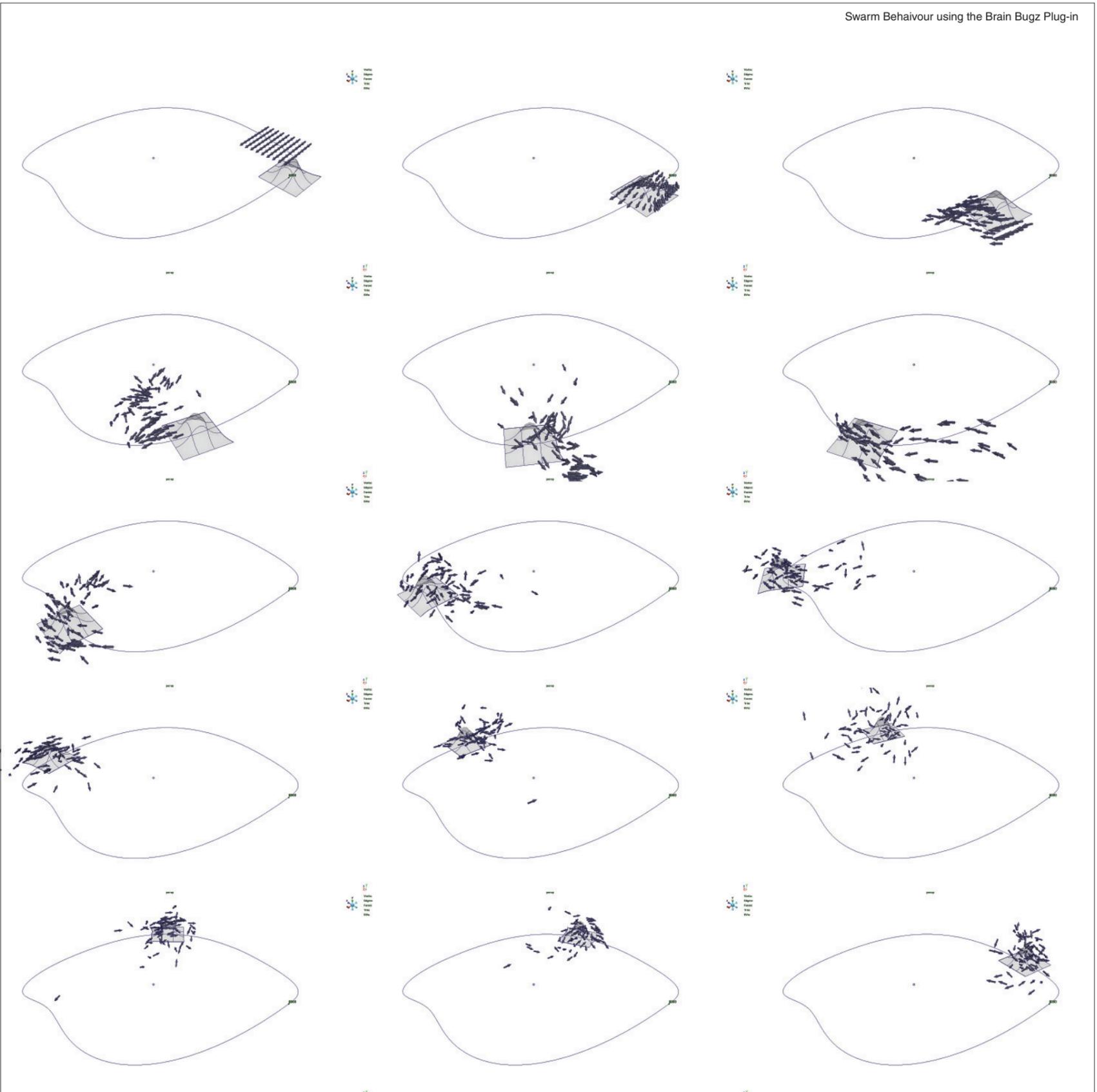
MOBILIZATION_ FLUID DYNAMICS

Fluid Dynamics in Maya simulate thermodynamic processes and therefore hold highly emergent possibilities. In the project they have used to either generate a raster image, which can be used in a subsequent technique such as generating as height field surface, or, to directly affect a NURBS surface by converting it to a softbody and connecting the particles of the softbody to the fluid field.
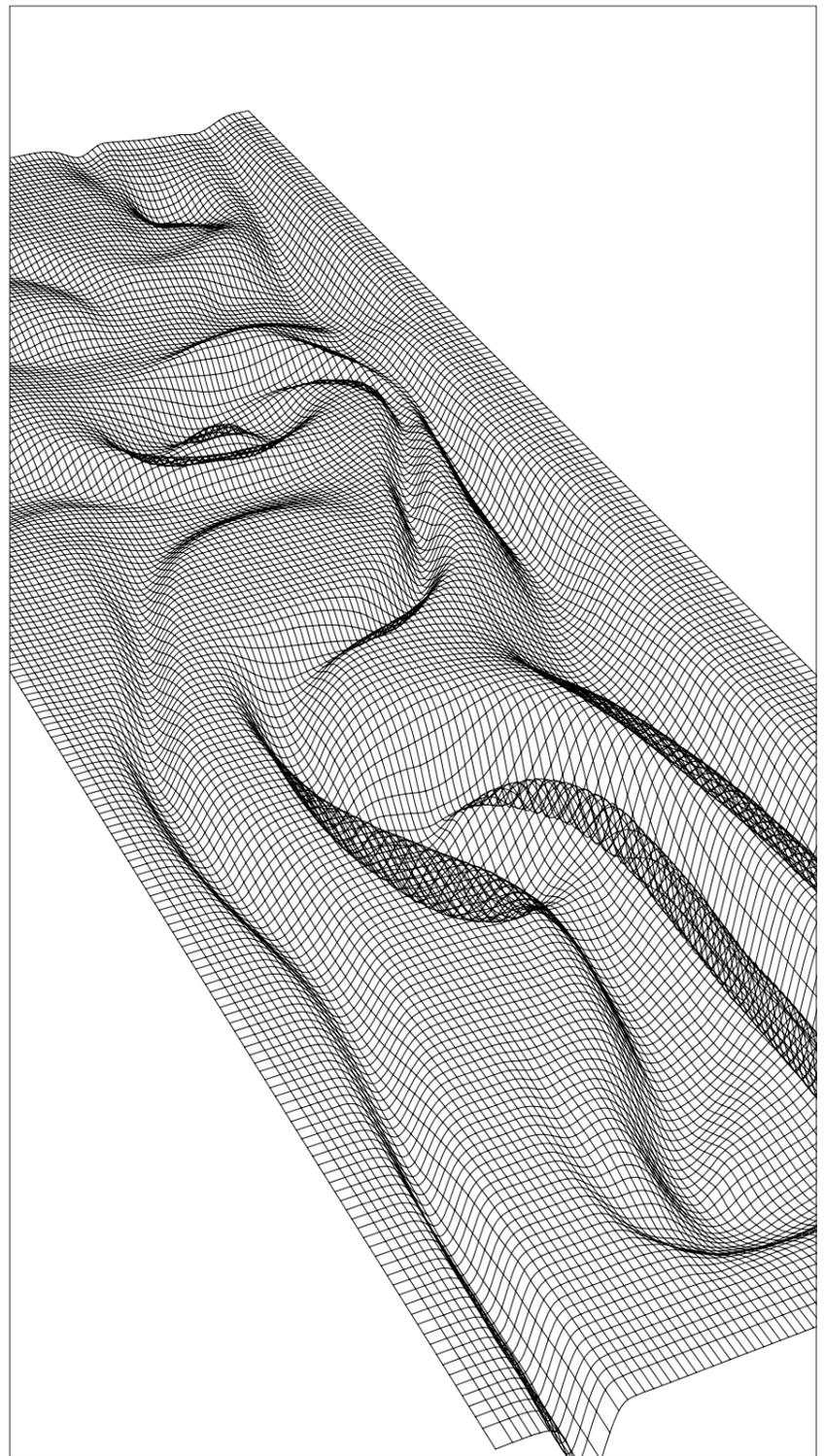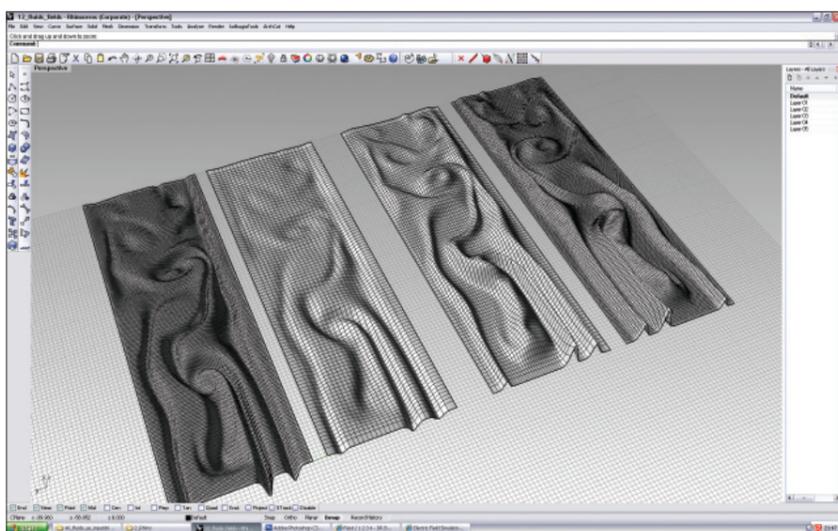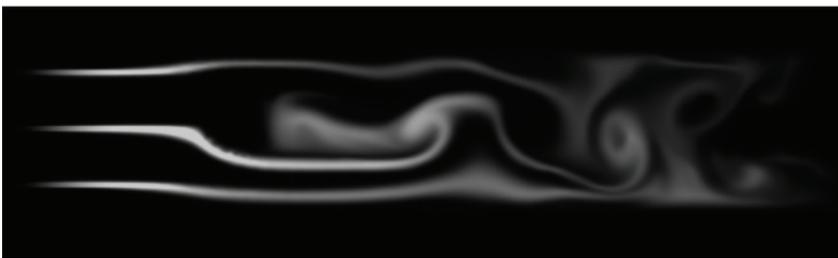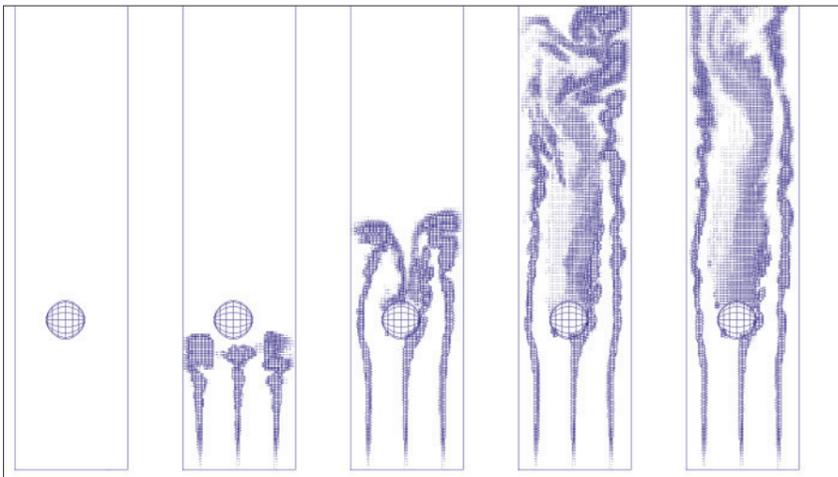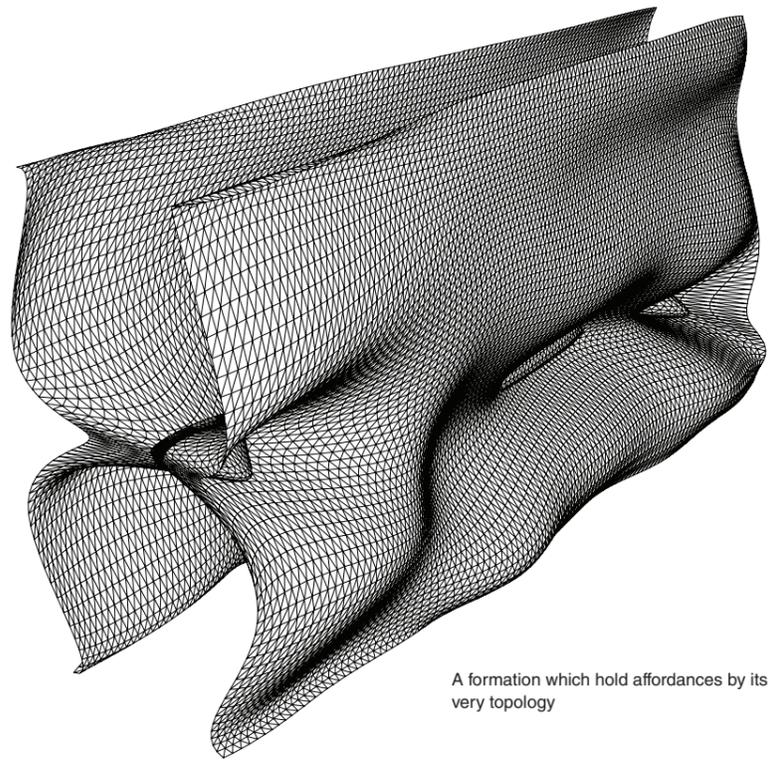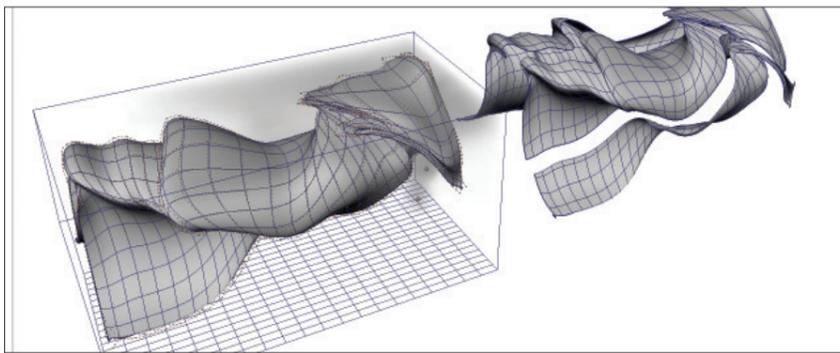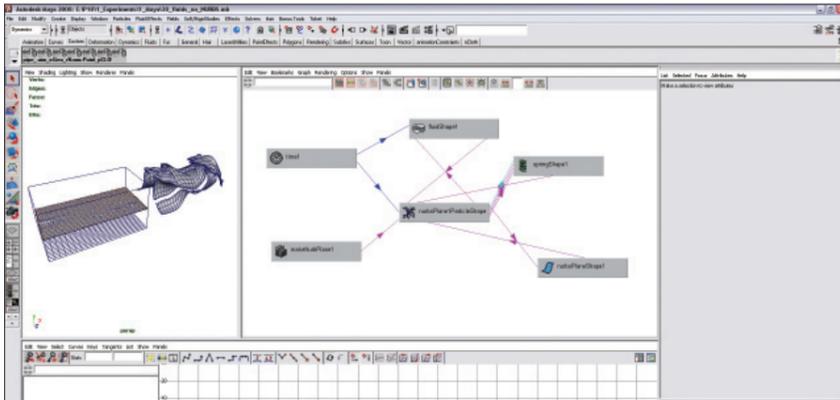
A formation which hold affordances by its
very topology
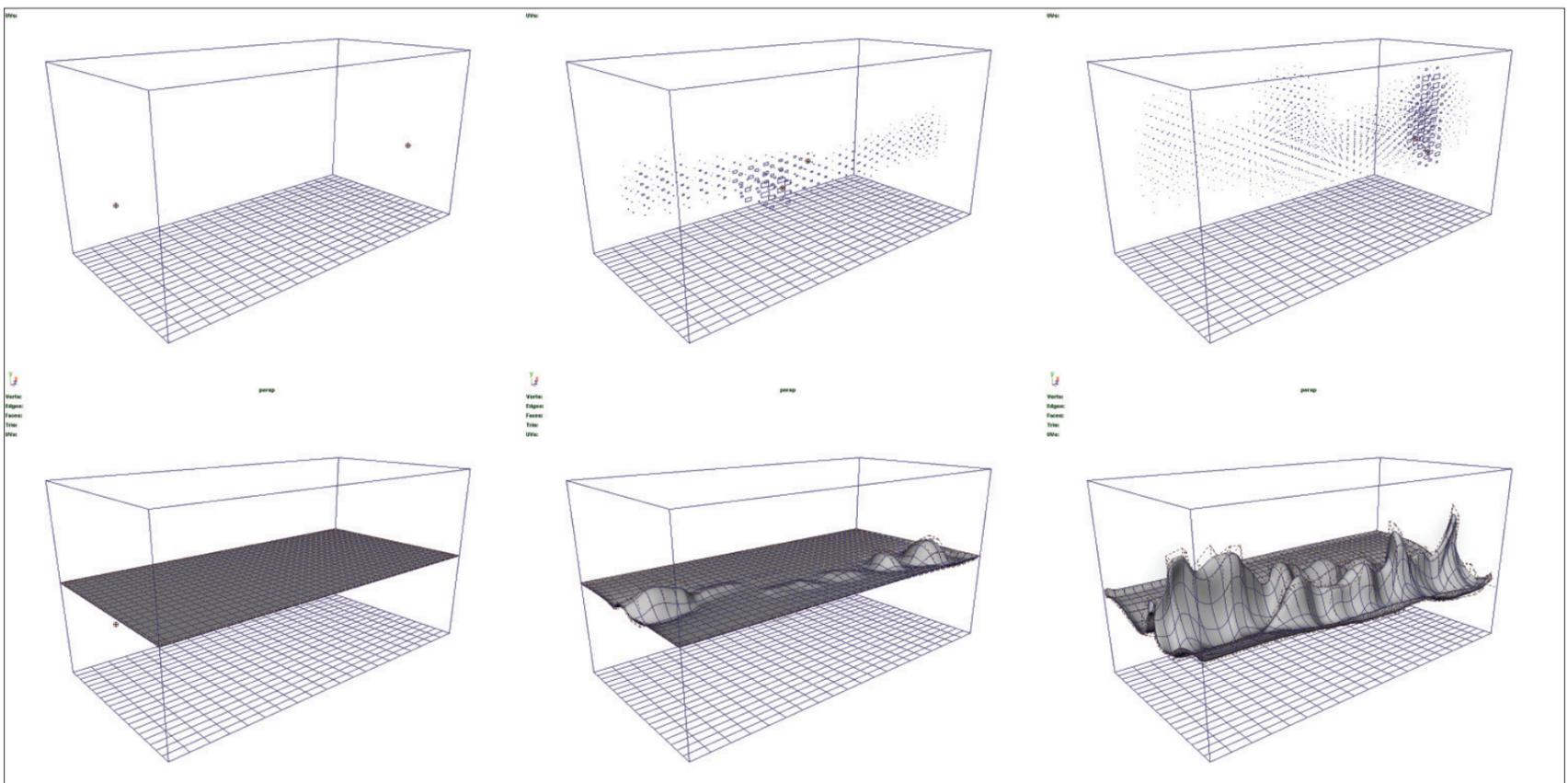
MOBILIZATION_ CLOTH SIMULATION

The nucleus dynamics core in Maya has a very strong cloth solver. By adding constraints to the cloth-mesh and applying to force the system begins to mobilize. This can be used for Catenary modelling similar to the hanging chain models of Gaudi and Frei Otto. Subsequently the resulting mesh can be rationalized.

The cloths meshes explore notions of complex curvature and topology as its material performance capacity. Grabbers of attention and holders of inherent affordances.
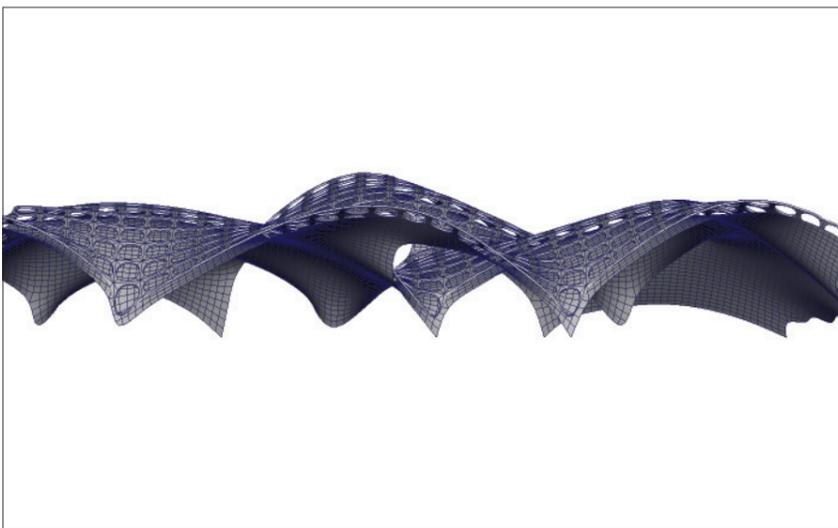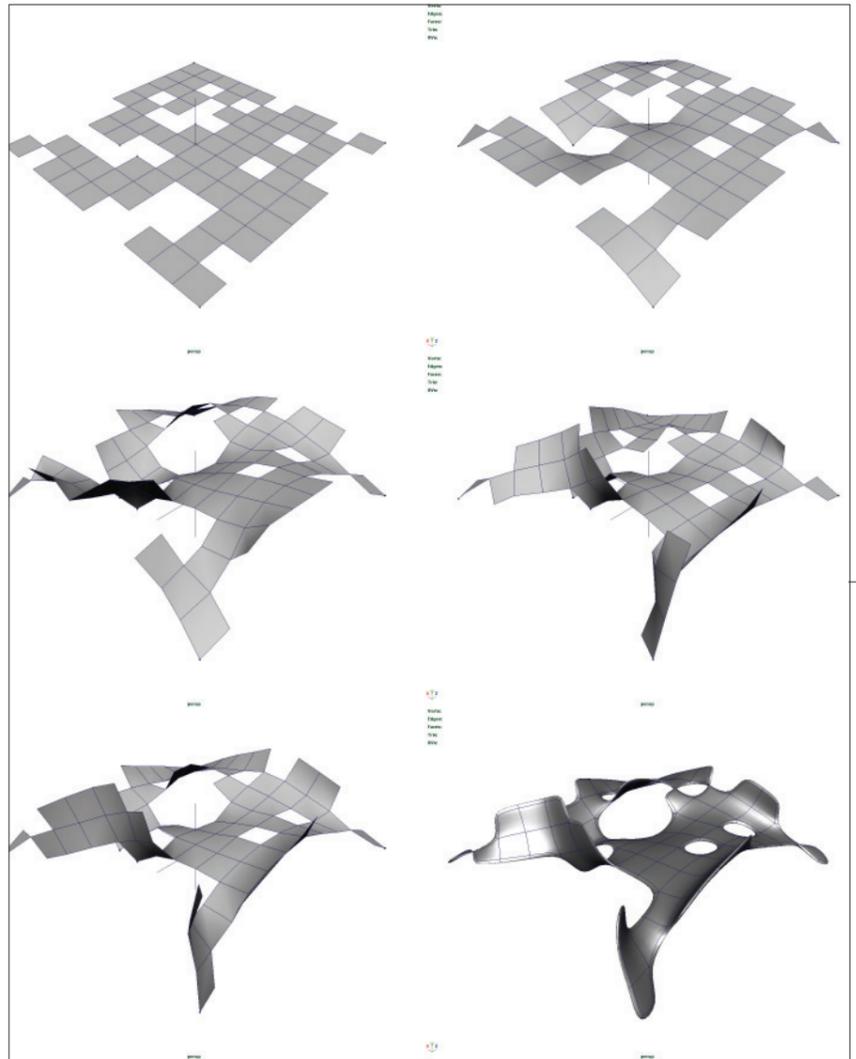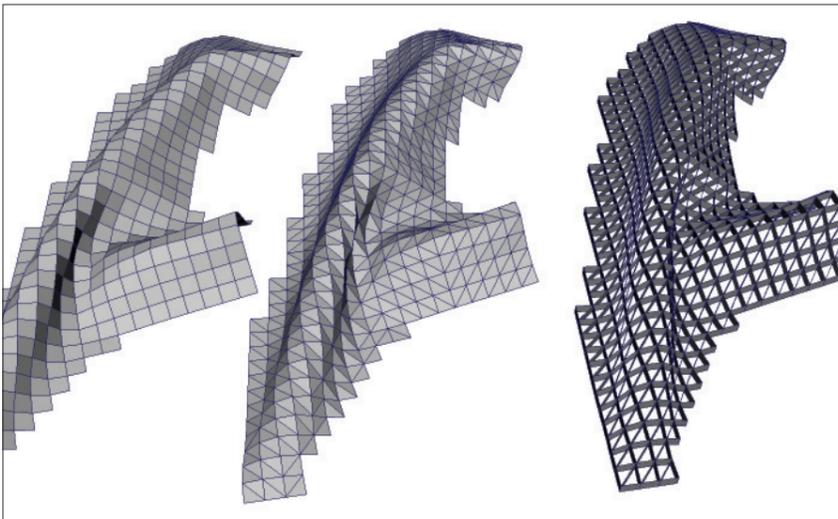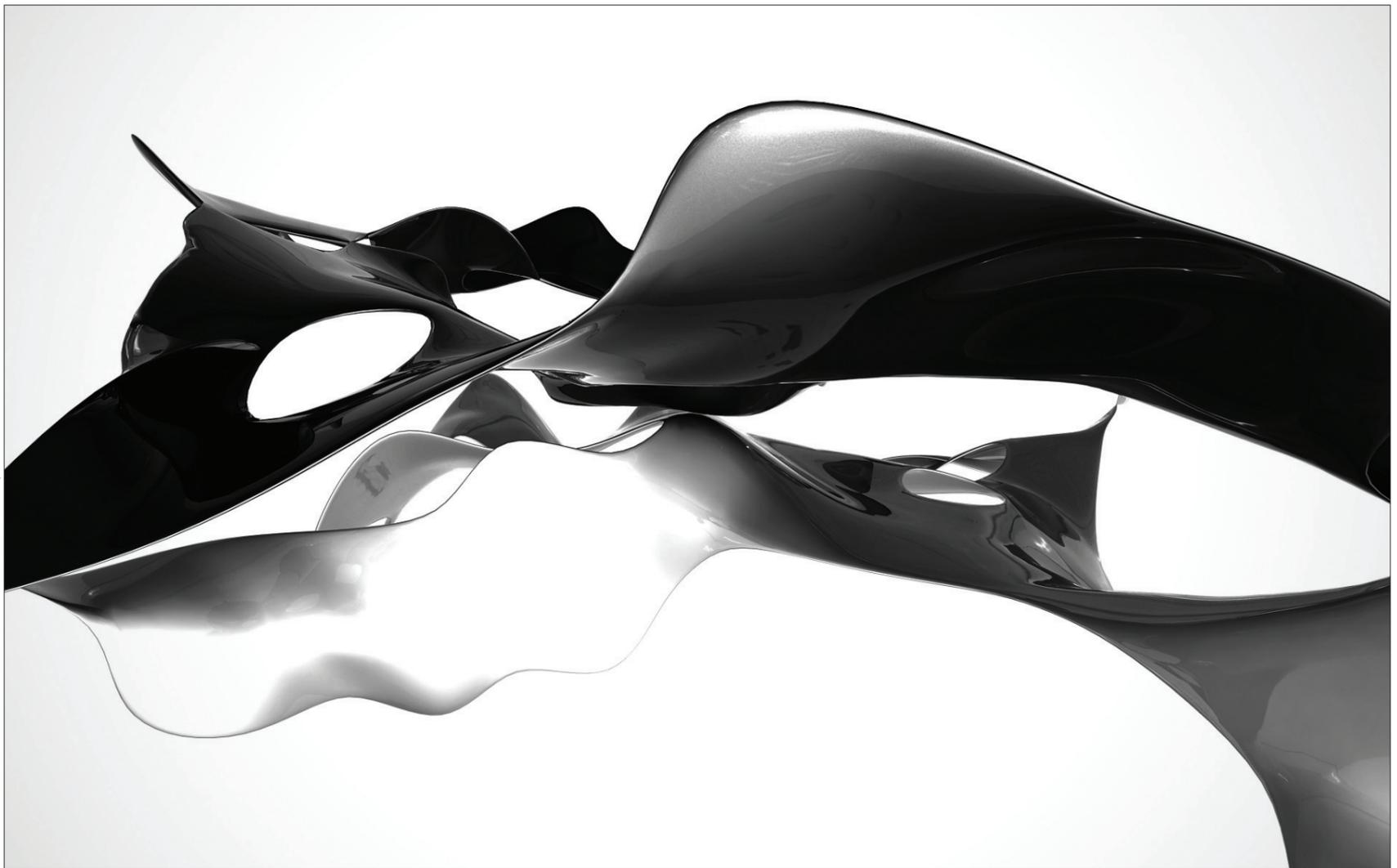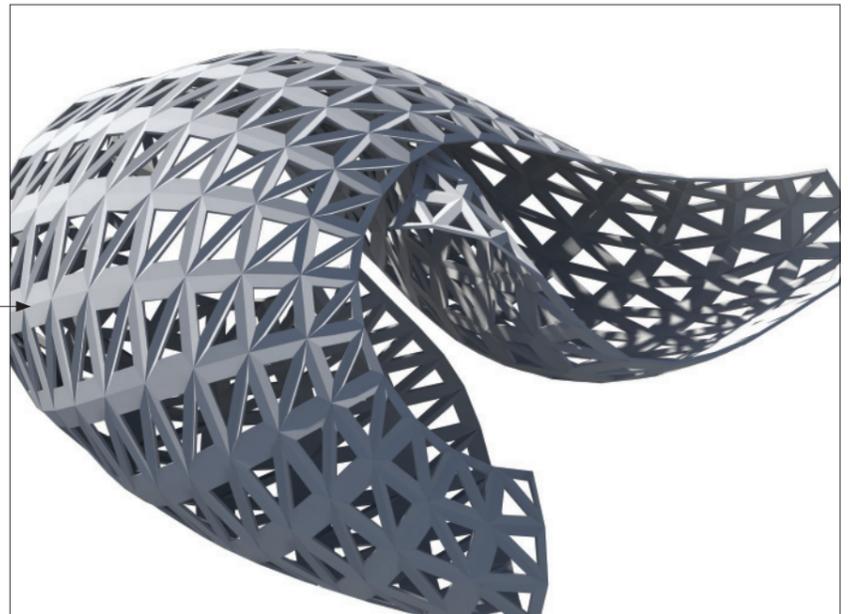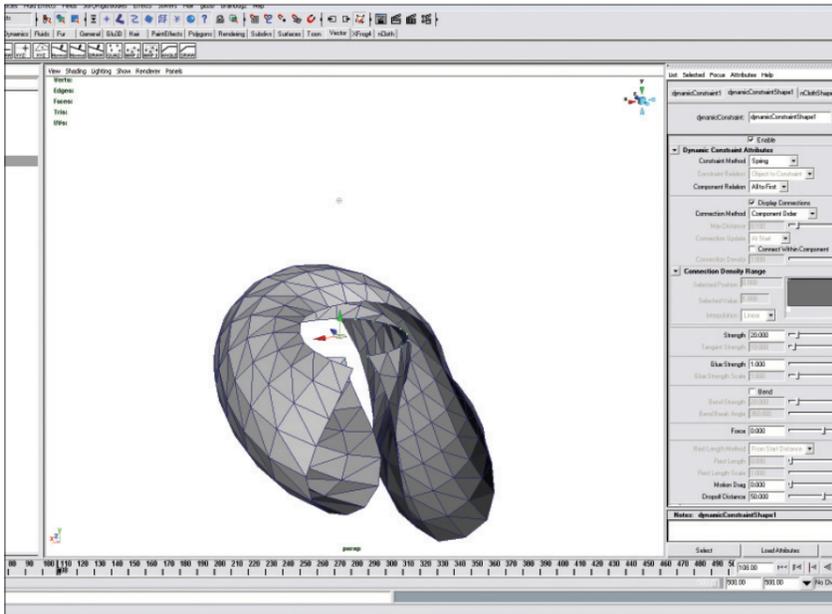
MOBILIZATION_ HAIR SIMULATION

Experiments in employing Maya's built in system designed for simulating hair in digital characters. Due to its dynamic properties the hair system provides some quite interesting opportunities with regards to generating form. The hair strands can be connected to any dynamic systems in Maya. Beyond this they can also be set to interact individually with each other, creating clumping effects or repelling each other depending on how you set up the system. By tweaking the properties just right the system eventually will reach a state of equilibrium.

It's performative behaviour could be yielded if the structure was made from rubber-tubing bound together, thereby if one person leans against the structure it will affect the entire structure and thereby other people leaning against it.

Initial state_top

Equilibrium state_top

Equilibrium state_side

Equilibrium state_front
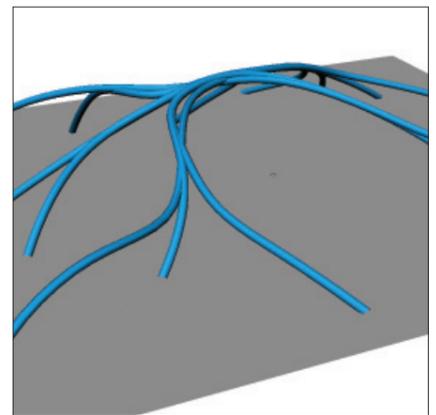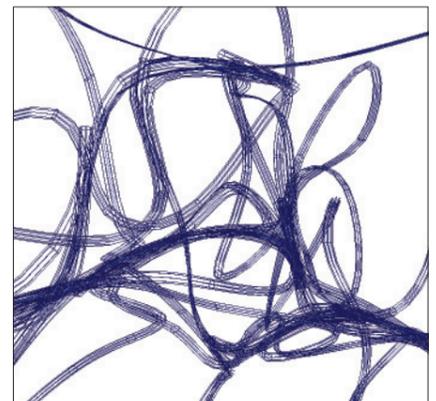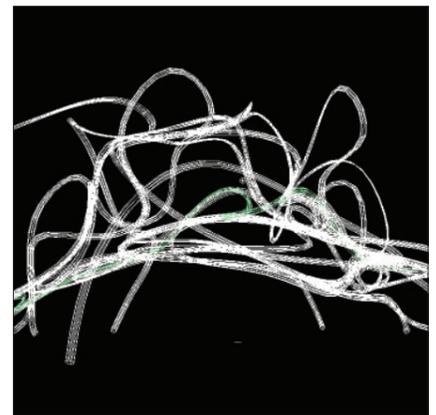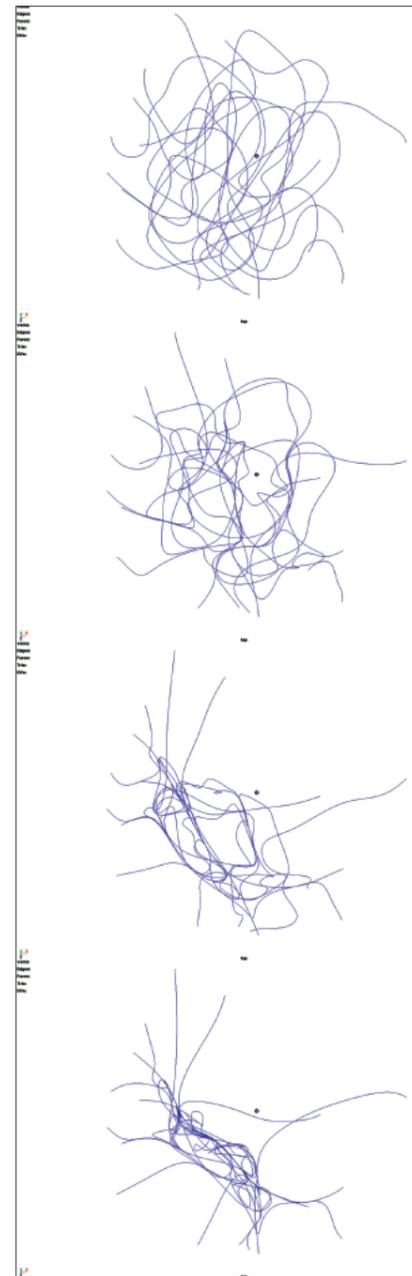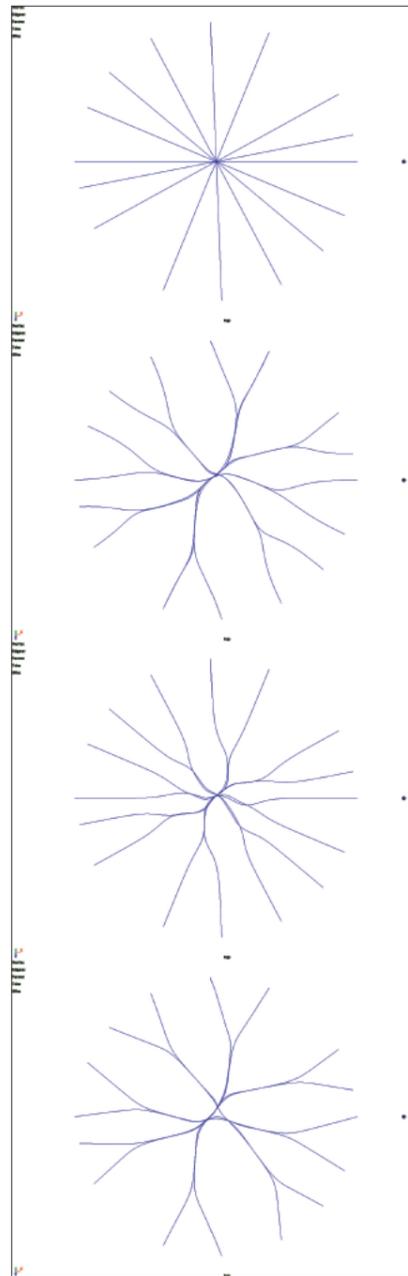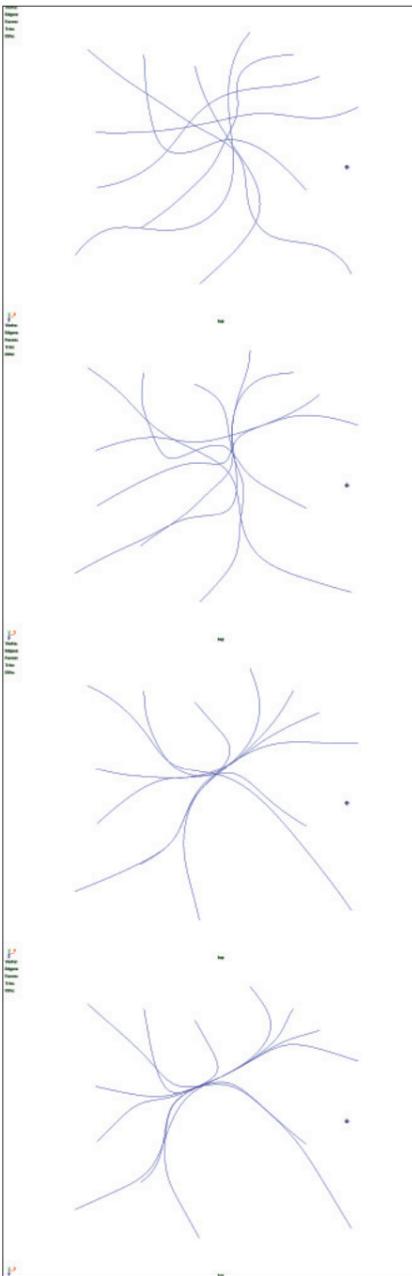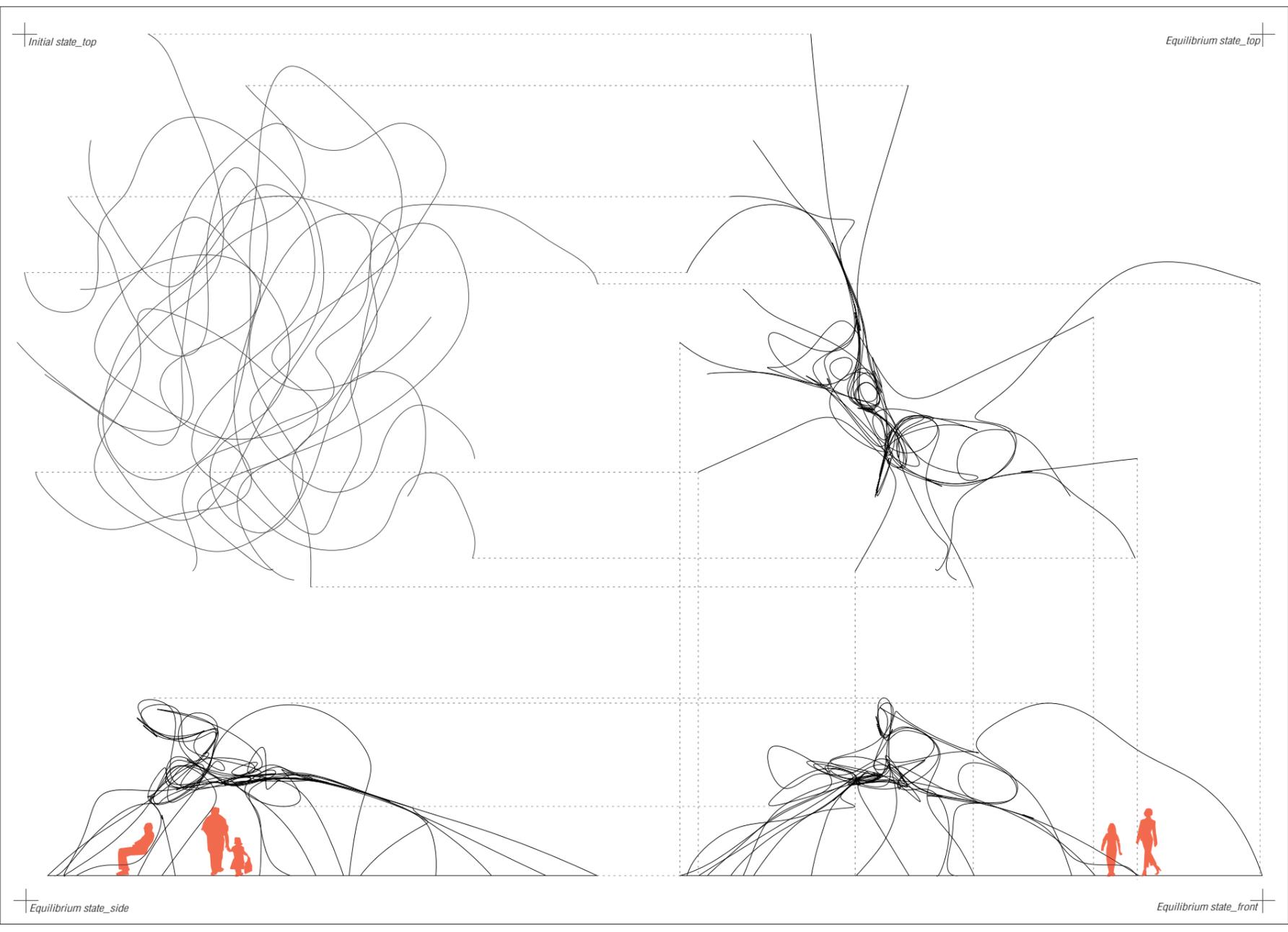
MOBILIZATION_ ELECTRIC FIELDS SOLVER

The electric fields solver plug-in for Rhino uses point-clouds as input, these are set with an "electric charge" and the field can solved. This results in curves which then can be for instance lofted or extruded, and in this case contoured to generate a complex surface effect which holds a certain potential for performing via its materiality.
The field solver also suggests the idea of working with this new approach to space as a field of relations which was discussed earlier.

04-06-2008   07:29:09
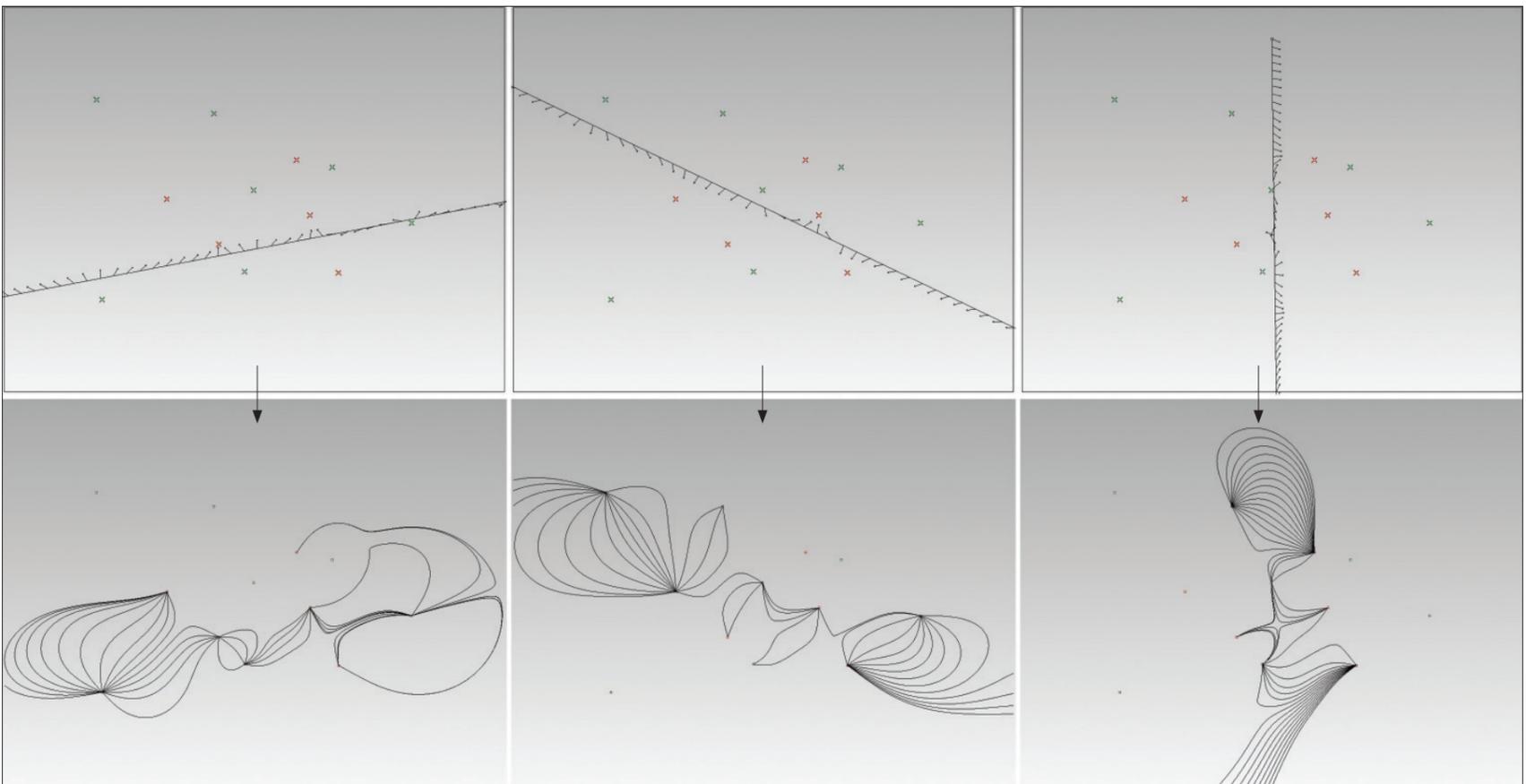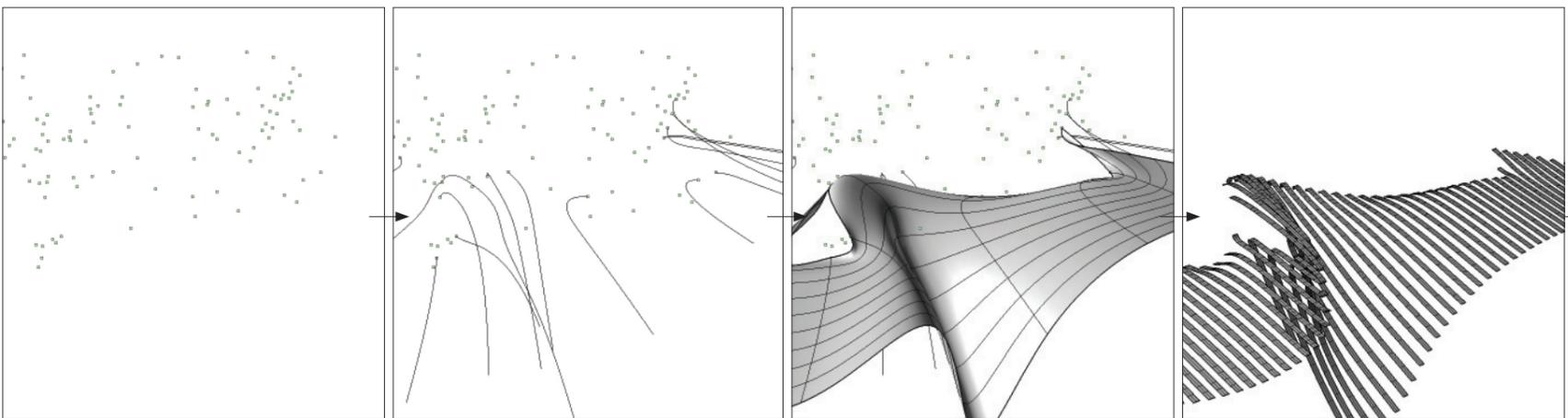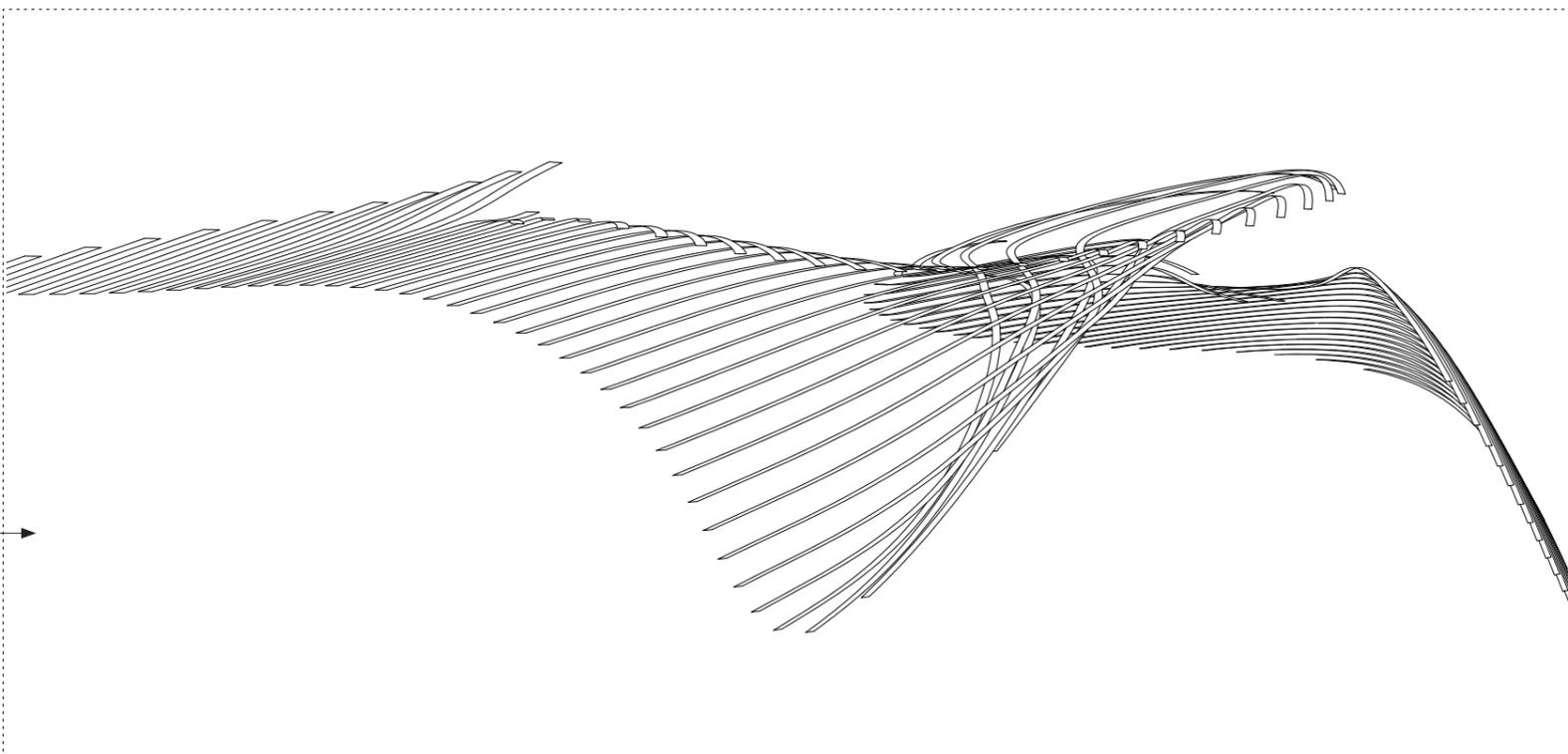
MOBILIZATION_ INVERSE KINEMATIC CHAINS

Inverse Kinematic chains in Maya are used for the "rigging" of characters for mov-
ies and videogames. They essentially act as the skeleton for which you bind your
character (geometry) to. However in the case of performative objects, IK-chains
present an excellent opportunity for working with complex system which literally
moves.
The example shown here depicts three IK-chains which have been linked para-
metrically together, so if you move the IK-handle of one chain to other will auto-
matically follow.

04-06-2008   07:29:19
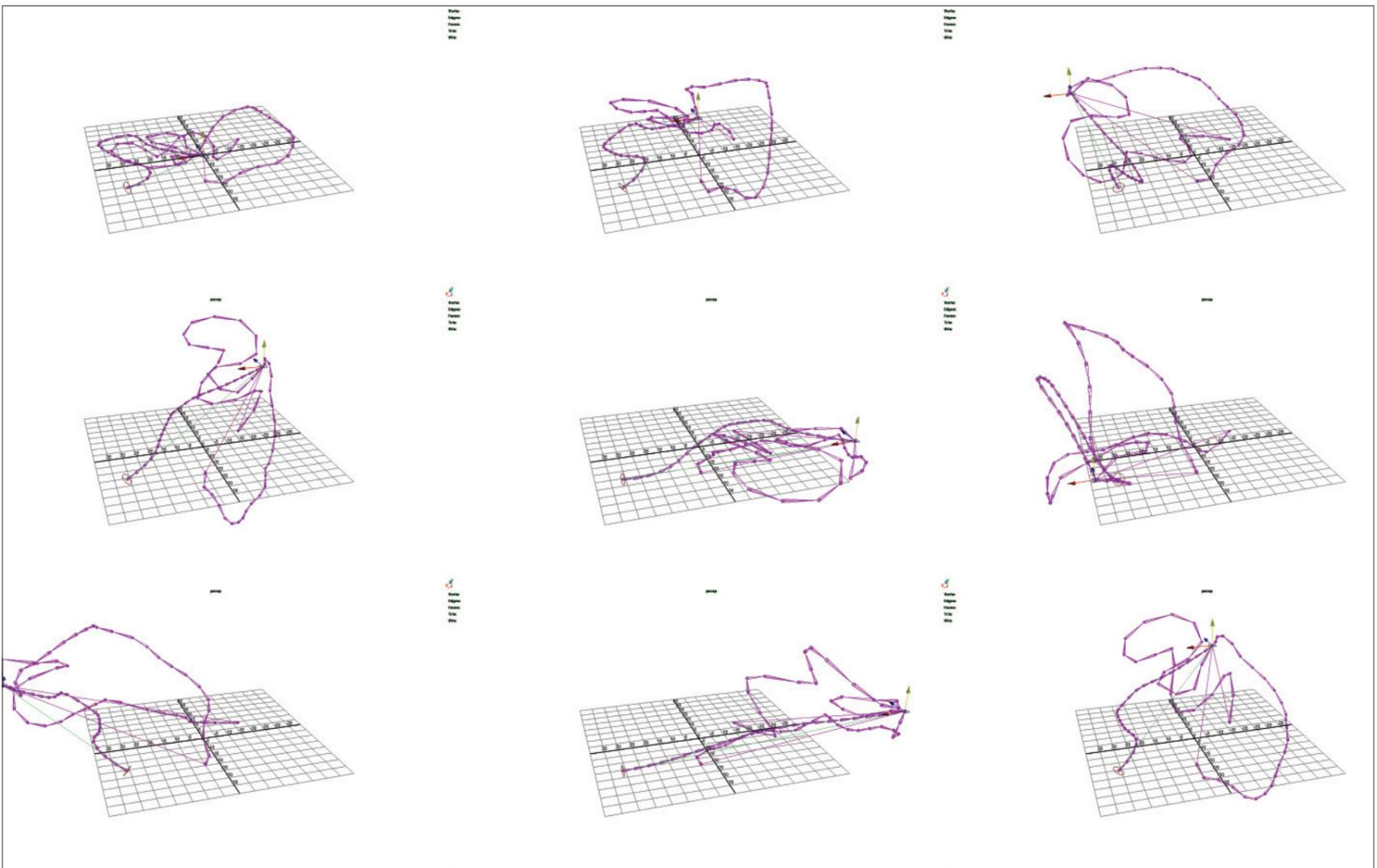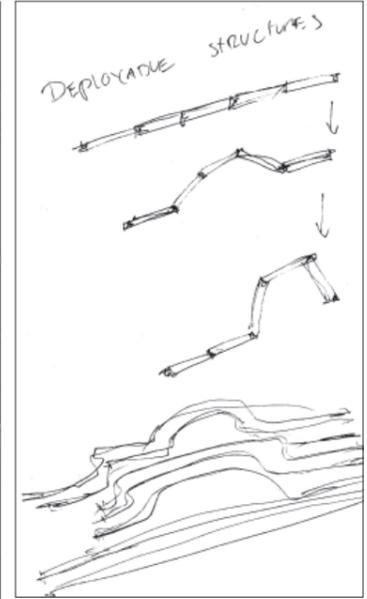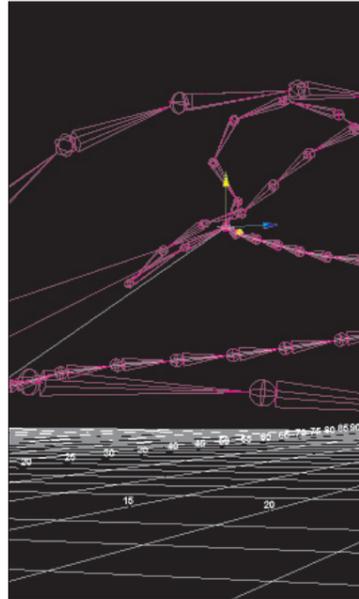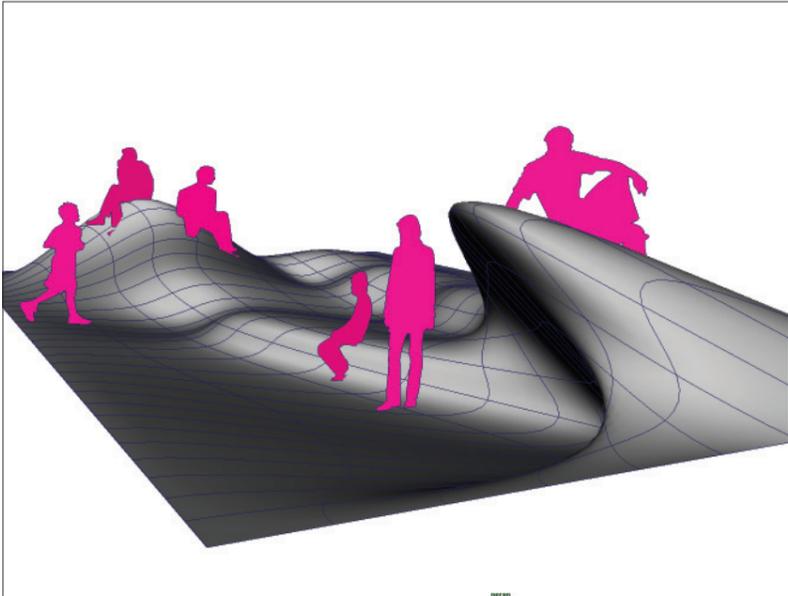
MOBILIZATION_ CONSTRAINT CLUSTERS

By parametrically linking clusters of vertices on a surface to another object (the sphere) using an aim constraint, the surface will alter its shape by the clusters "pointing" in the direction of the sphere.

Such systems might be used for the generation of static physical object as well simulating responsive environments that literally move.
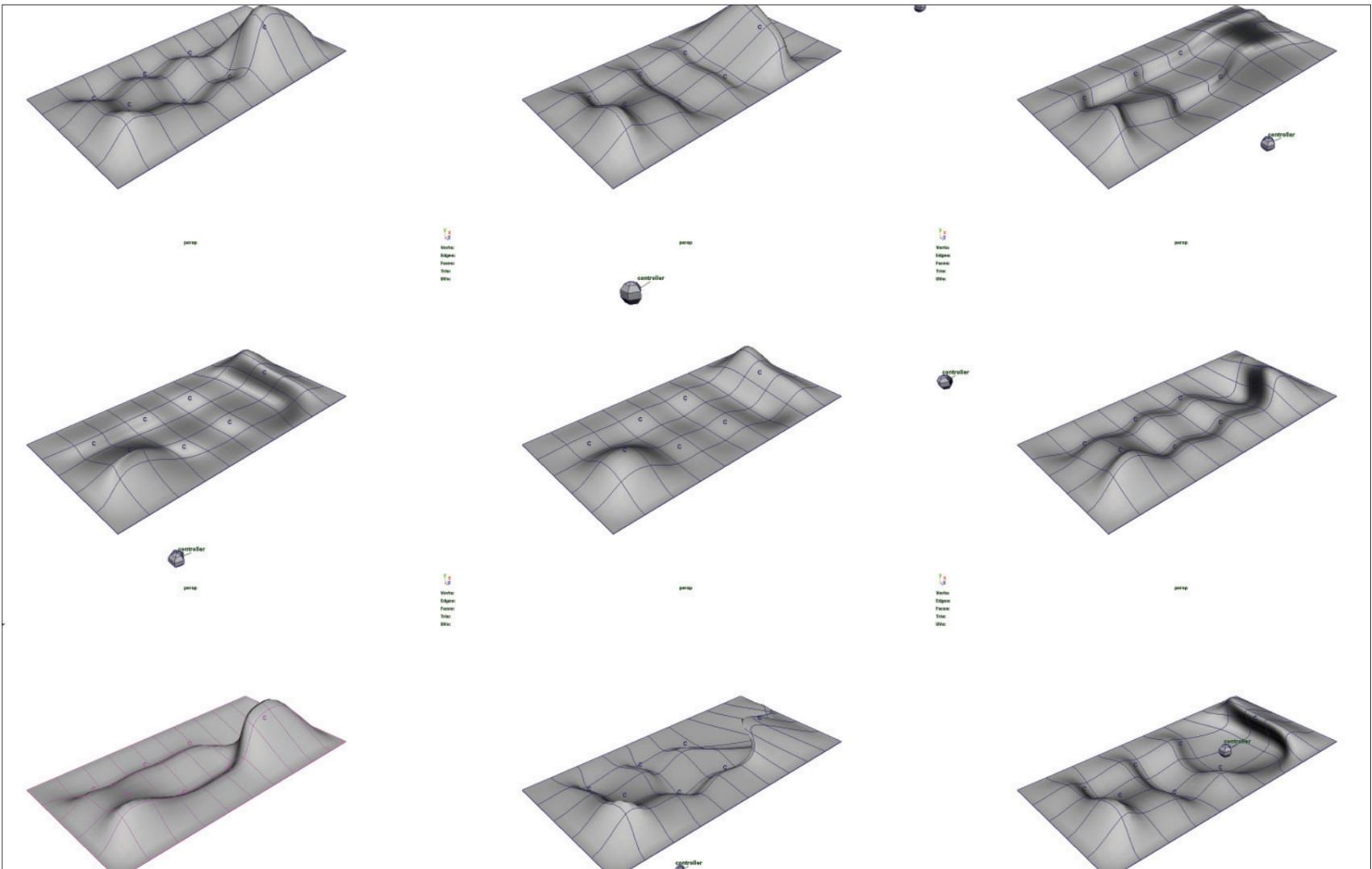
MOBILIZATION_ NON LINEAR GRID OPTIMIZATION_

A MEL-script that can be used to apply surface relaxation using dynamic relaxation to a polygon surface. This can be used for optimizing the surface grid or to generate minimal surfaces. This tool is clearly very interesting for issues such as simulating/designing membranes or textiles.

In a performative sense these membranes might be driven by pulleys, making the membrane expand and contract. Another use could be to use them as projection screens, with the projectors mounted on the walls of the building in the site.
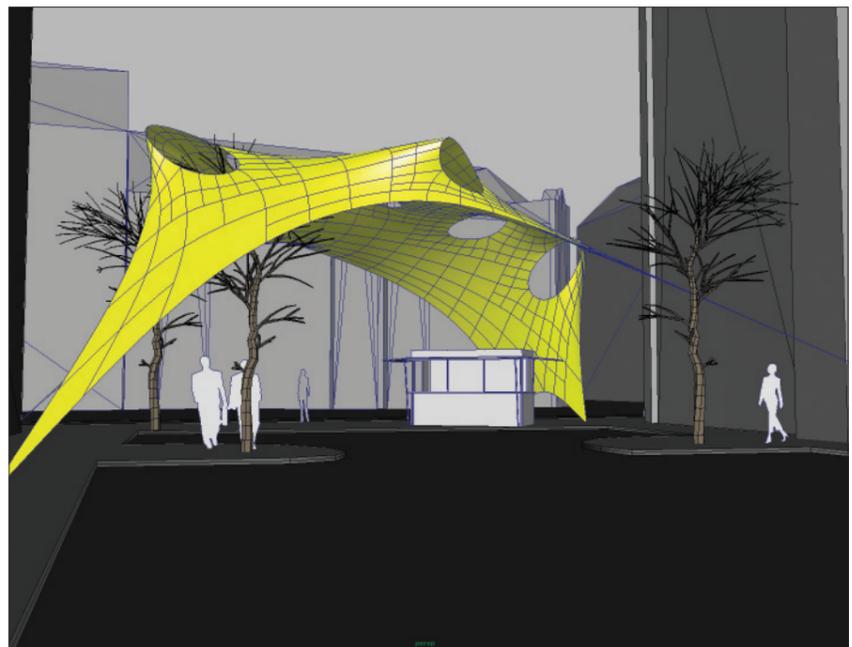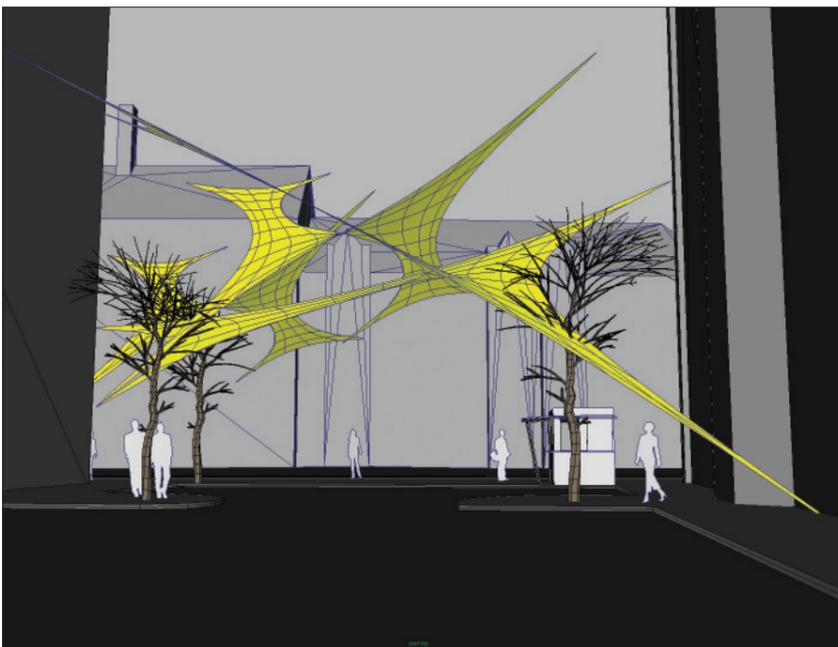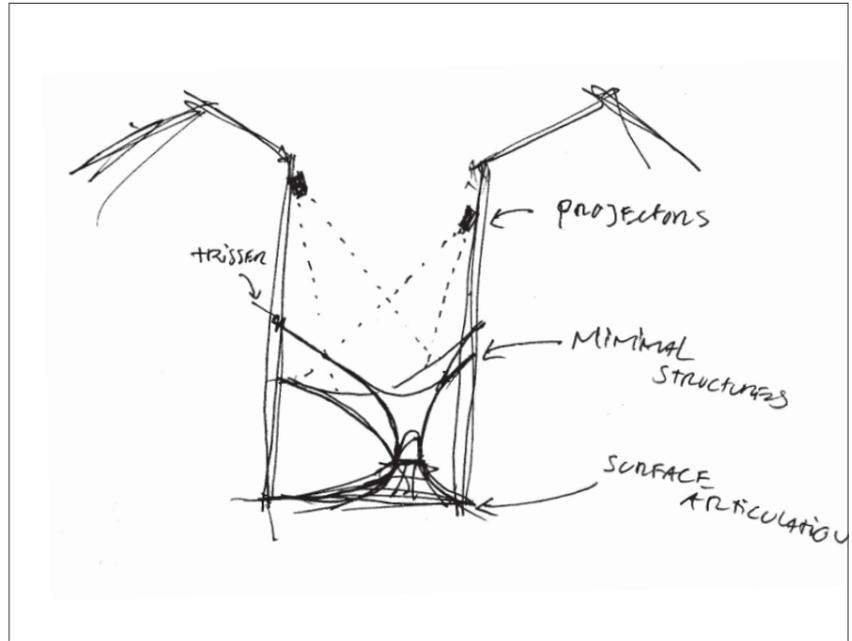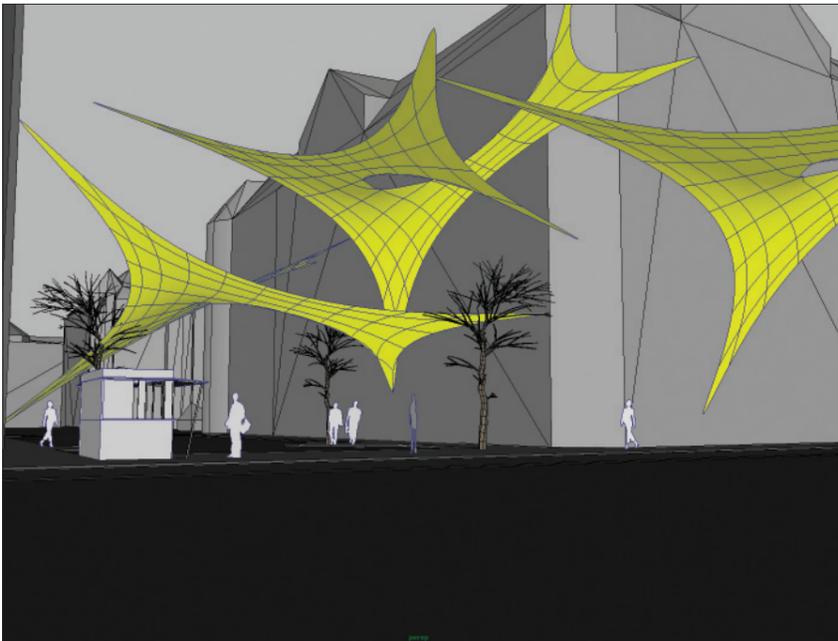
MOBILIZATION_ SCHERK-COLLINS

The Scherk-Collins Sculpture Generator is freeware that uses simple parametric controls using saddle rings with different number of holes and different amounts of twists. This is useful for generating highly complex topologies which hold many affordances. It would be quite expensive to fabricate though.
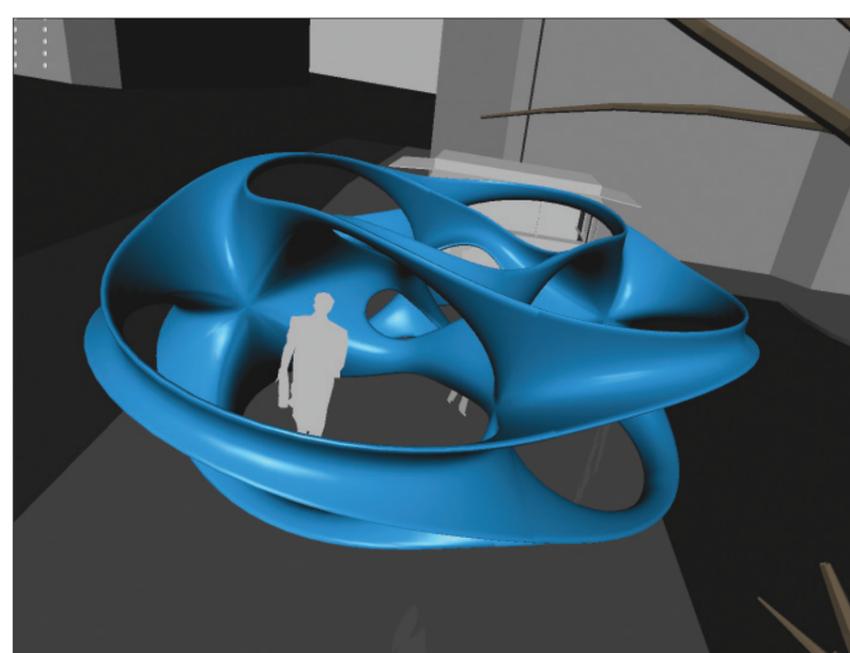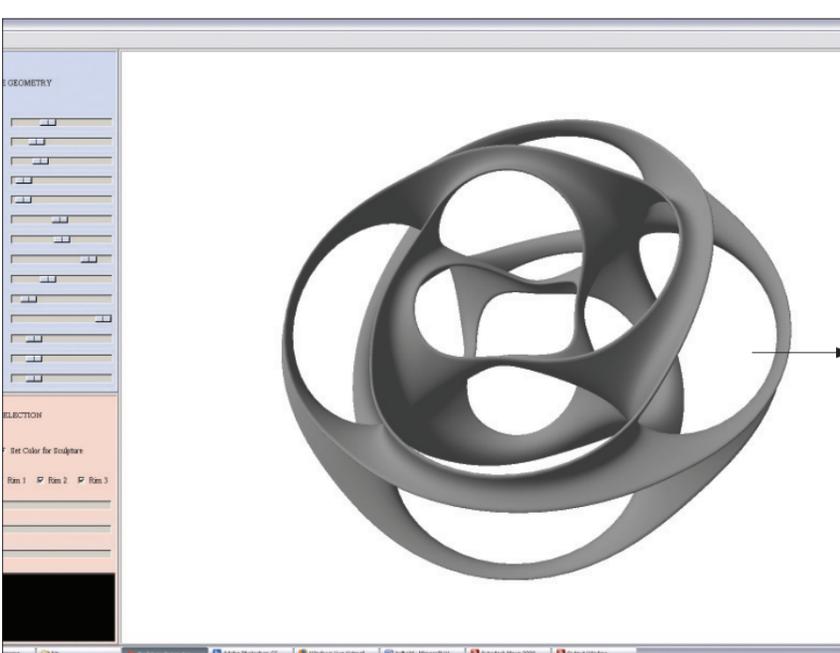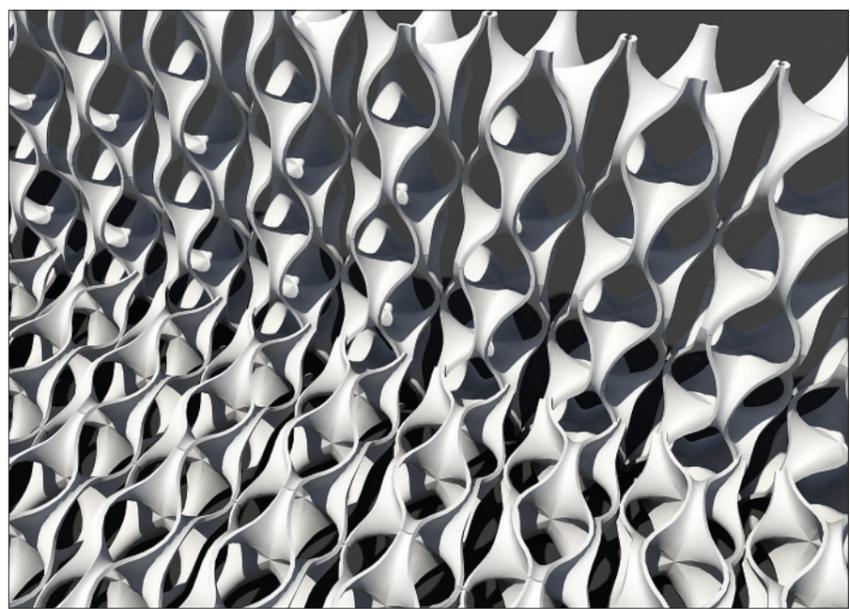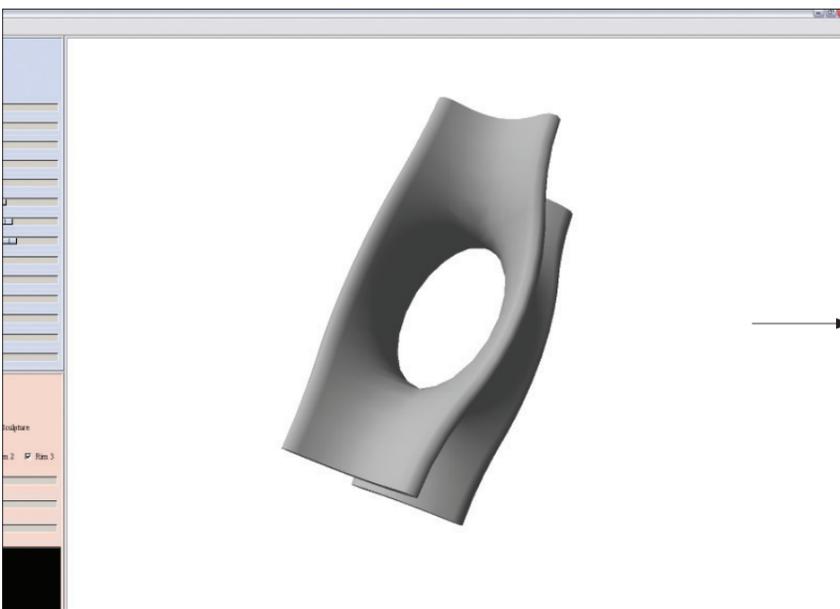
ACTUALIZATION_INSTANCING + BRIDGING_

By using a particle system as placeholders for geometry it is possible to bridge the faces of the poly-meshes. If also applying a subdivision surface the results become somewhat reminiscent of Hernan Diaz Alonsp's Fleshology. Funny, somewhat disturbing and thus also with a performative sense in its capacity to draw people in. It would however be very hard to build.
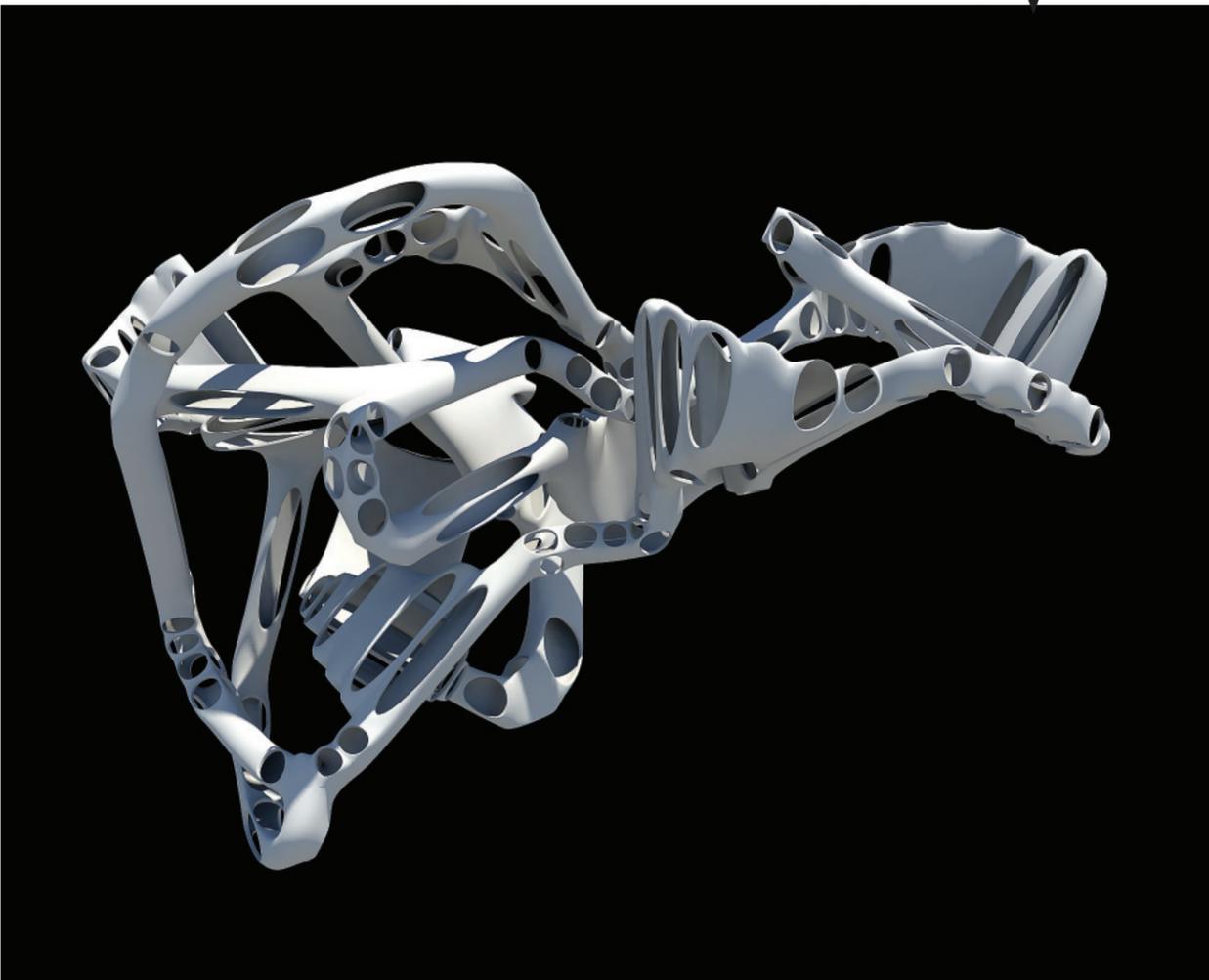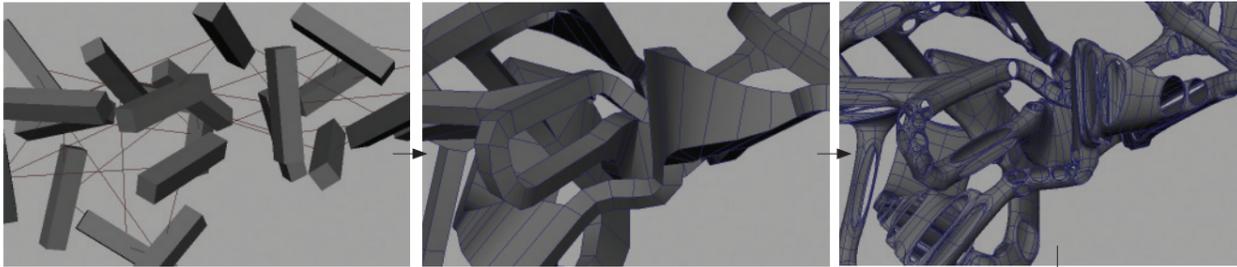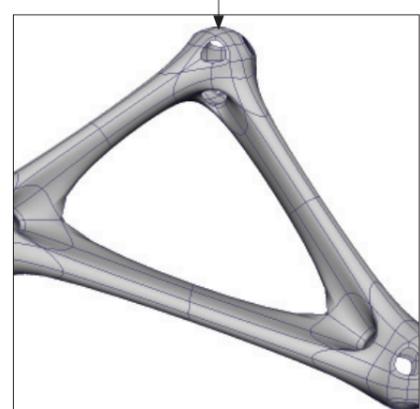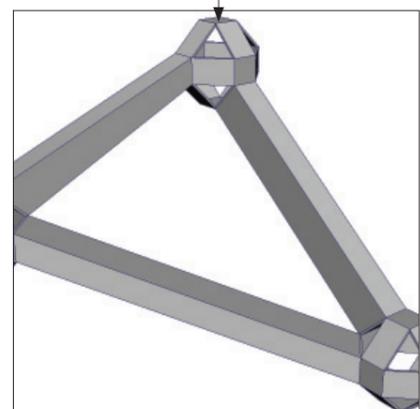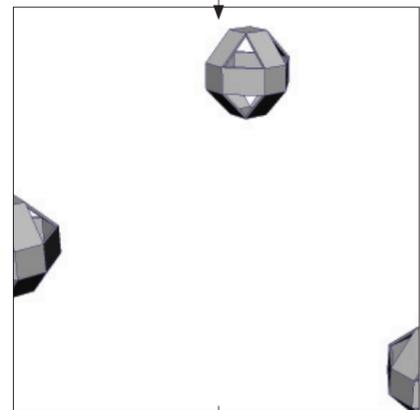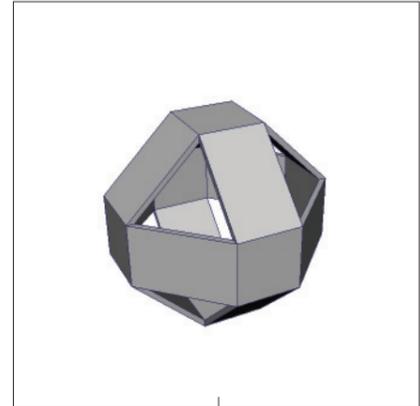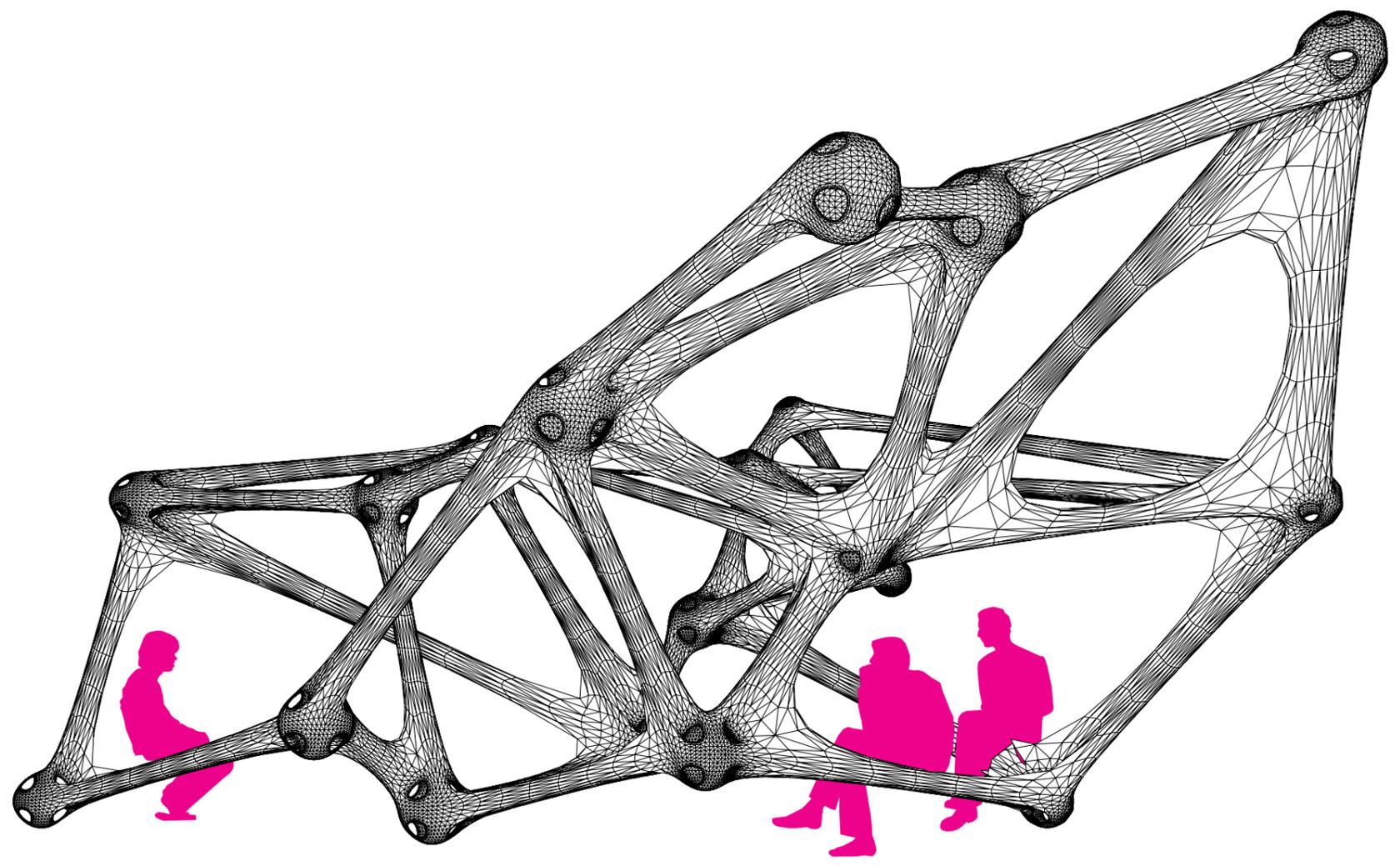
ACTUALIZATION_ "SPACEFRAMING"

The SpaceFraming technique which was used in the 9th semester project, uses a point-cloud and calculates the distance between all the points. By setting a threshold value the point are connected by lines, which then can be extruded.

The resulting structure is arguably filled with affordances and definitely would get noticed. Construction would be tricky due to the many connection nodes, but would be quite feasiable
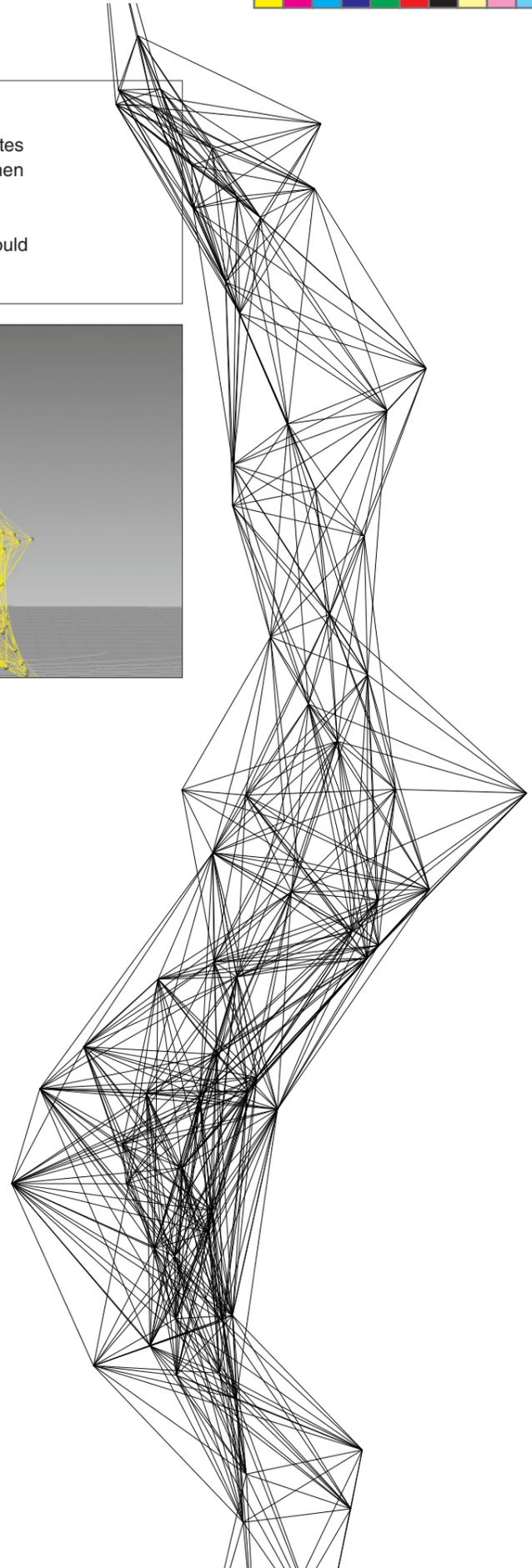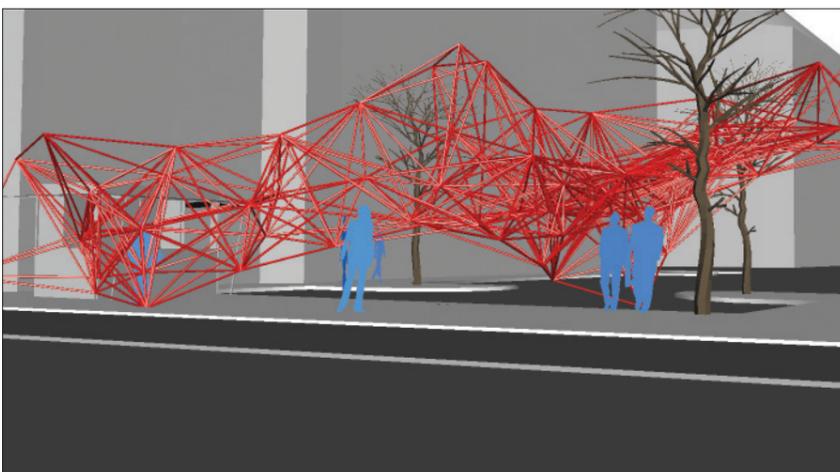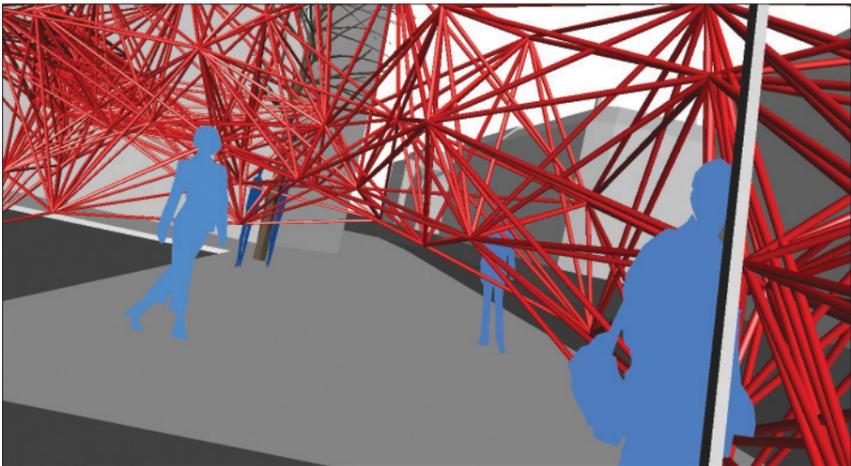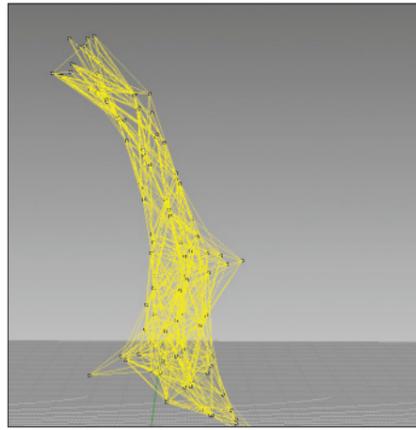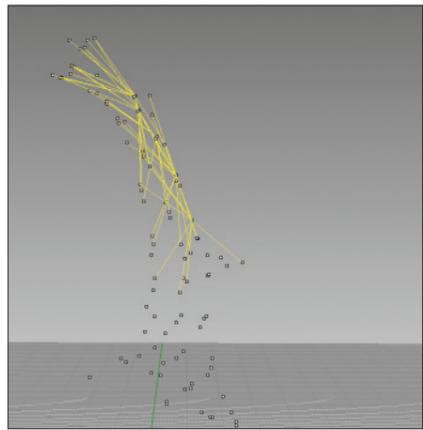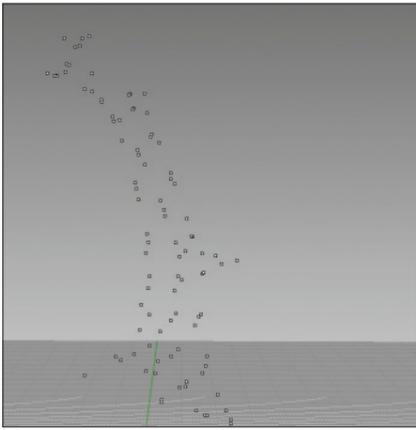
ACTUALIZATION_MESH SHRAPNEL

Tests from using Rhino's "Mesh from Points" command on a particle system generated in Maya. The results look like some kind metal shrapnel; maybe this would carry a performative effect in itself. It is also interesting in that it opens the door for using recycled materials and scrap, this might be what could give the site it's identity.
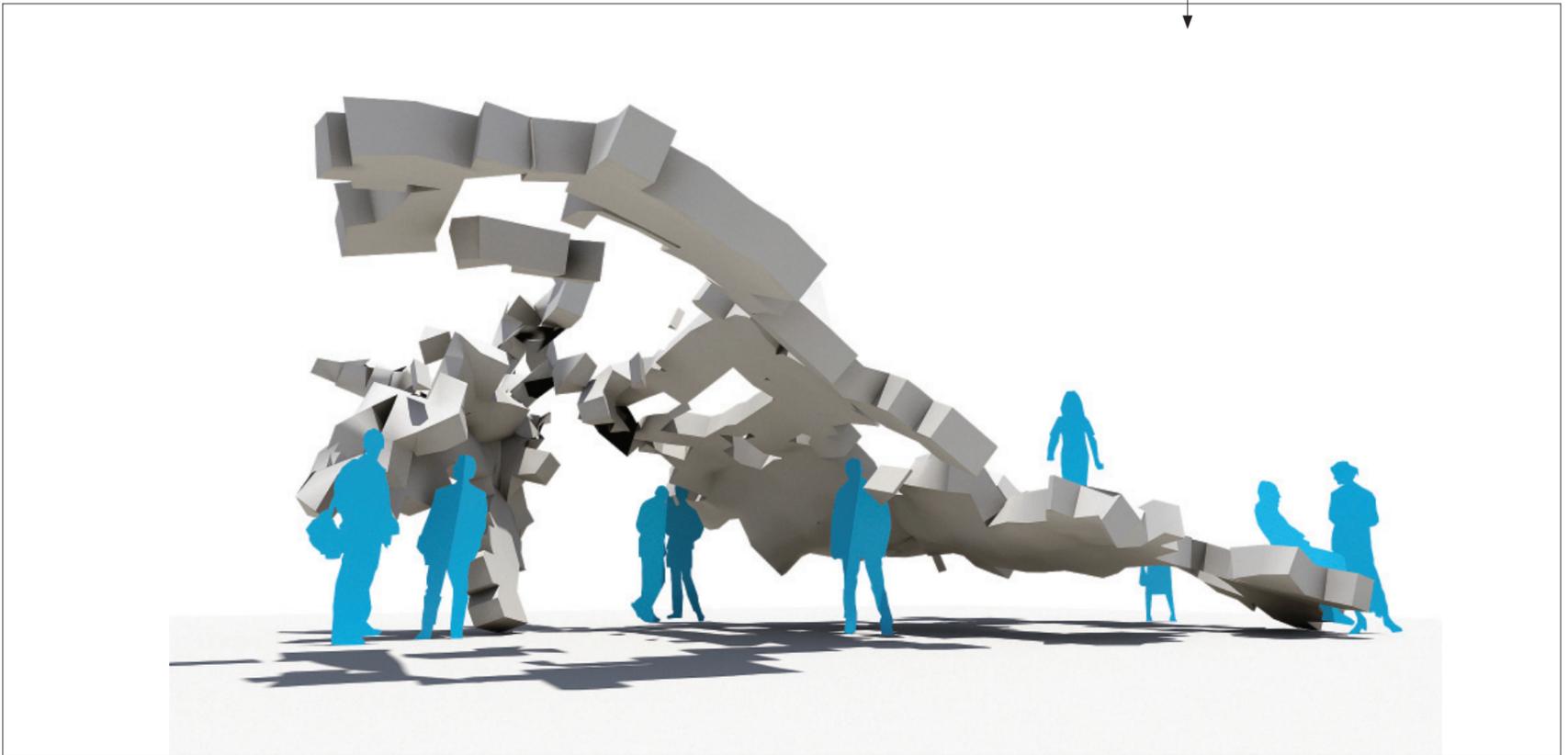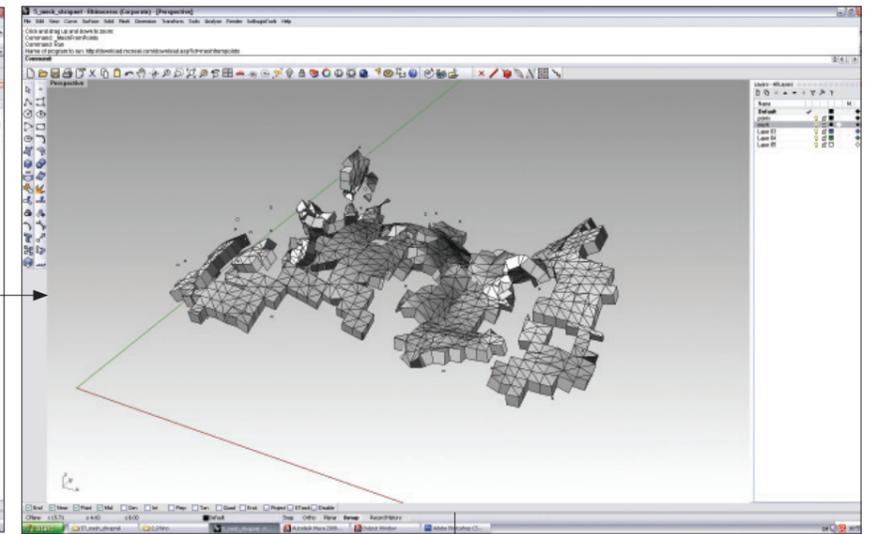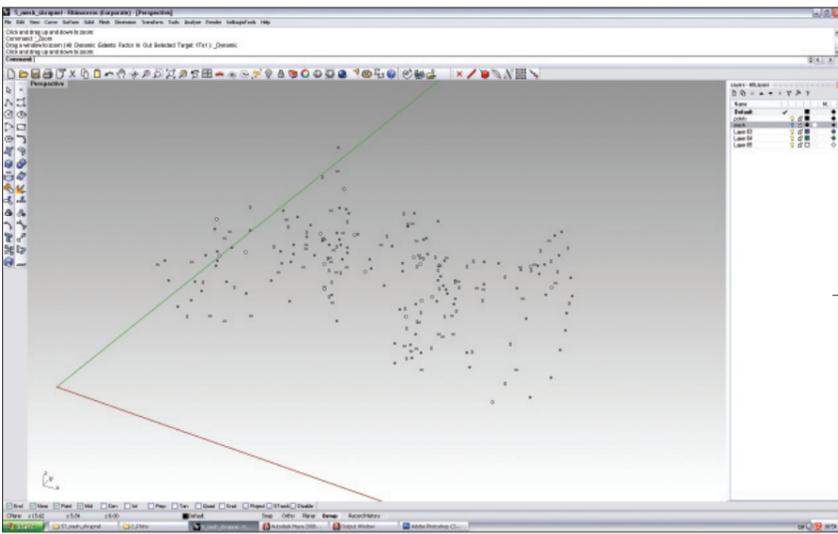
ACTUALIZATION_VORONOI 2D_

Experiments with the Voronoi plug-in for Rhino. Essentially the Voronoi diagram operates on a number of points in 2d or 3d space. For each two points, a vector is drawn half-way between them in a direction perpendicular to an imaginary line connecting them directly. So, draw a number of points, and then connect them to each other. At the half way point of each line, draw a line perpendicular to the first line. Erase the connecting lines, and then trim every vector. This results on patterns of packing similar to those found in nature in bubbles, rock-formations etc.

The Voronoi technique is actually quite interesting as it is equally beautiful and structural, it is however also a terribly overused technique these days. So the idea of designing a unique object which stands out with it seems almost counterintuitive.
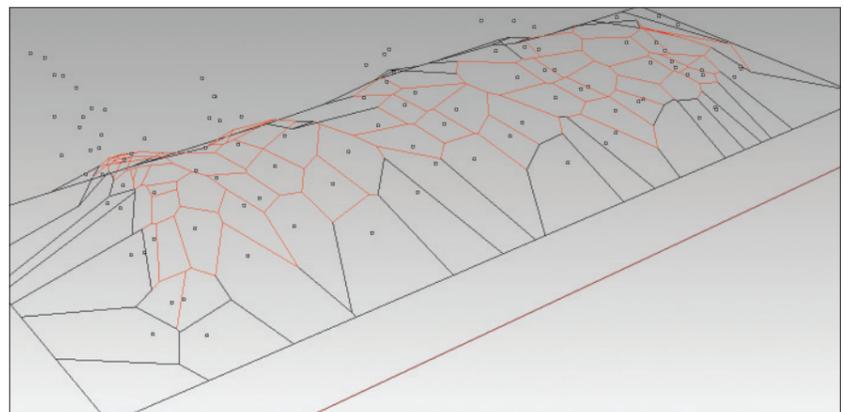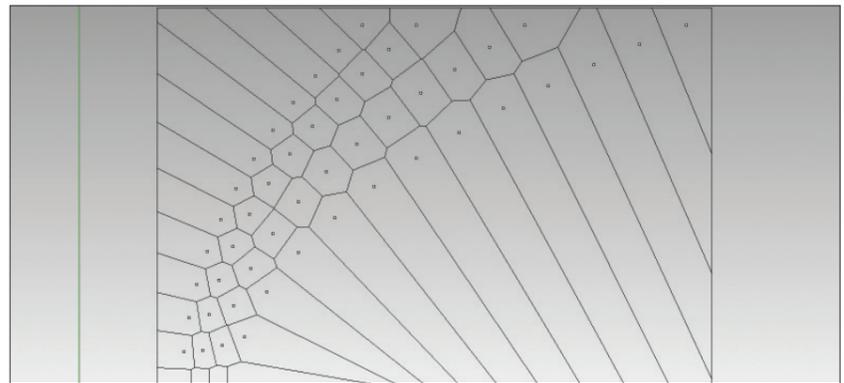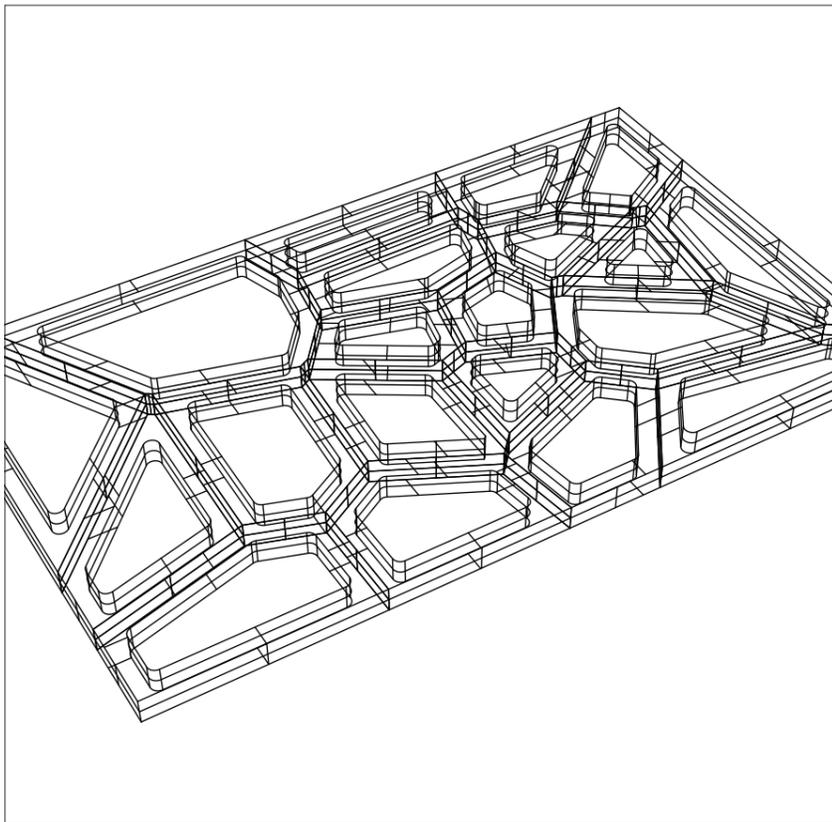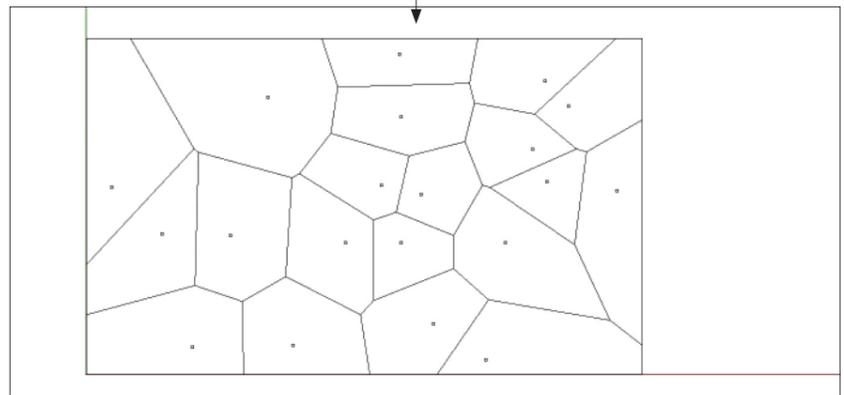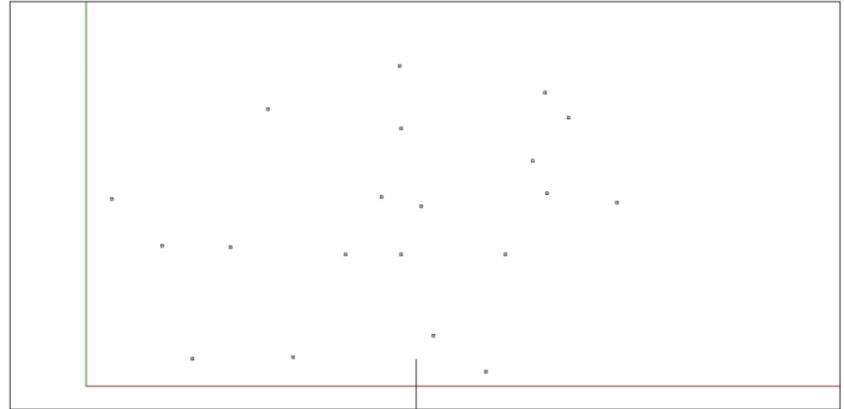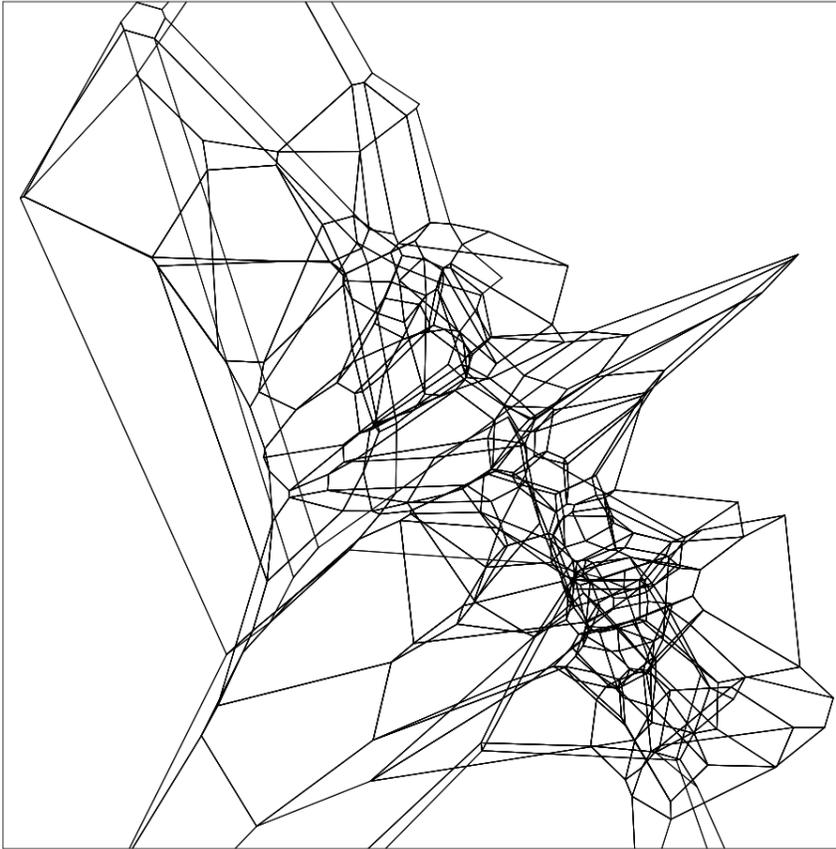
ACTUALIZATION_VORONOI 3D

While the Voronoi 2D technique might be predictable and fairly easily in fabrication, it becomes a lot more complex when it comes to 3D Voronoi. In the tests performed during the semester, like say, meshing a point cloud imported from Maya things quickly became very complex very fast. It is indeed a hard beast to control!
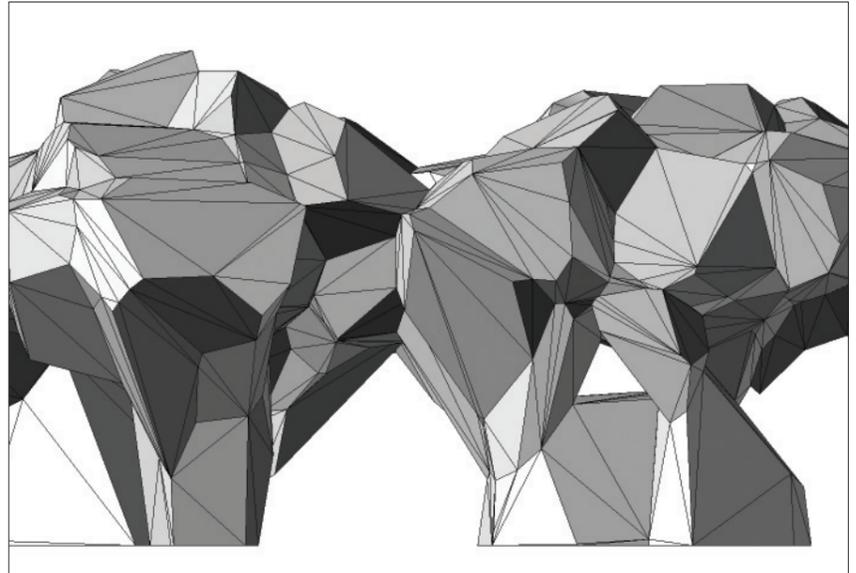
ACTUALIZATION_TOMOGRAPHIC ISOSURFACING_

Tomography is imaging by sections or sectioning and is method of imaging used in medicine, archaeology, geophysics and other sciences to describe an object by a sequences of images such as for instance in a CT-scan of the brain (Wikipedia). The inverse of the process is to reconstruct the object in 3D-space by interpolating a mesh between the sequences of images. During the progress of the semester I stumbled upon a piece of very rudimentary software to do this.

The software called Isosurf works by feeding it a sequential series of black and white raw-images in the form of a .bin-file (Isosurf does not have a graphic user interface so one has to work out of the DOS-prompt, classic). Dependent on the settings that is used to run the software it will now attempt to interpolate between the frames in order to extract a poly-mesh, which then can be taken into 3DS Max or Maya in order to be cleaned up, as Isosurf has a tendency to create a harsh transition between the images if it is not feed a sufficient amount.

At first this was only seen as an opportunity for meshing a particle system by rendering out clipping planes of the particles and using these as input by blurring them in Photoshop. However Isosurf is really an amazing piece of software.

Firstly it can literally mesh anything thrown at it and generate insanely intricate topologies from this. Secondly, since its input is image sequences, the possible for actualization of emergent systems are literally endless. Furthermore it also breaches the gap between digital tools of form generation and old school drawing and painting techniques. By using Isosurf anything could potentially be turned into a 3D object.

Regarding its use as tool for designing objects which hold the performative capacity that we are looking for there is no doubt. The topologies generated have a fluency to them and an ability that seem to make people wonder "what it is" and draw references to a number of objects . That was surely the case for the people passing by the workstation during the semester. The intricacy of it form is however also what might make it difficult to fabricate.
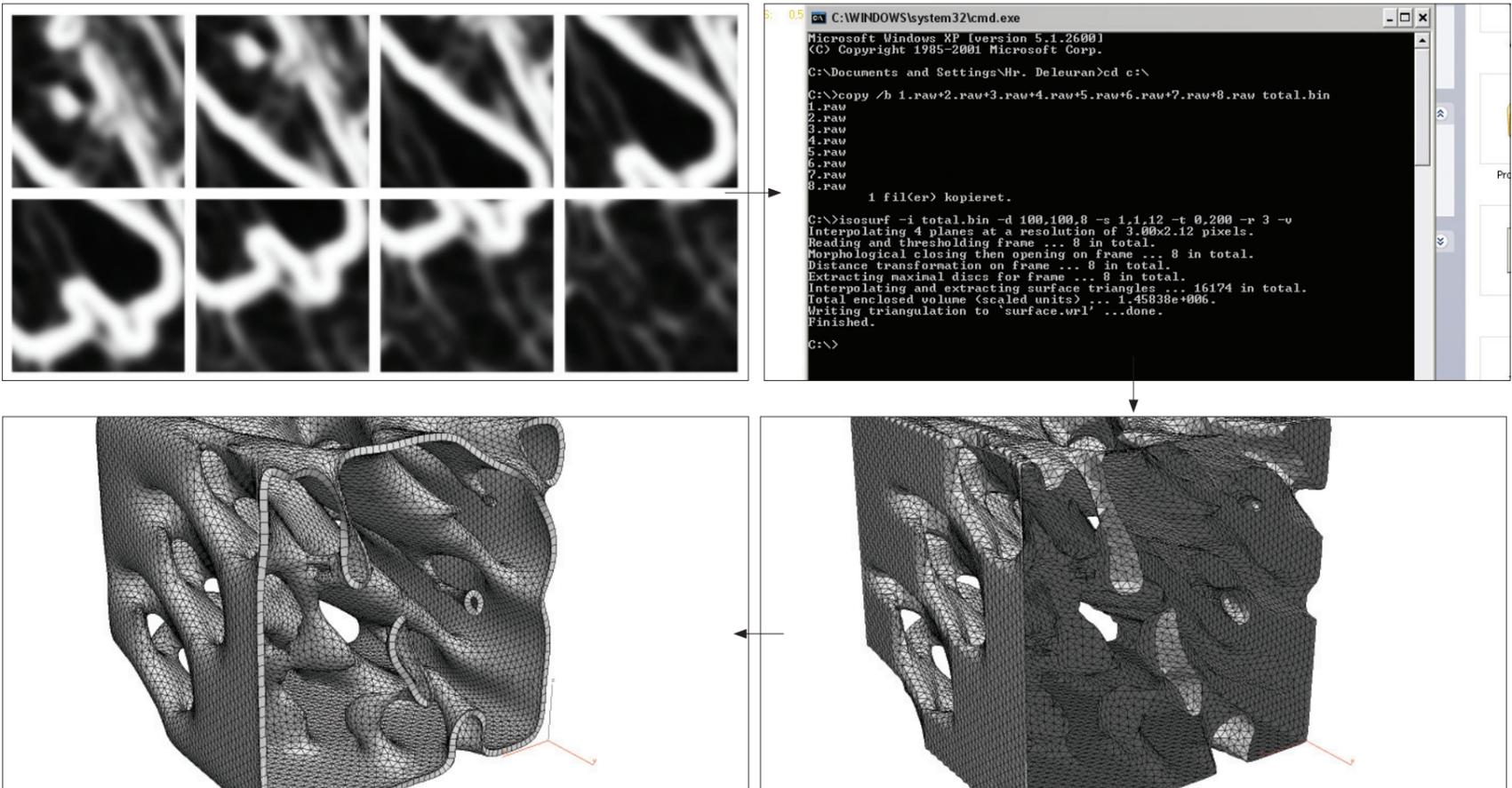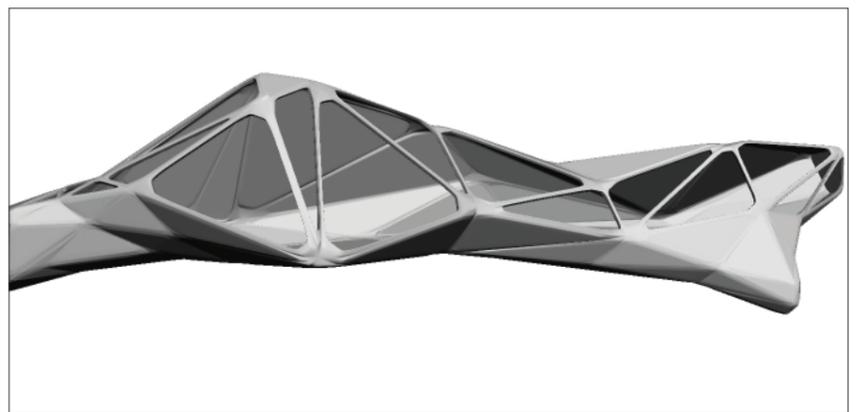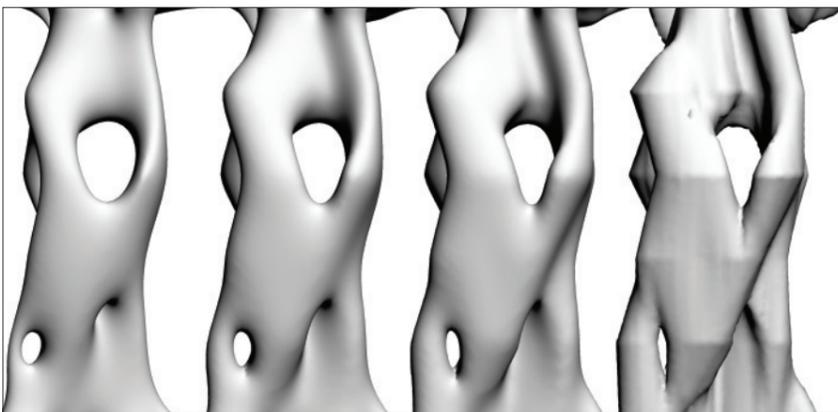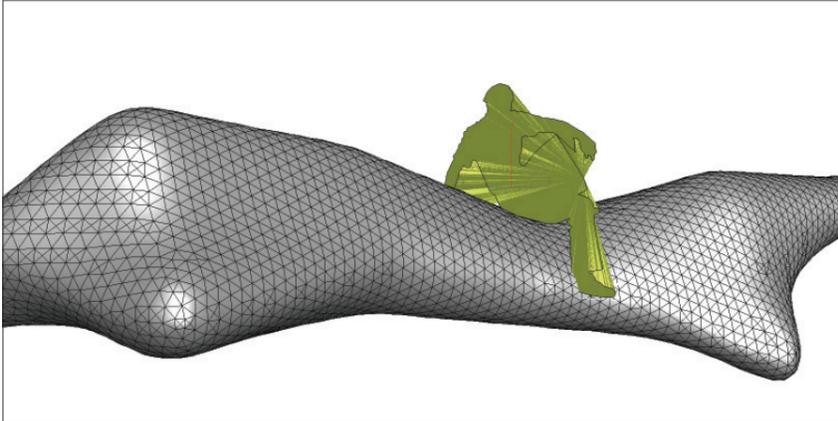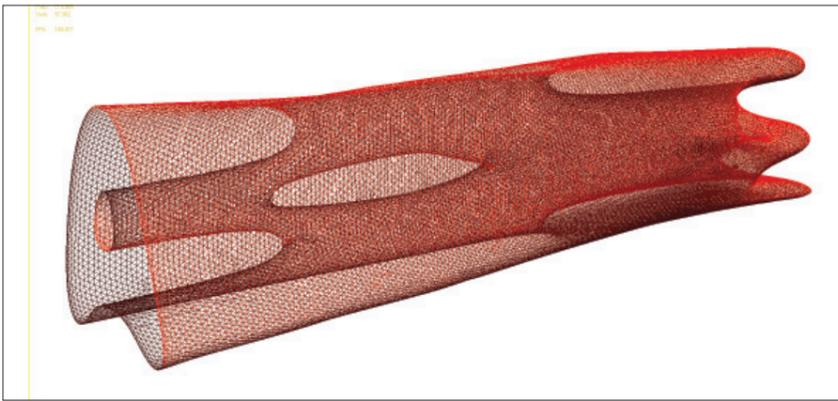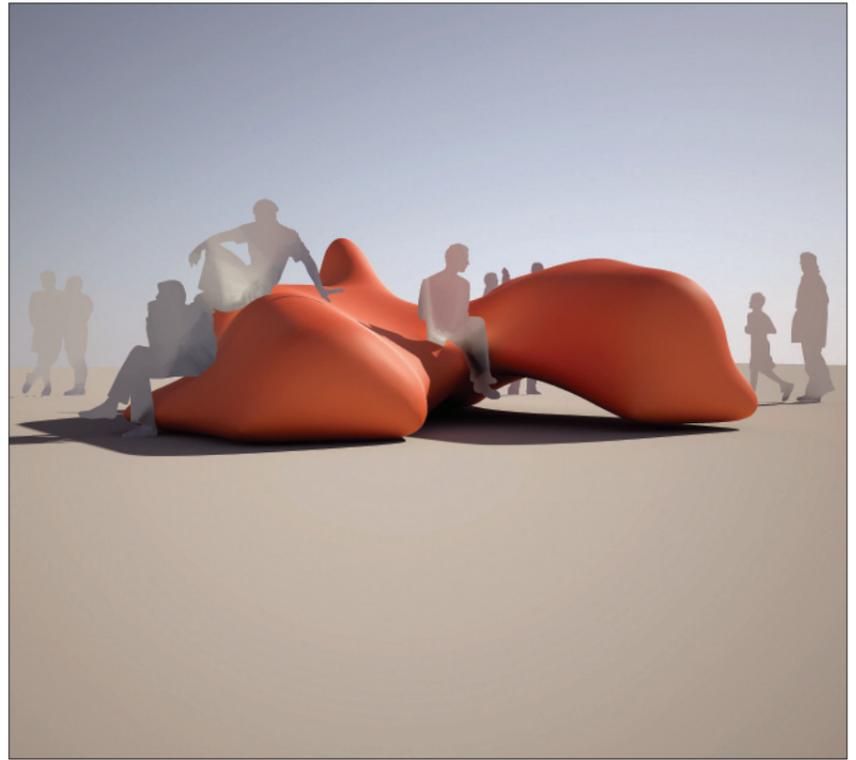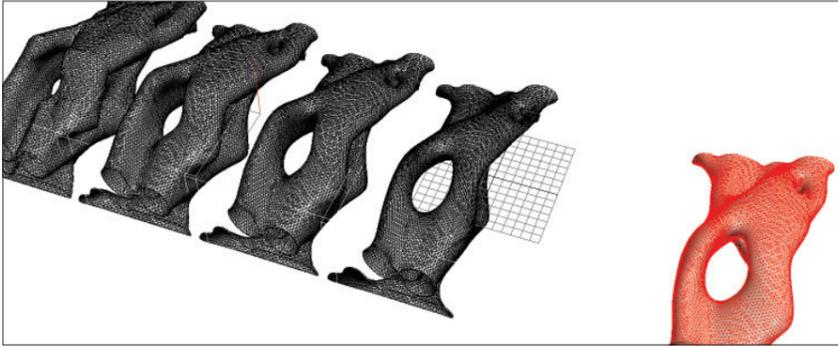
RATIONALIZATION_COMPONENT PROPAGATION_

Component propagation refers to the process of propagating a component (parametric entity) on to a surface in order to rationalize it. These images show some of the experiments performed during the semester in Maya, Rhino and ParaCloud. They all involve some level of scripting which will define how the component is propagated. Naturally the surface affects of an object will have an effect on its performative capacity. So this might a way of approaching it
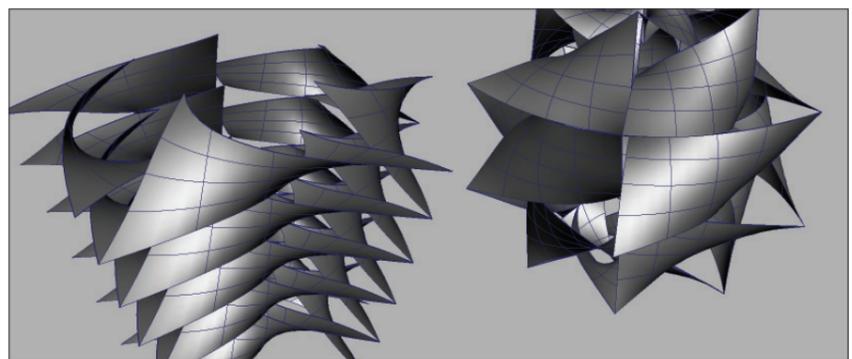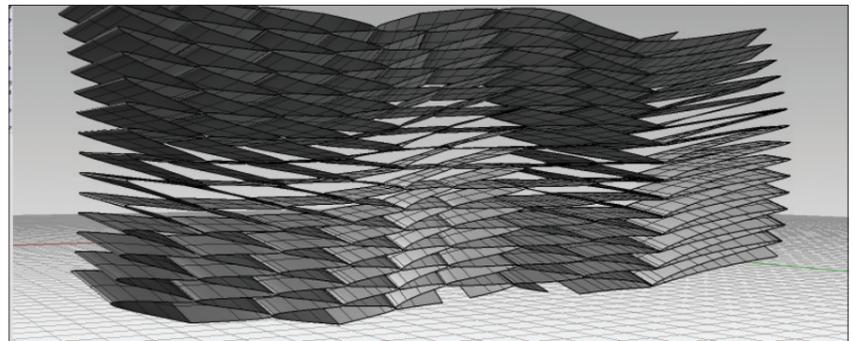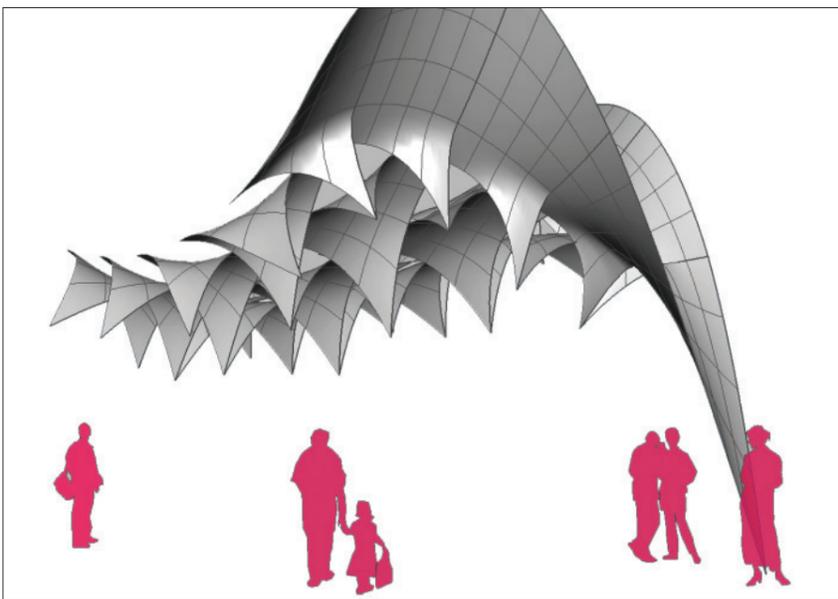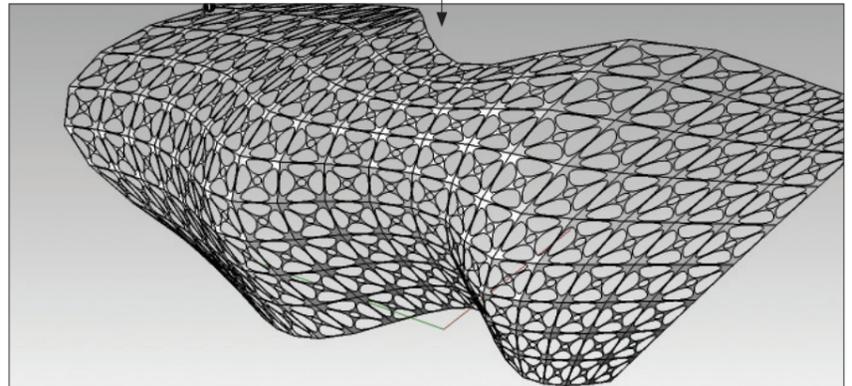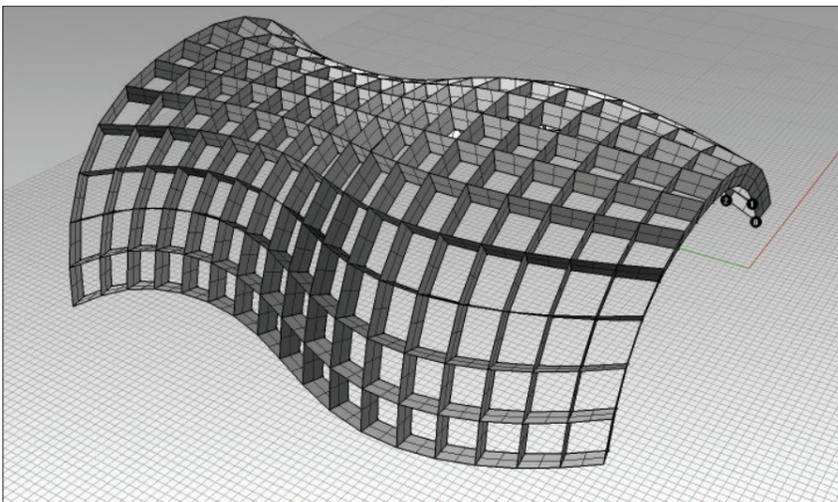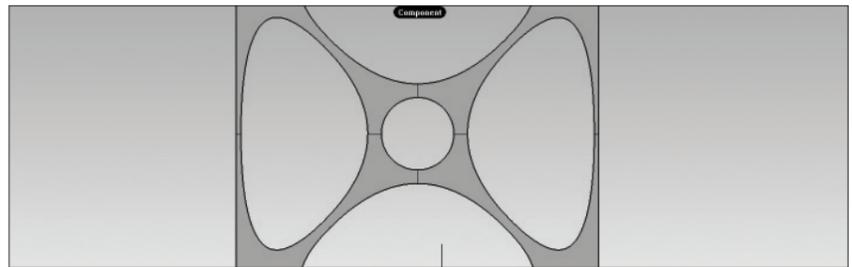
RATIONALIZATION_PARAMETRIC MODELLING_

These experiments were all carried out in 3DS Max or Maya. They seek to explore how standard modelling tools can be used in congruence in order to generate performative material effect such as seen by the beginning Moiré patterns of the lattice structure below. The rationalization of the original geometry are all fully parametric by use of node-history in Maya and by using the modifier stack in 3DS Max. These experiment go to show that by creative use of the tools we already use we do not need Generative Components or similar for simple operations such as these.
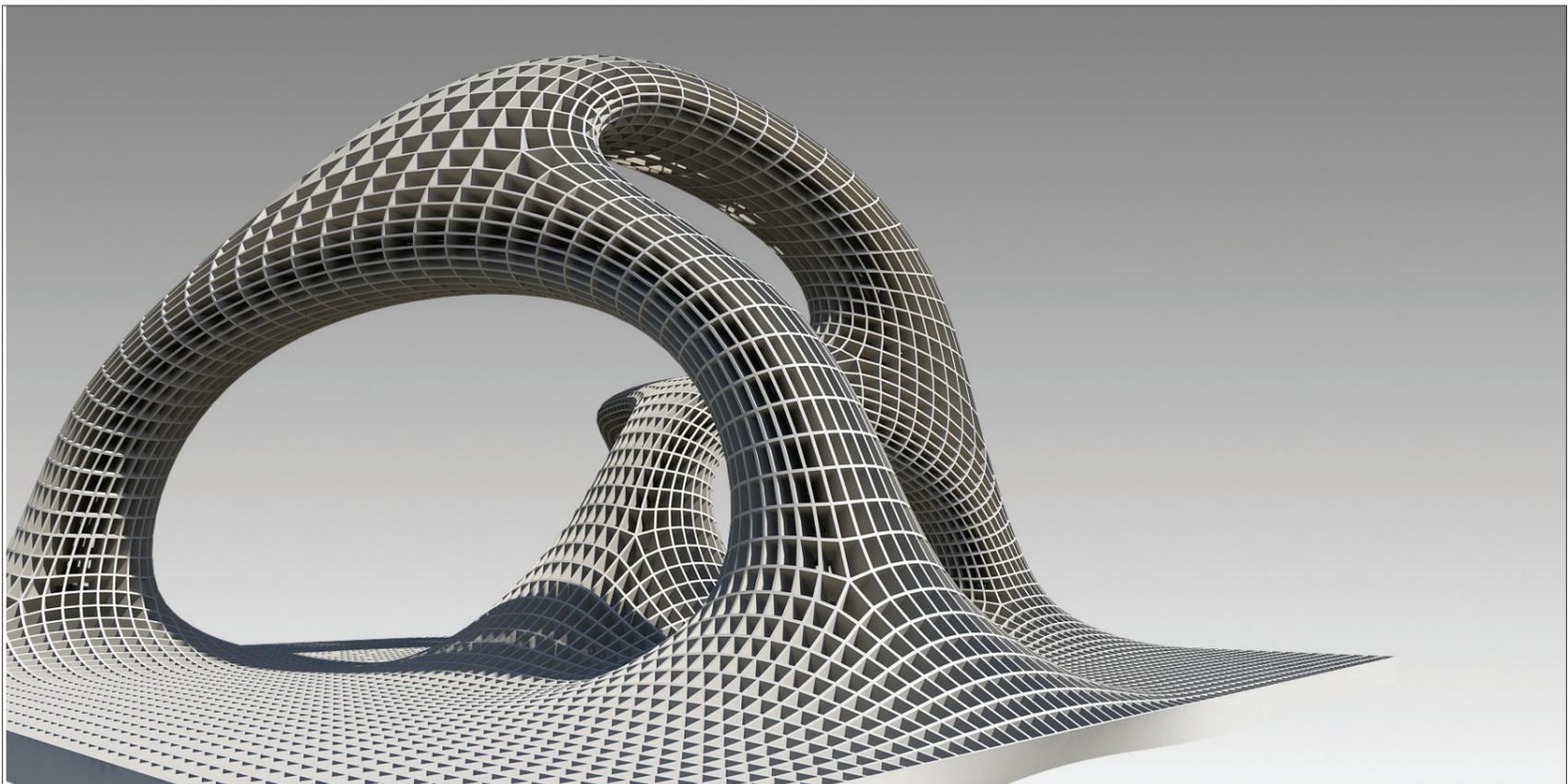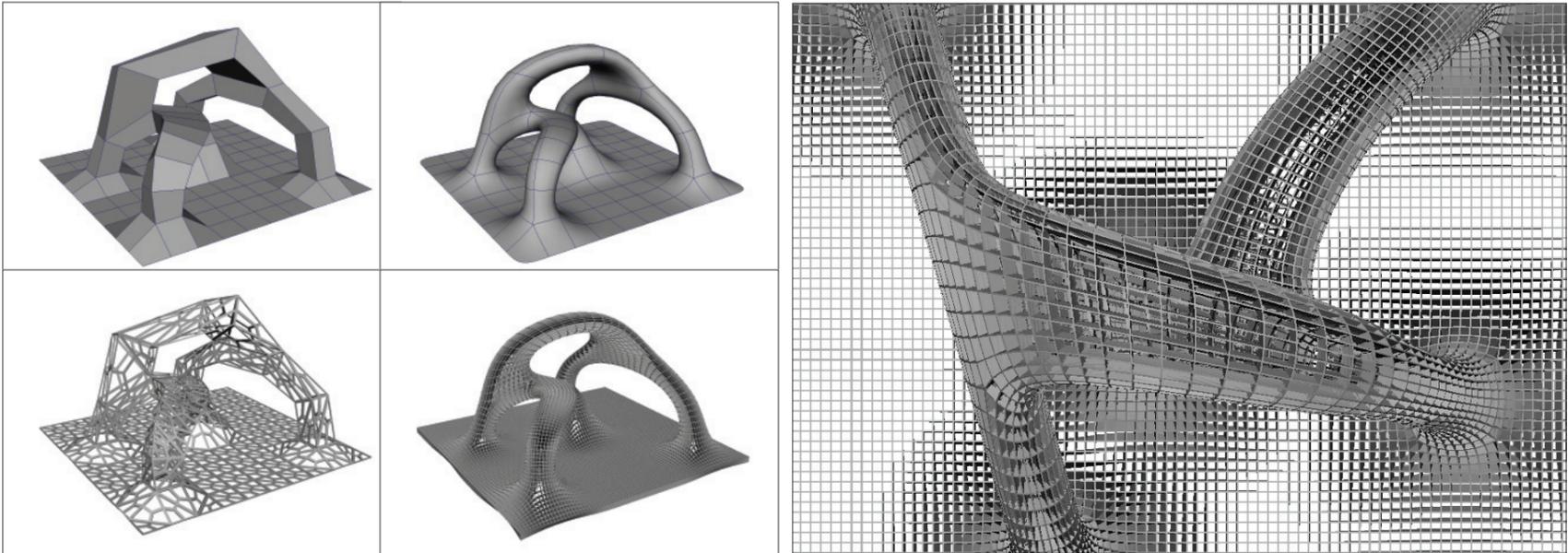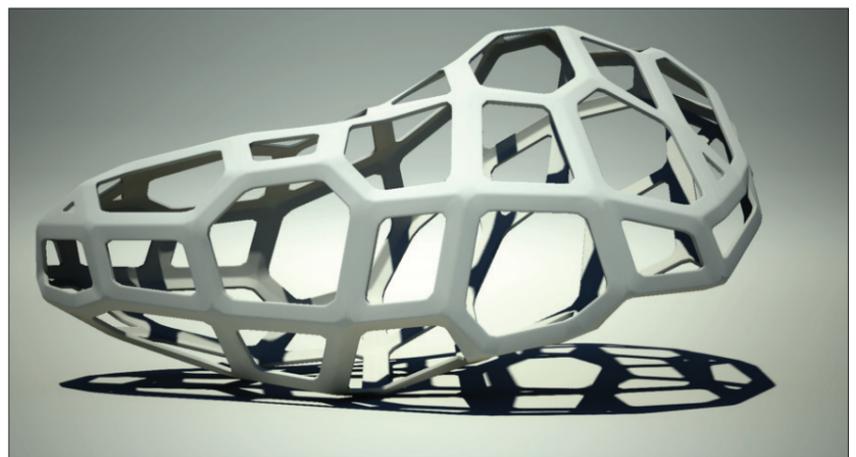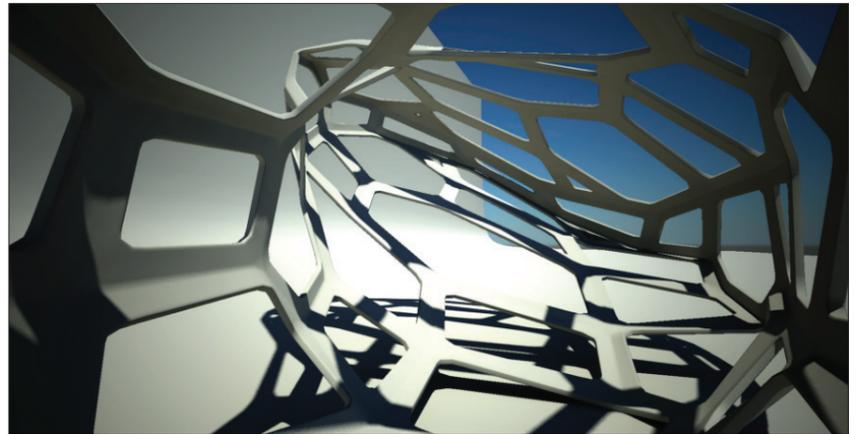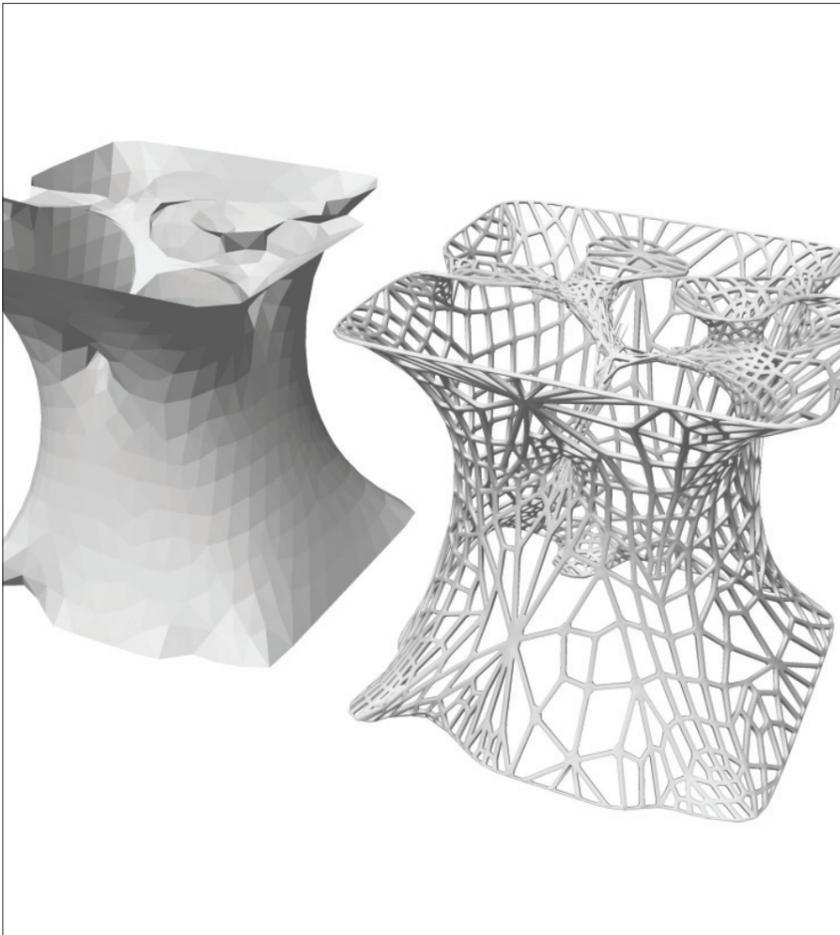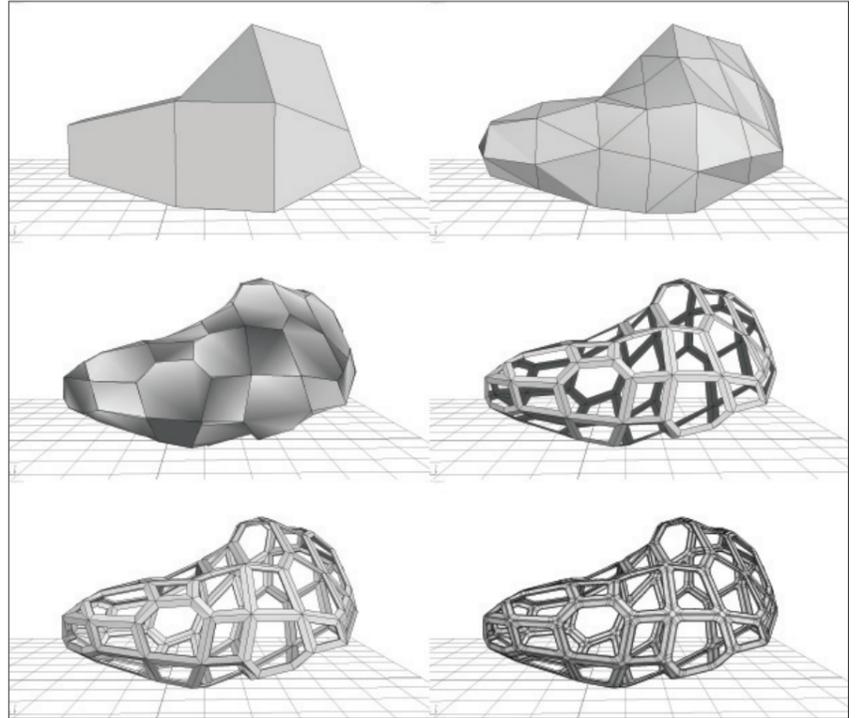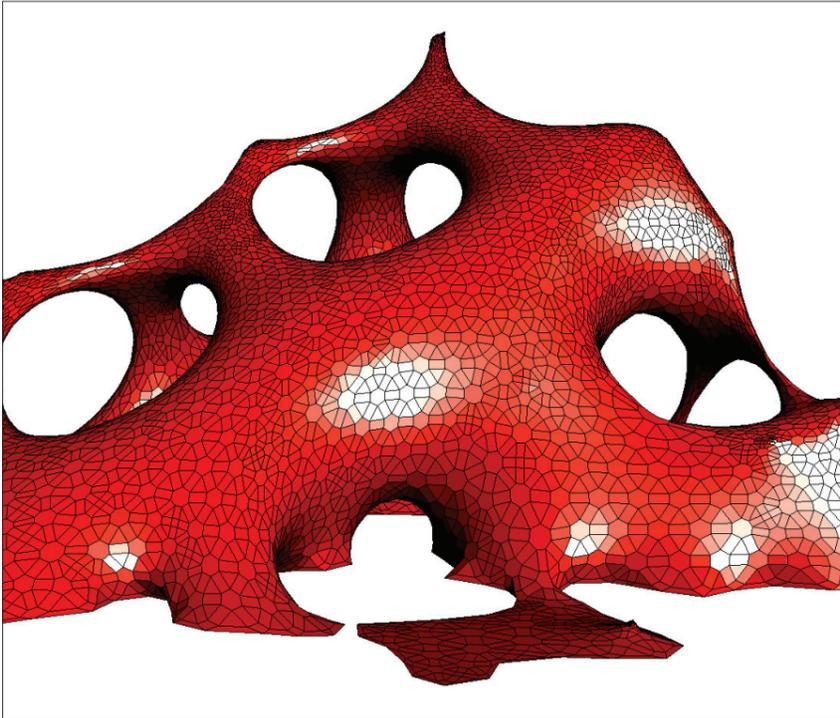
RATIONALIZATION_PARAMETRIC MODELLING_CONTINUED

As for as constructability goes these techniques apply mostly to 3D-printing for models etc. As these shape topologies would be very hard and expensive to pro-duce, unless you are Zaha Hadid.
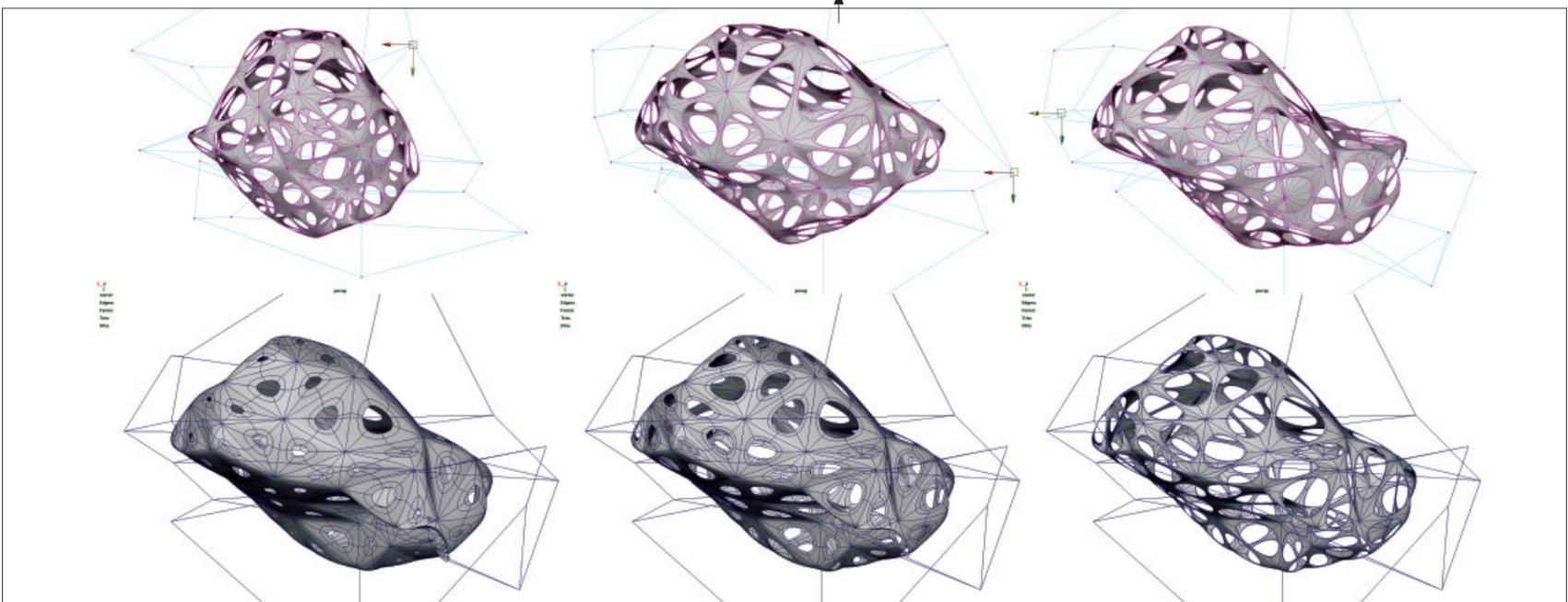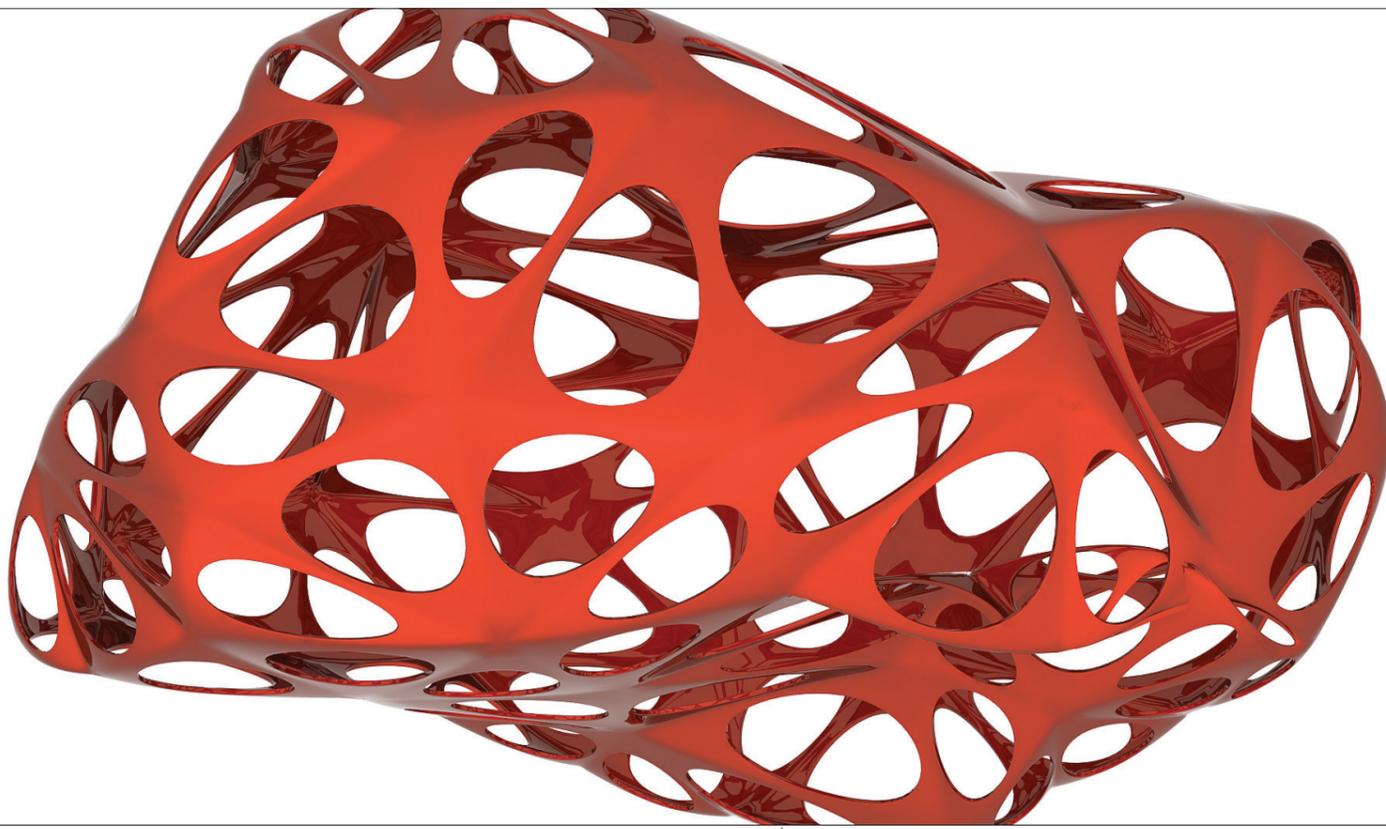
RATIONALIZATION_CONTOURING

Contouring is a rationalization technique in which a geometry is sectionalizes and the resulting curves are used for generating a structural system. During the process of the semester this technique proved to have several excellent characteristics. Firstly it very apt at describing an essentially very complex geometry by the use of planar fabrication strategies, this include high-genus topology (to see more on this subject refer to the appendix). Secondly, the structural qualities of the ribs mean that the formation will need no additional structure, only brackets or spacers between the ribs. Thirdly, the overlapping patterns off the ribs generate a moiré effect. That is the interference pattern created, for example, when two grids are overlaid at an angle (Wikipedia). This in inherently performative material effect based on the movement of the viewer, as per earlier described in connection to NOX's Maison Folie project. For all these reasons contouring might be the best alternative of rationalization so far in the report.
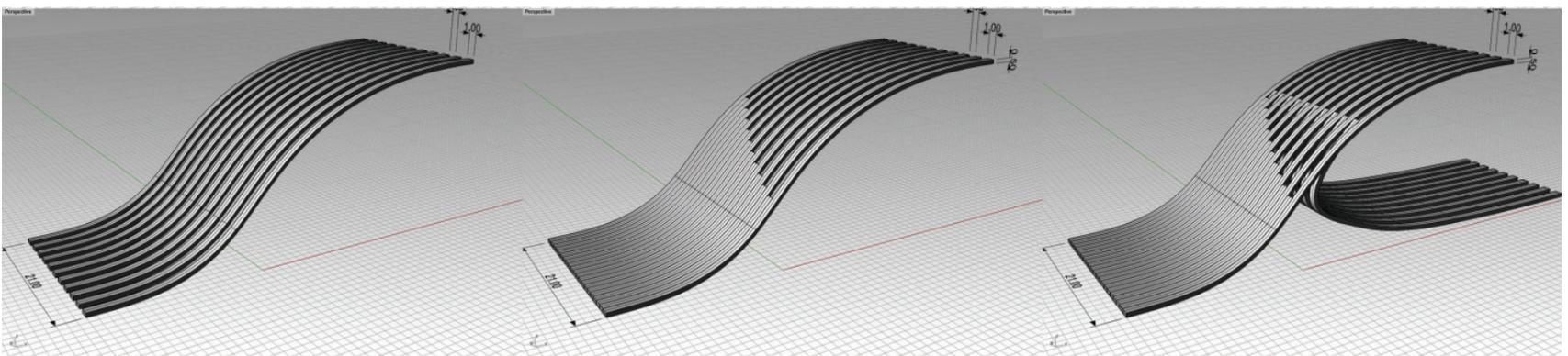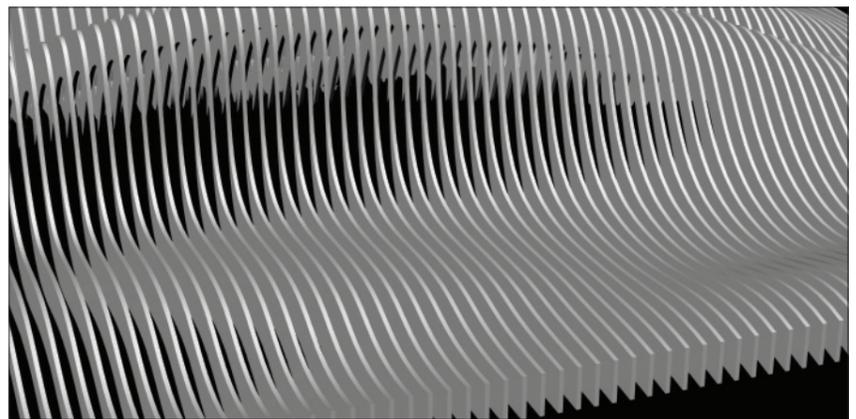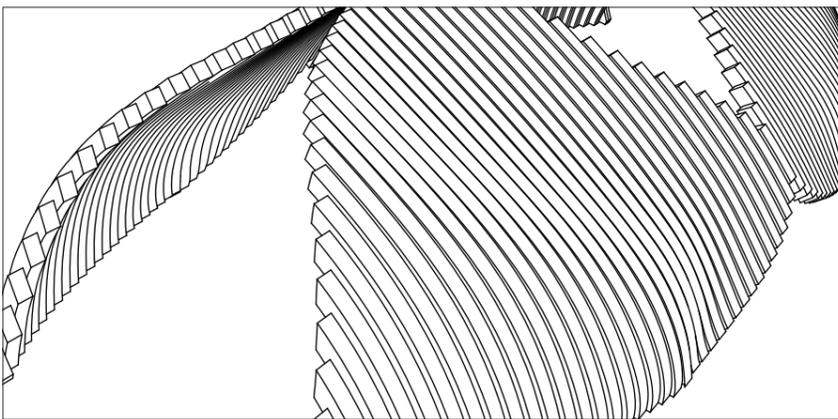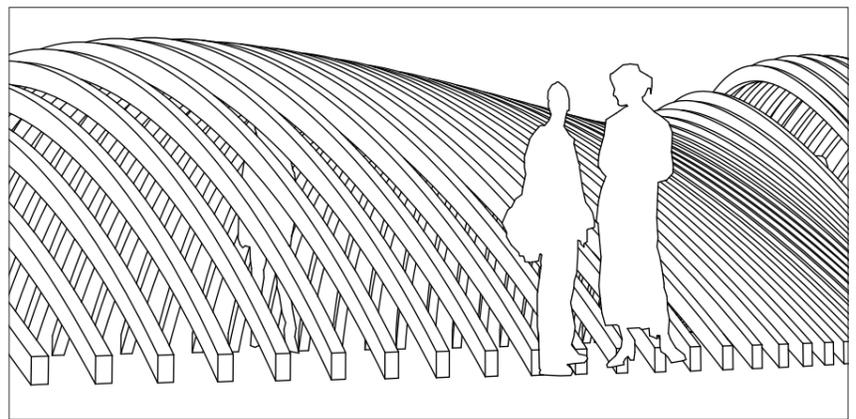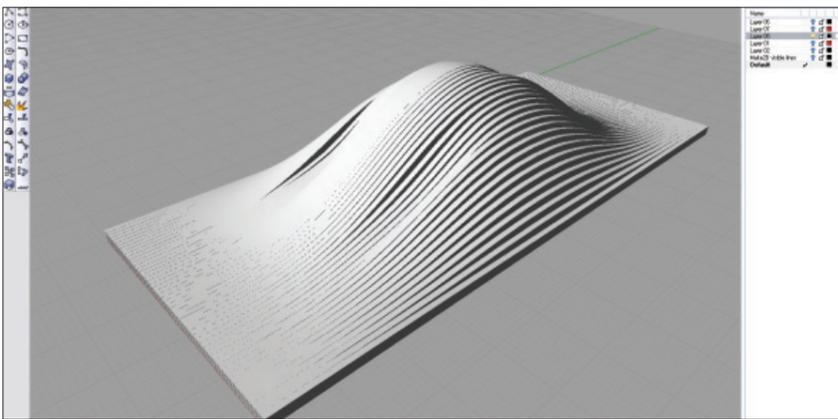
RAPID PROTOTYPING_DEVELOPABLE SURFACES_

"A developable surface is a surface with zero Gaussian curvature. That is, it is "surface" that can be flattened onto a plane without distortion (i.e. "stretching" or "compressing")" (wikipedia). What this means for designers and architects is that a developable surface can be fabricated using sheet material, therefore making manufacturing considerably cheaper than double curved surfaces. Rhino has a command and a plug-in for generating developable surfaces via lofting between curves. This experiment was the first of the five rapid prototyping experiments during the semester.

The initial surface is generated by converting an array of curves to soft-bodies in Maya and subjecting them to a number of fields. As the system mobilizes the curves are imported to Rhino and individually lofted using the loft command with the developable surface option checked. Then the lofts are unrolled into strips that can be printed, cut and assembled using tape.

As one can tell the prototype does not look exactly like the digital model, this was due to a mistake made during unrolling, namely the correct labeling of the strips. Creating developable surface structures is not as simple as it appears. It is however still a valid technique for fabricating complex surfaces.
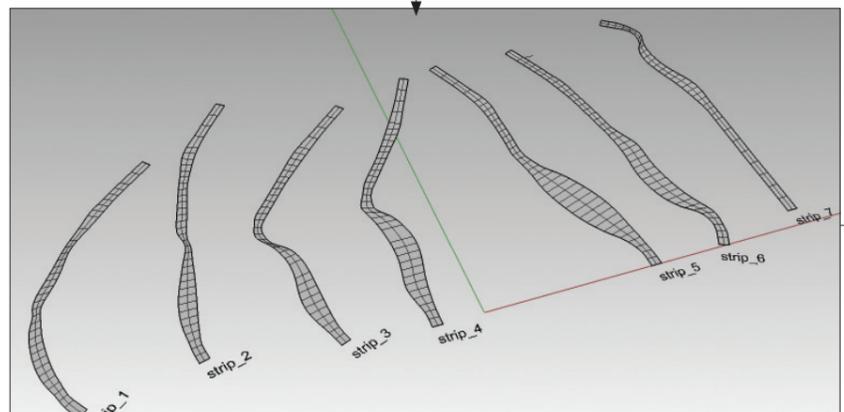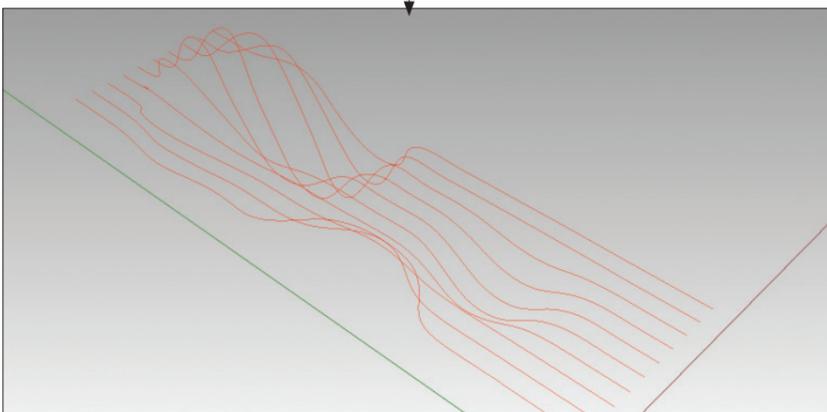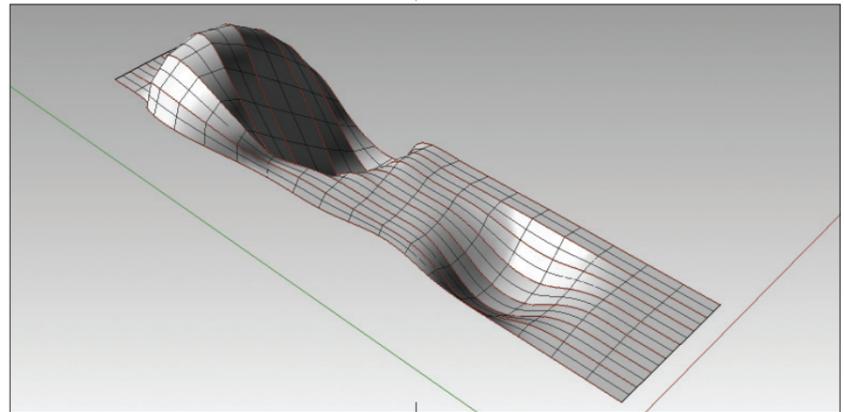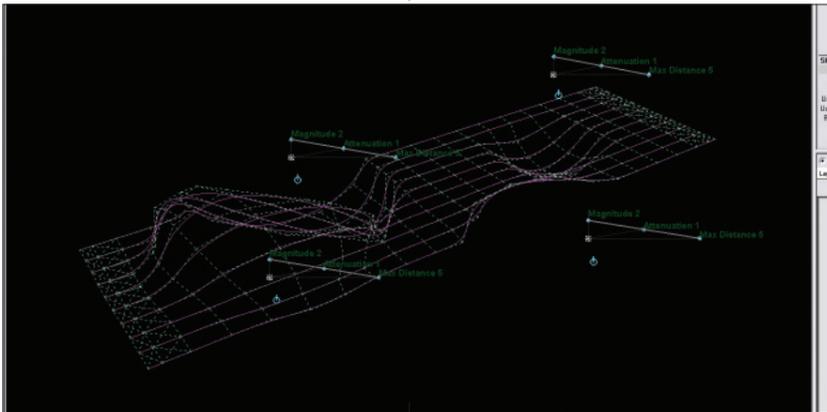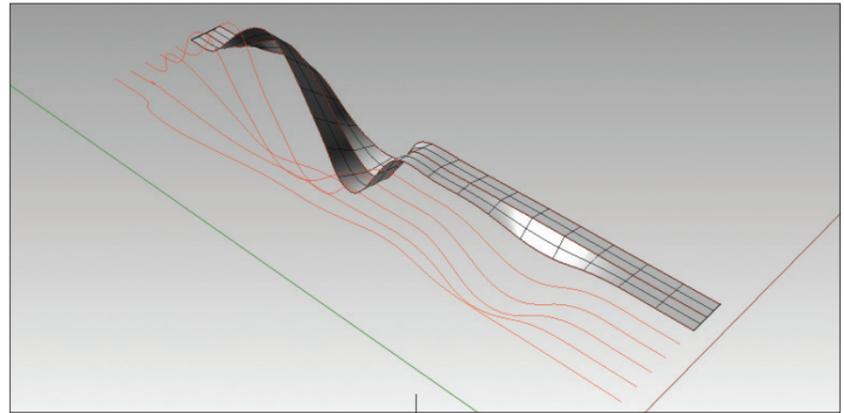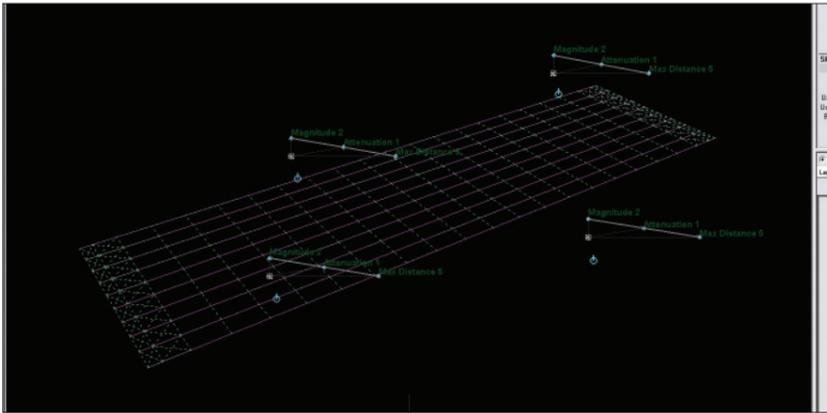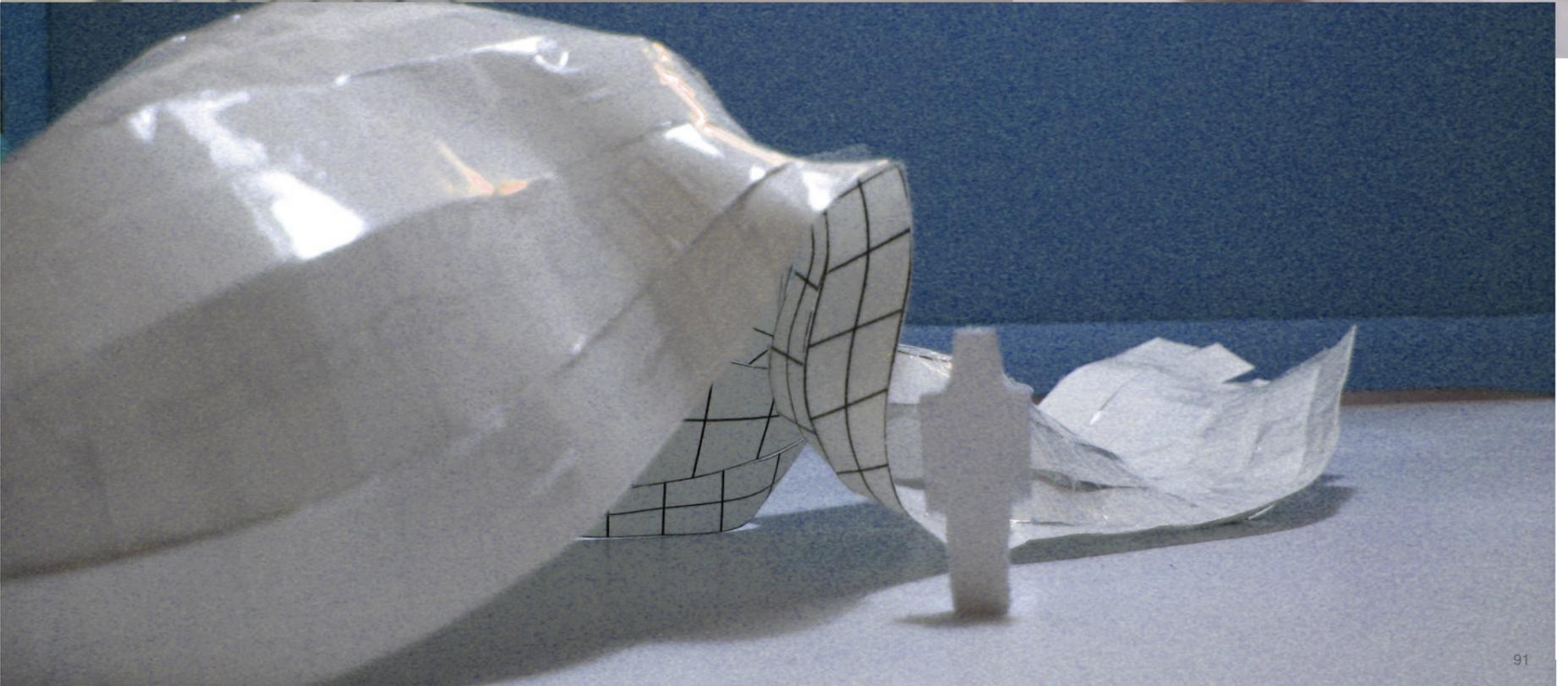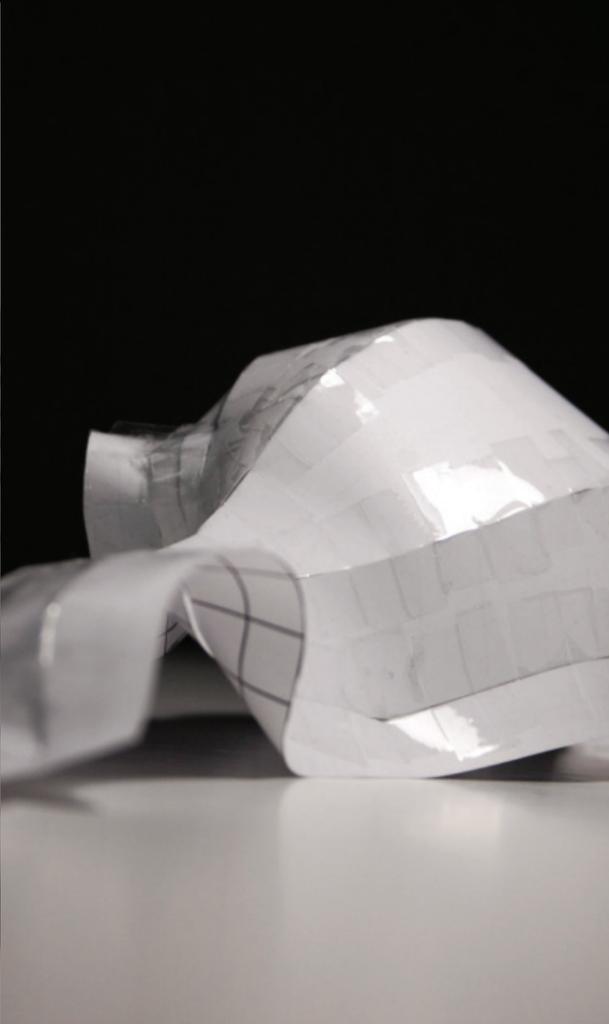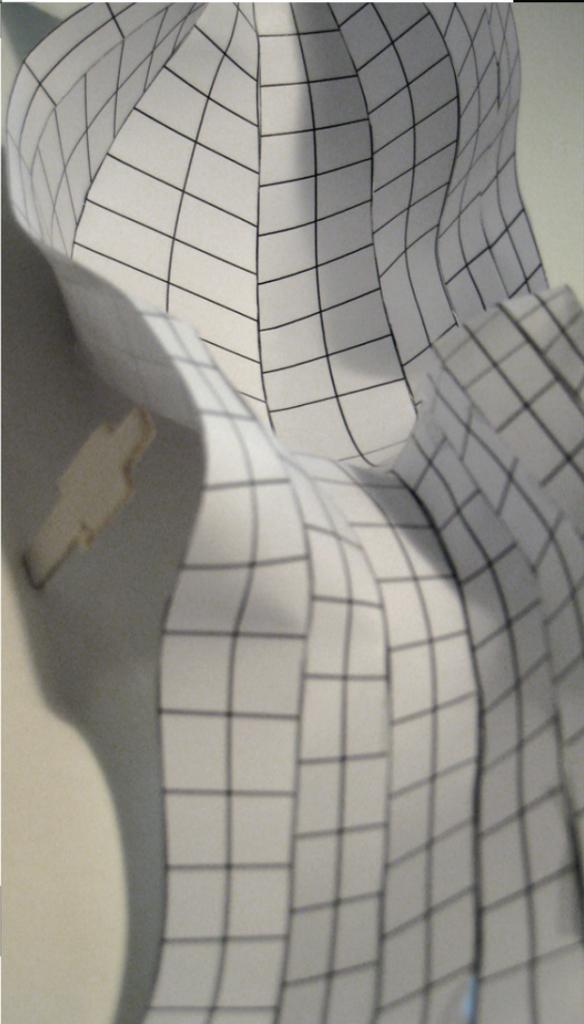
RAPID PROTOTYPING_HAIR SYSTEM TO SOLID_

This experiment was the first attempt at using the CNC-milling machine. To make it a bit more interesting a hair-system was set up in Maya in order to generate a surface that was complex, but still simple enough to be milled using 3-axis tooling.

The surface was taken into Rhino in order to solidify it and export to the milling software Visual Mill. Here tooling paths were programmed and simulated before sending the file to the milling machine.

The experience of milling something for the first was actually quite invigorating. Having using many 3D packages over the past years there was something quite weird about the object suddenly being "real".
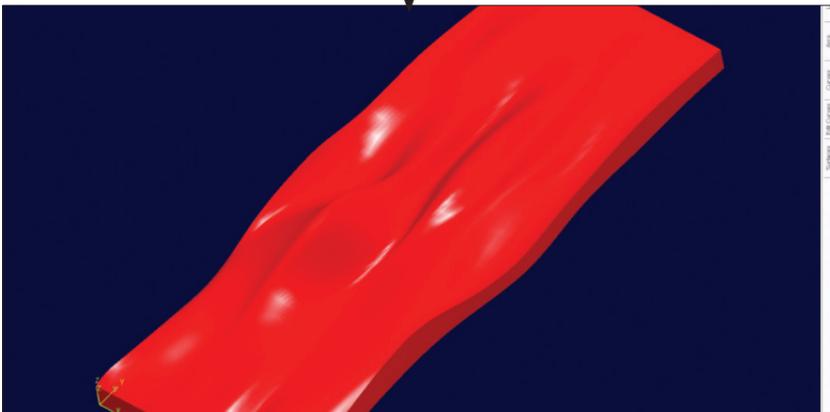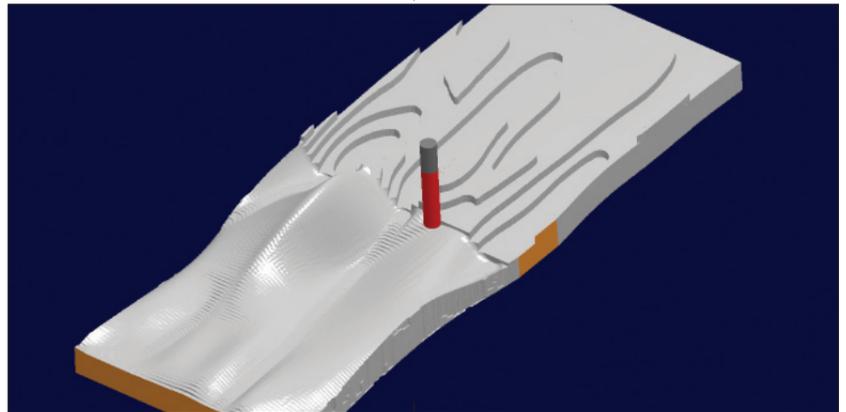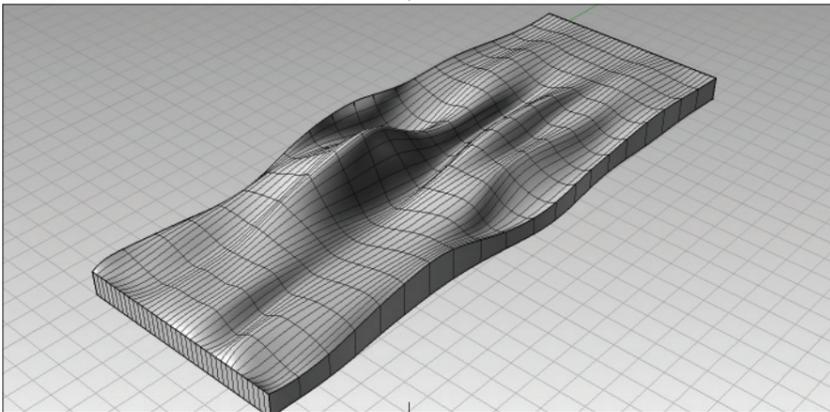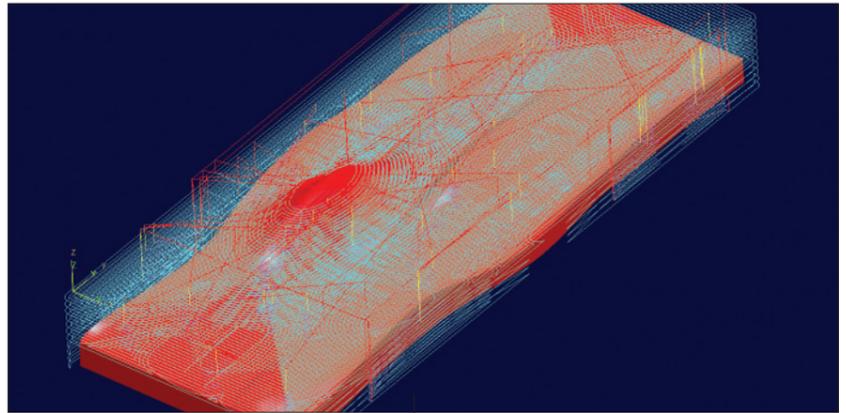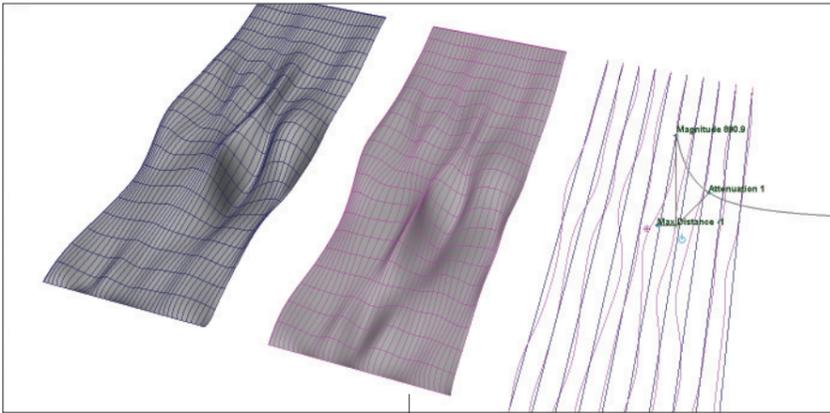
RAPID PROTOTYPING_VORONOI WALL_

The Voronoi wall was primarily created to test out the tolerance level of the milling machine and its tooling bits. That is, if the individual component would fit when assembled, like a puzzle. Furthermore is was an attempt at using the milling machine like a laser-cutter. Which means that the tooling bit would have to go all the way through the material into the underlying material holding it in place. Something that turned out to be rather problematic.
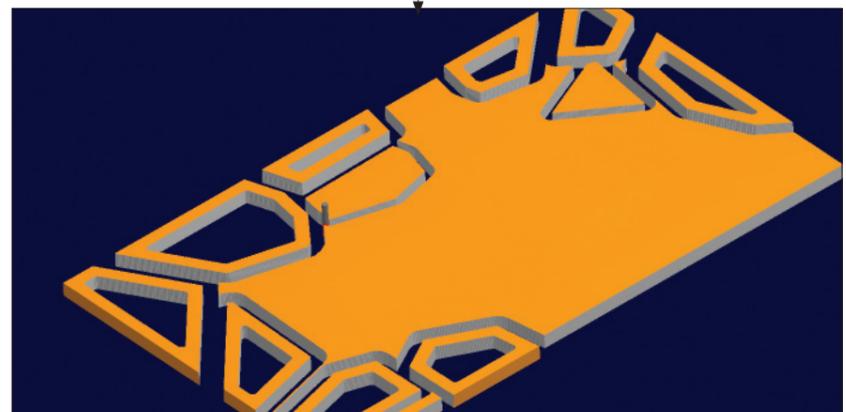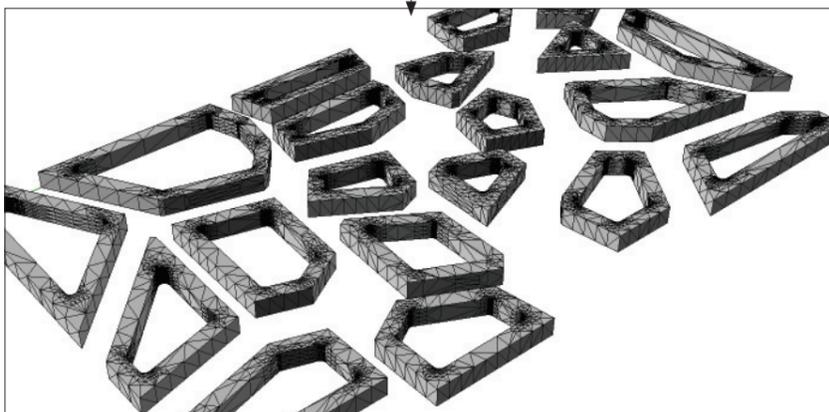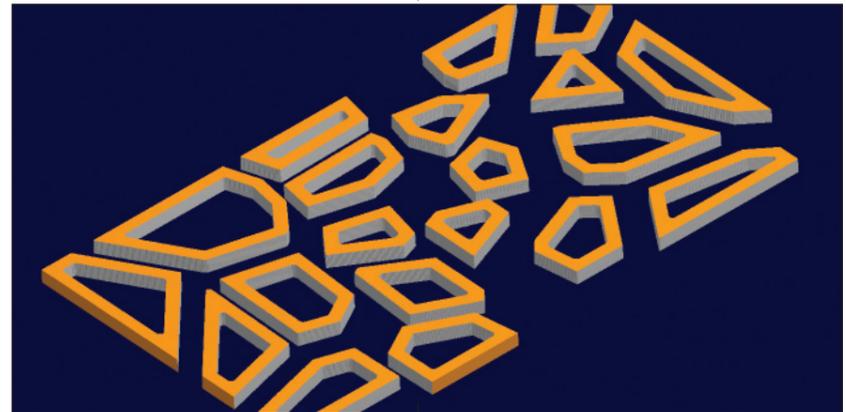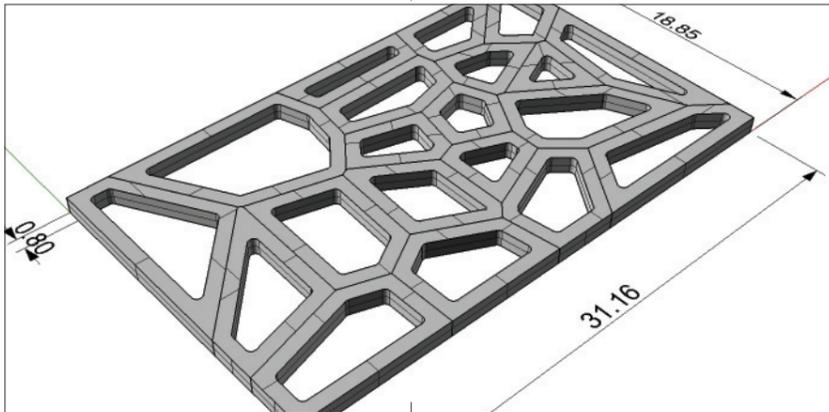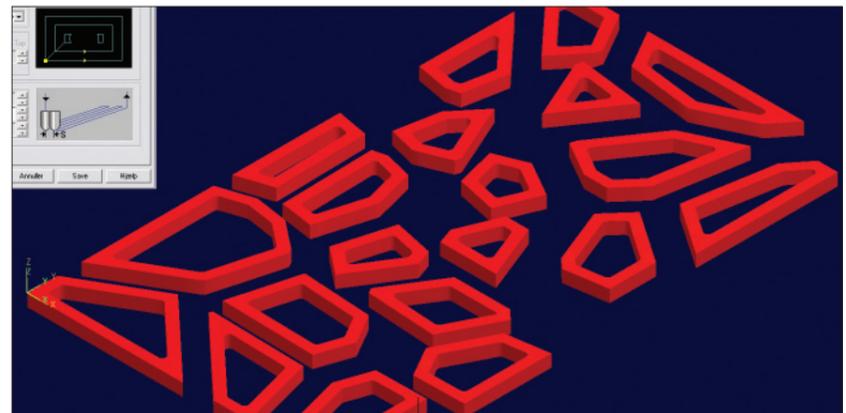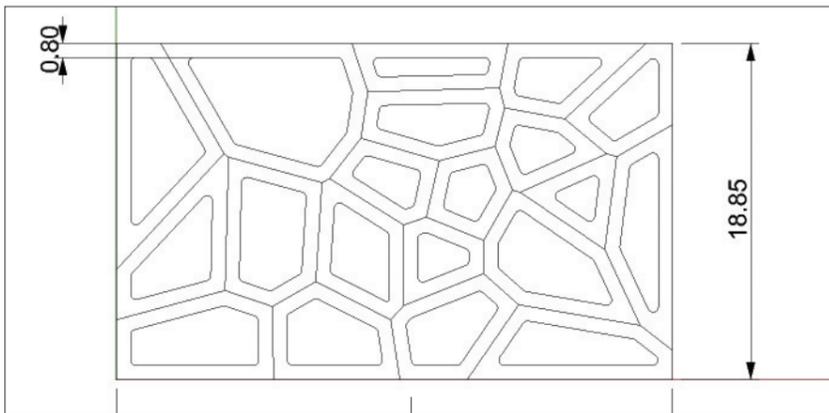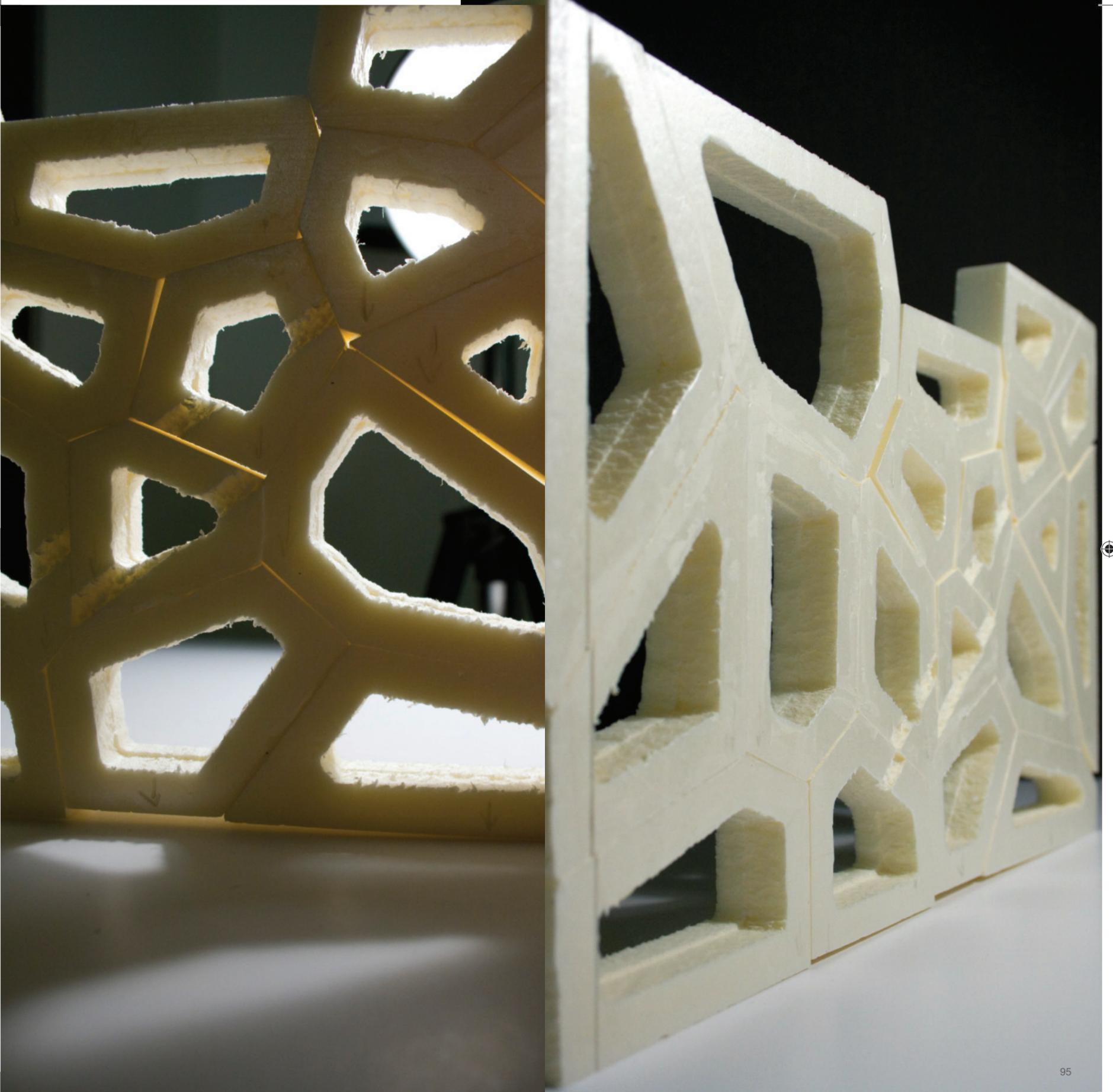
RAPID PROTOTYPING__KNUCKLE-BOY_

This experiment was an attempt at prototyping geometries of higher complexity and genus. This was tricky as the geometry had to be split into several parts, and even then you would not be able to get in everywhere with the tooling bit due to the limitations of 3-axis milling.

This particular Isosurface had also seemed to gather some affection during the project, referred to in its file-name as "knuckle-boy". Perhaps this is the product of my interest in topological geometries, or simply that this Isosurface also seemed to connect strongly to Ali Rahim's concepts of "affordances" and "catalytic formations". The surface was generated through the tomographic sectioning of particle system, however this system setup was merely a test to try out the technique. I guess that makes the "Knuckle-boy" what earlier was described as a "happy accident".
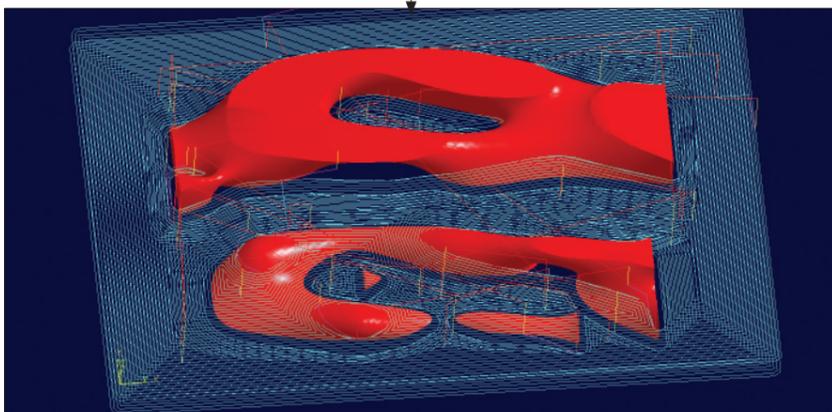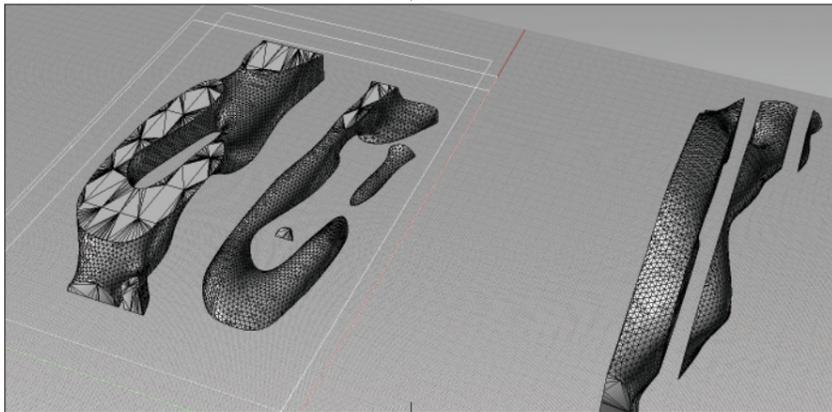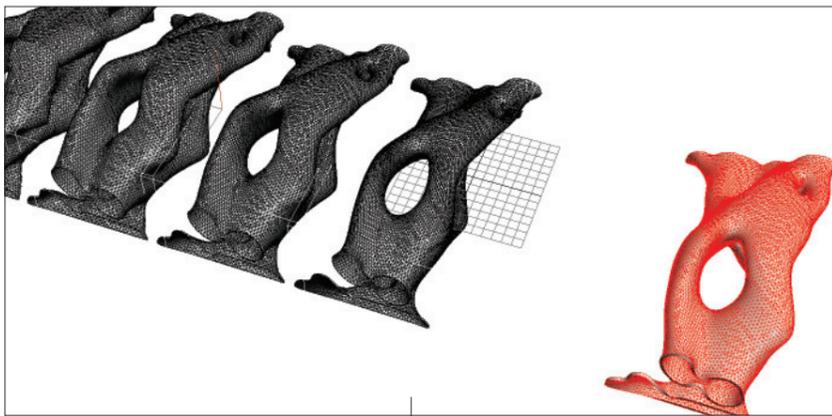
DIGITAL PROTOTYPING OF RESPONSIVE ENVIRONMENTS

As stated earlier one of the goals of the project was to test out the prototyping of responsive environments and objects by using Maya, 3DS Max etc. Besides the techniques we have already gone through, a number of very specific techniques were developed to aid in testing out concepts that were concocted in cooperation with by Bo Stjerne Thomsen and Esben Skouboe Poulsen in a number of joint sessions.

Specifically these concepts centred on two overall aspects:

1) The use of old bicycles and caravans as performative elements in the first stages of the overall research project.

2) The use of proximity sensitive actuators which would enable the testing of "moving surfaces" that perform by its relative distance to the people in the area.

In this section we will briefly go through the techniques which were developed in this conncection.
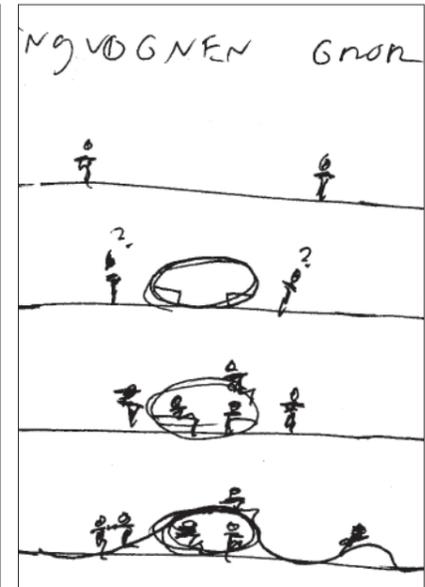
BICYCLE AGGREGATIONS AND CARAVANS!

On a direct play on the term "bicycle aggregation" from the site-registration we decided that it might be funny if we literally go a bunch of old bicycles and caravans and scattered them around the site. The reasoning for this has long since passed, but it did provide some quite interesting design challenges such as figuring out how to "aggregate the bicycle frame. In these sketches a simply particle system is used upon which the frame is instanced in order to generate the aggregation. Besides this an array of frames were converted to rigid bodies and simply dumped on one of the caravans by connecting them to a gravity field. Good times indeed :)
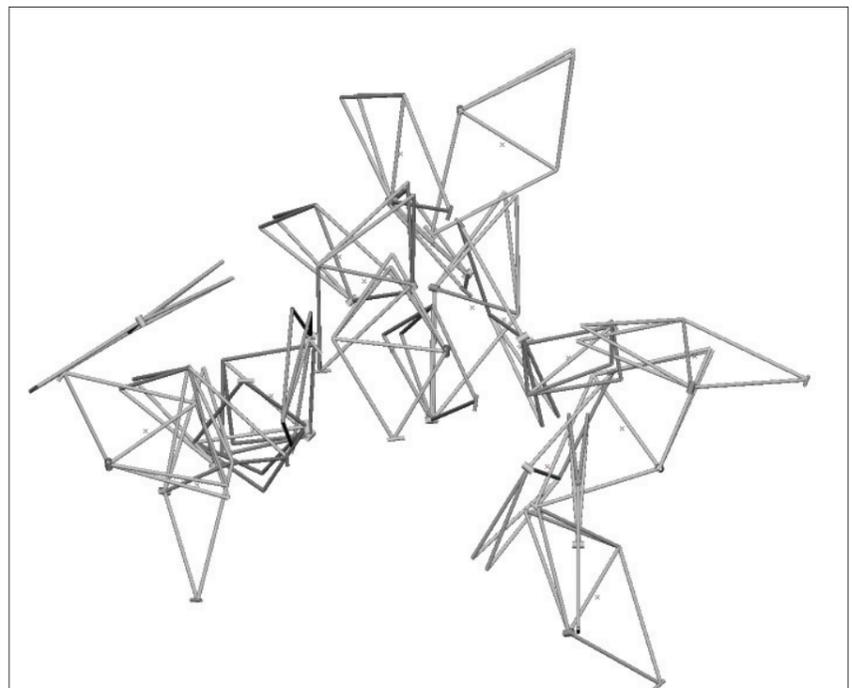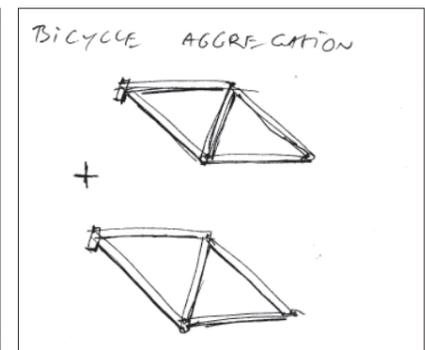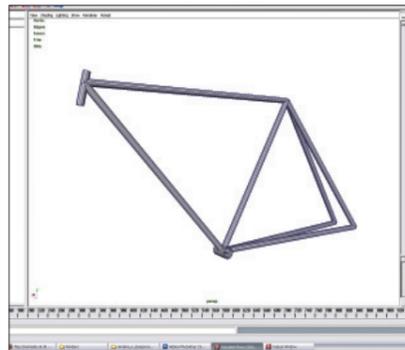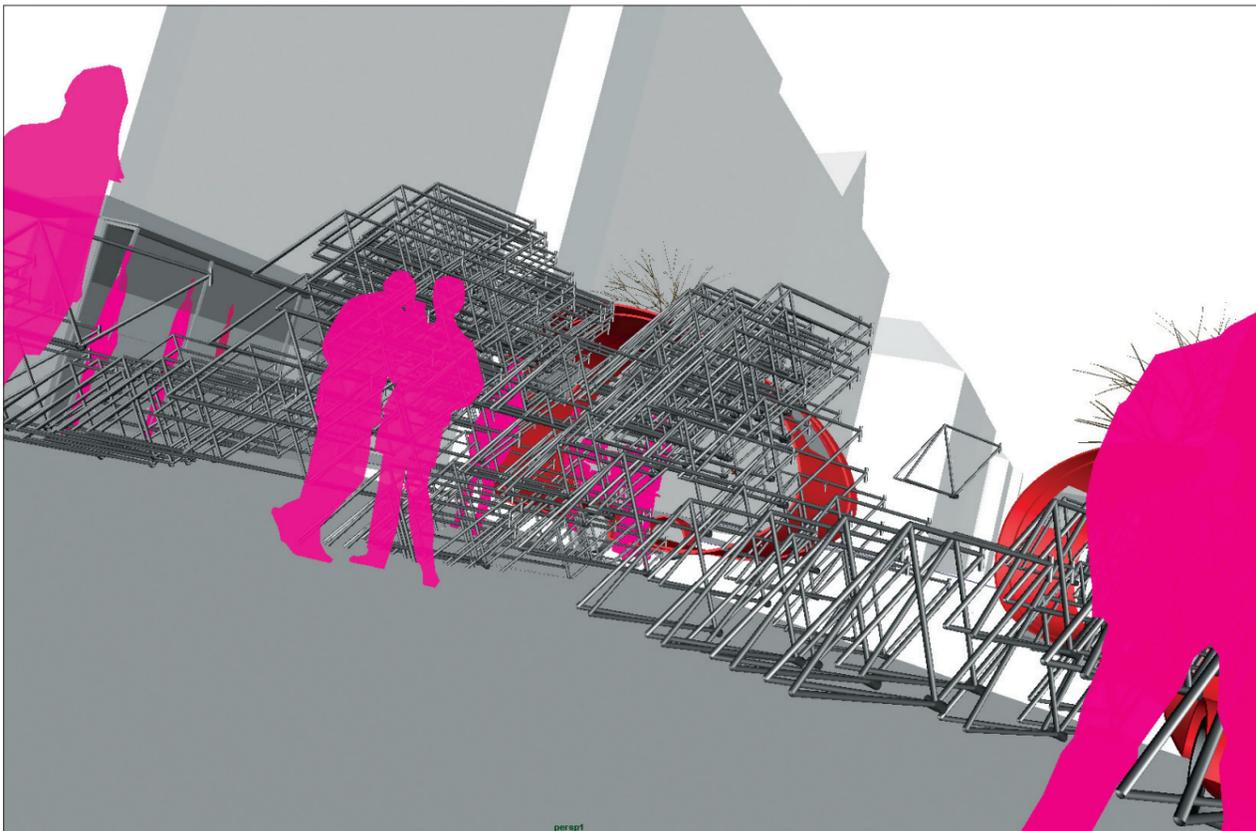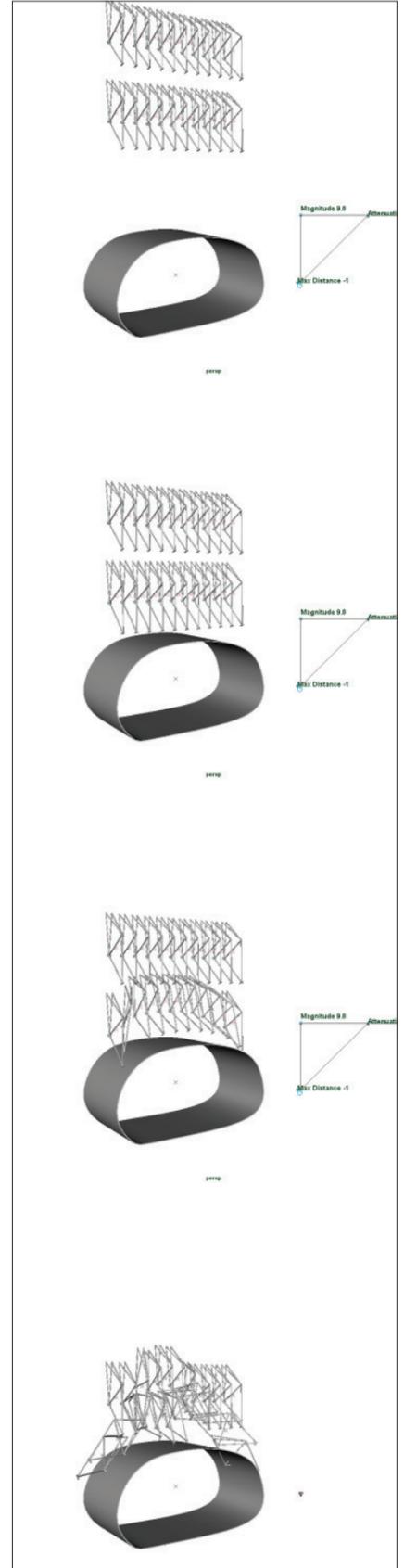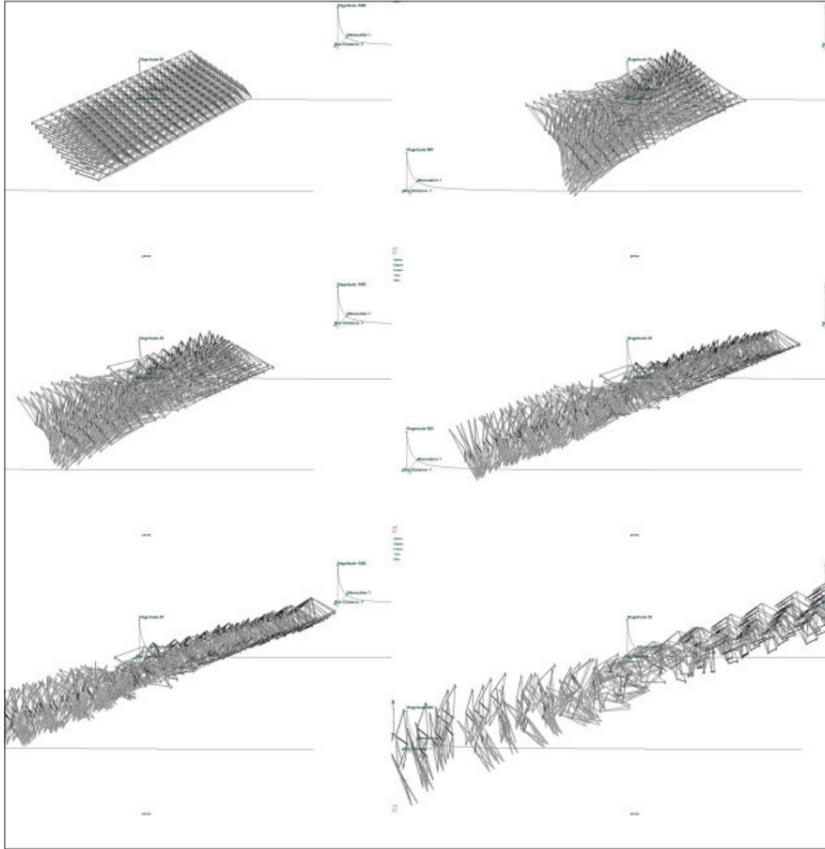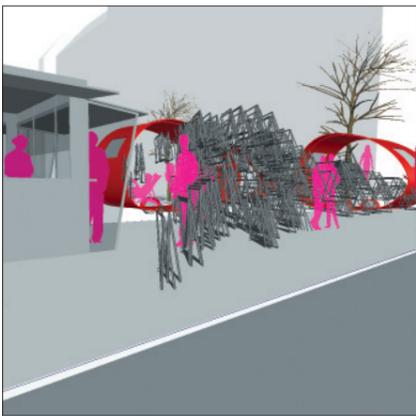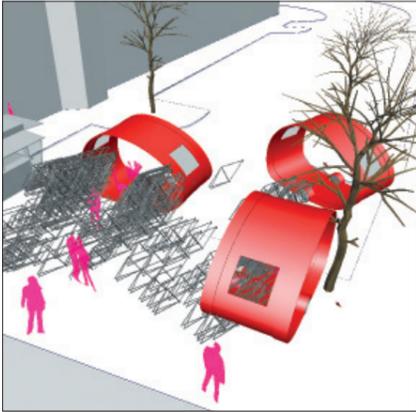
ACTUATED BRICK SYSTEM V.1.0

This first version of the actuated brick system was not driven by proximity, but by inverse gravity fields and a sine-curve deformer. This was to test out the surface effects of an actuated system.


Brick_System_Frame:00

Brick_System_Frame:10

Brick_System_Frame:20

Brick_System_Frame:30
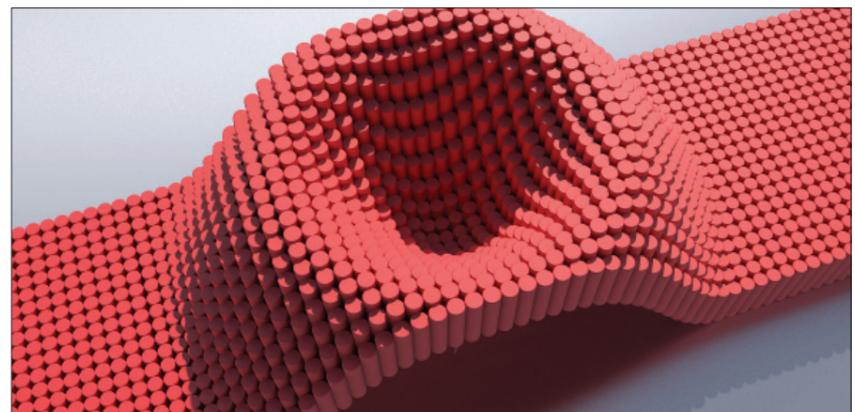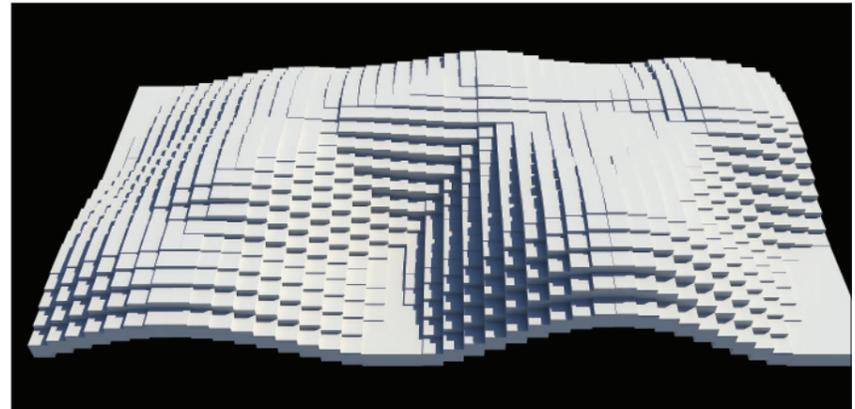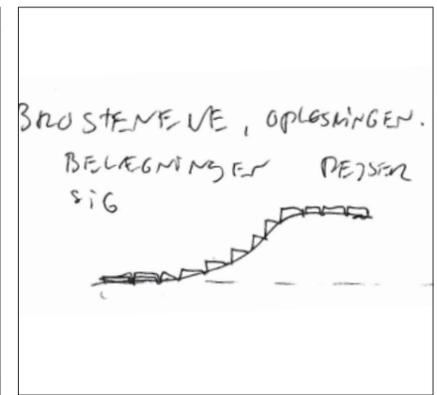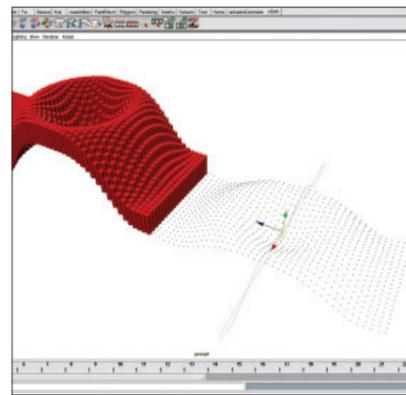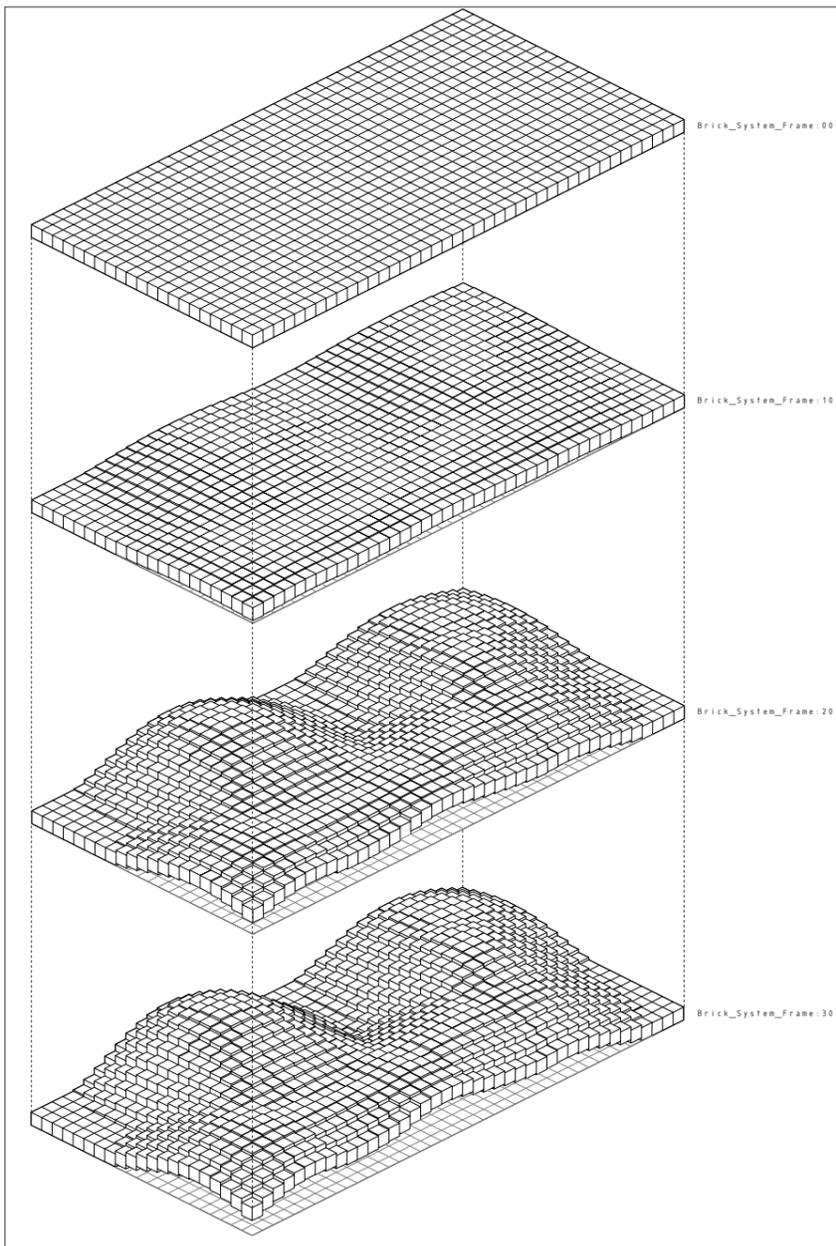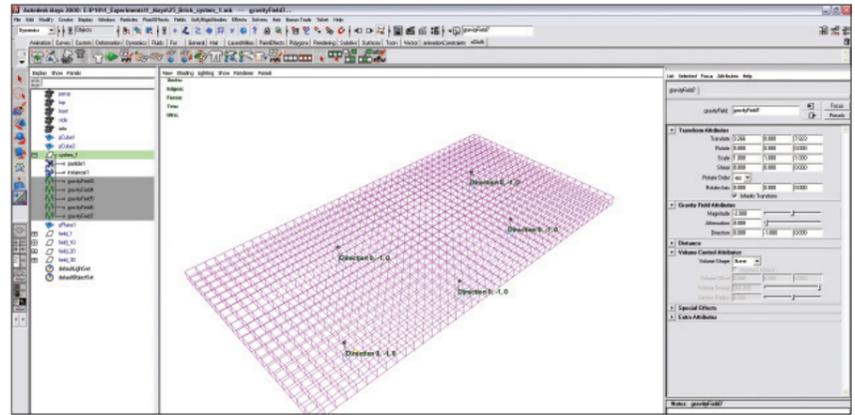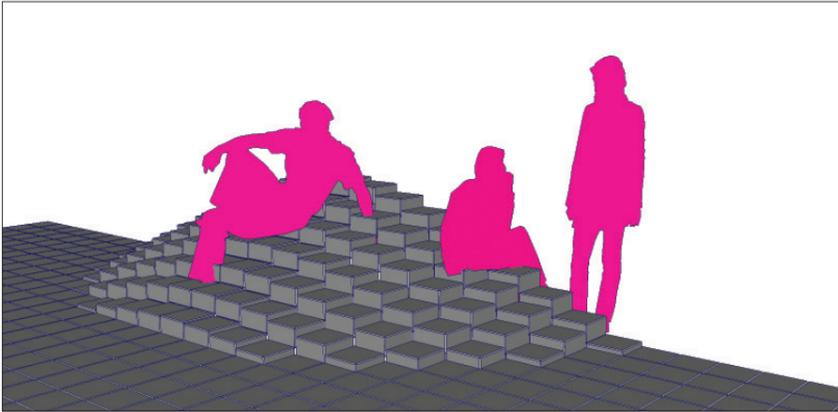
ACTUATED BRICK SYSTEM V.2.0

In this next version of the actuated brick system proximity driven behaivour was added to the system. This was accomplished by using a number of different parametric animation tools in conjunction such as "driven keys", expressions (via MEL-scripting), attribute holders and a distance node.

The spheres acts as drivers of the actuation, as they get within a certain radius the individual actuator will start pushing up the brick, generating an over gradient effect in the field of bricks. This however also makes this system pretty problematic, how would get onto to it, what if moves as you are on it etc.?

In this iteration a Voronoi variation of the concept was also produced.
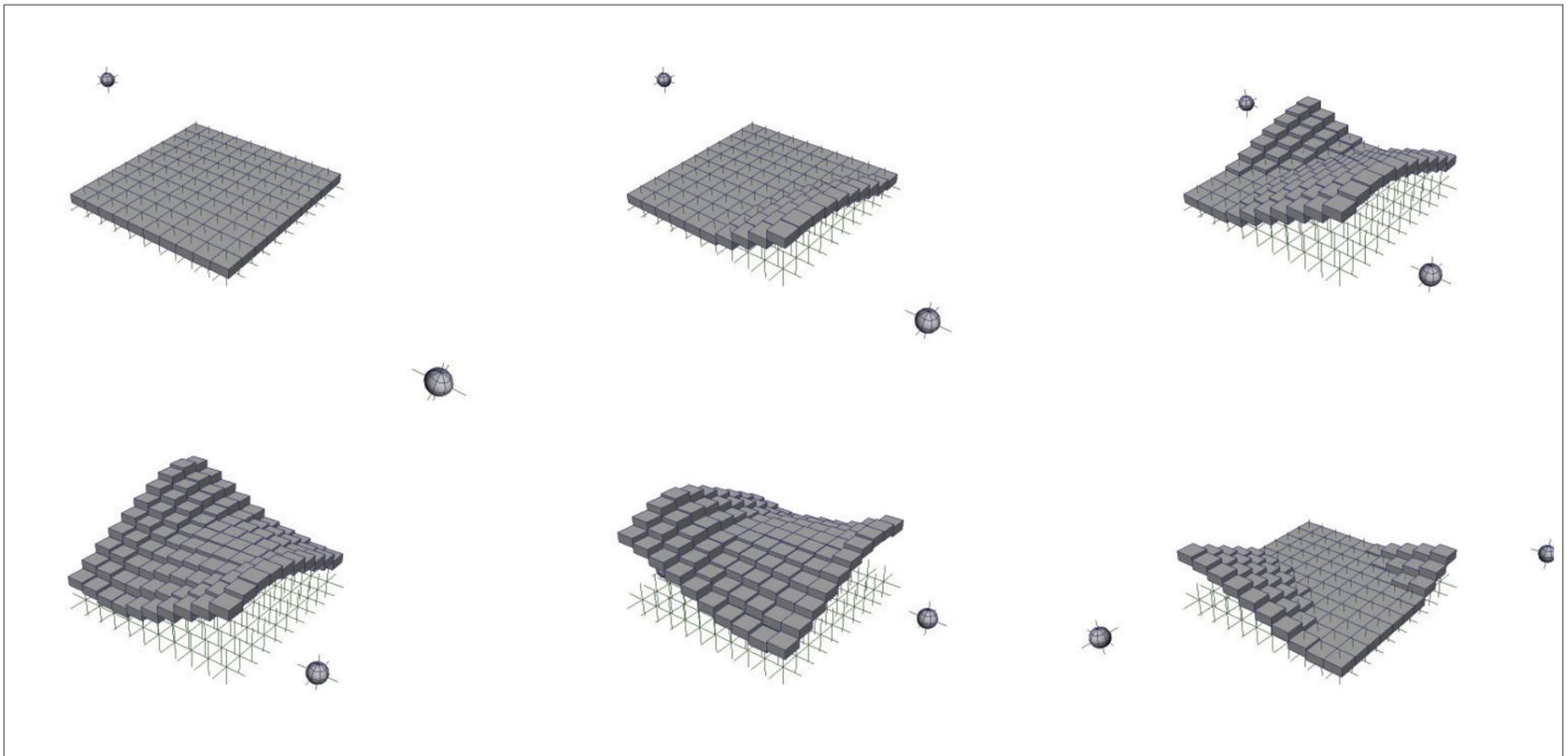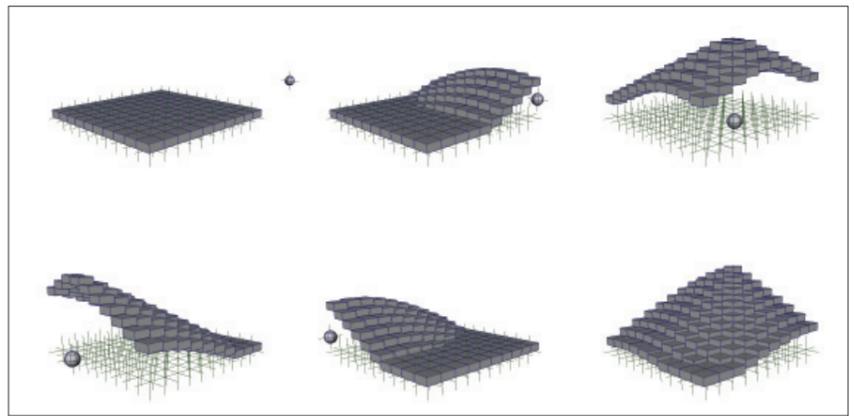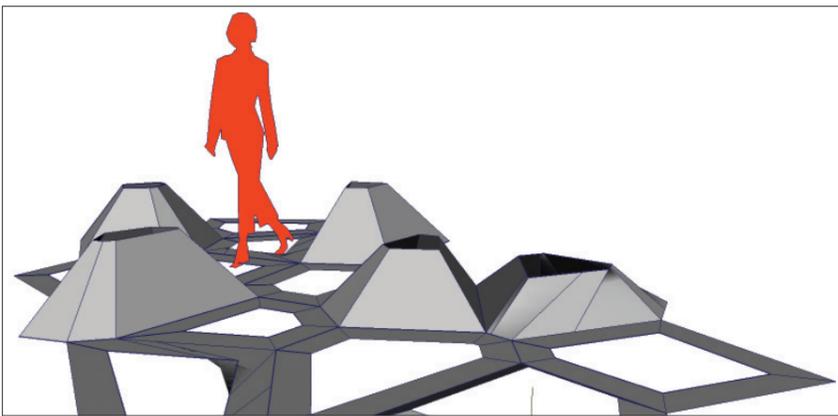
OTHER PROXIMITY EXPERIMENTS_

Besides the specific concept of the actuated brick system, a number of experiments were performed using the same basic proximity based set-up.

These include a wall of proximity sensitive components which rotate around their z-axis as one gets close to them. This also generates gradient effect. It is also interesting with regards to the social aspect, setting up a barrier that you have to engage in order to see through.

An actuated "rubber surface" was tested out to see how that would work. Still with the caravans!
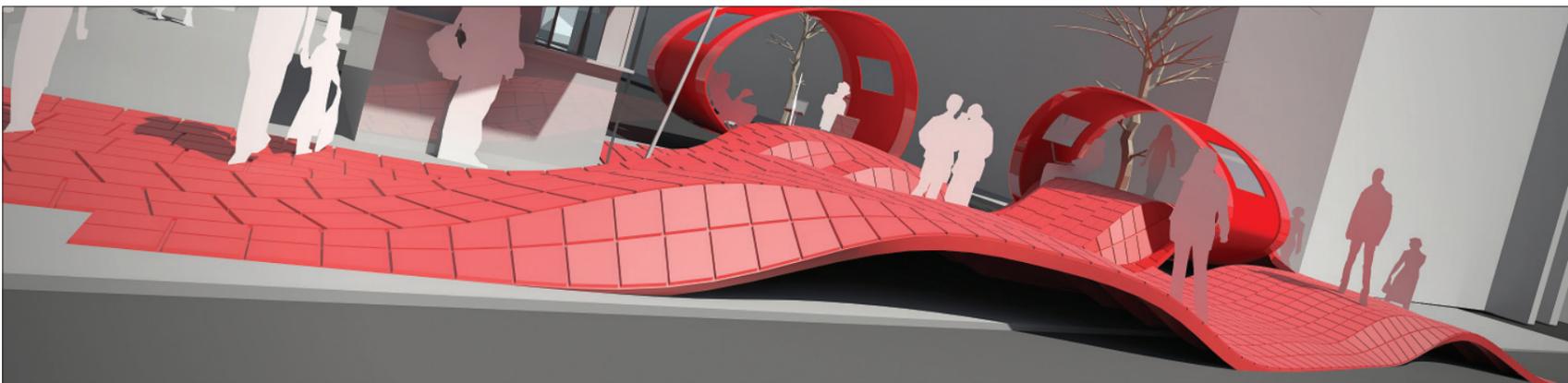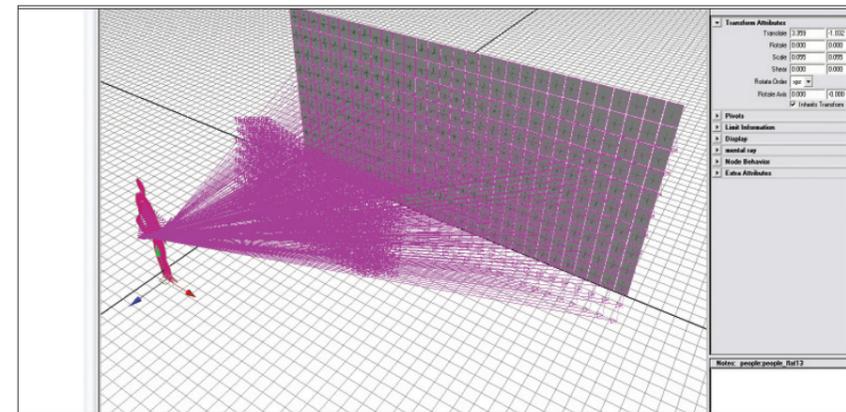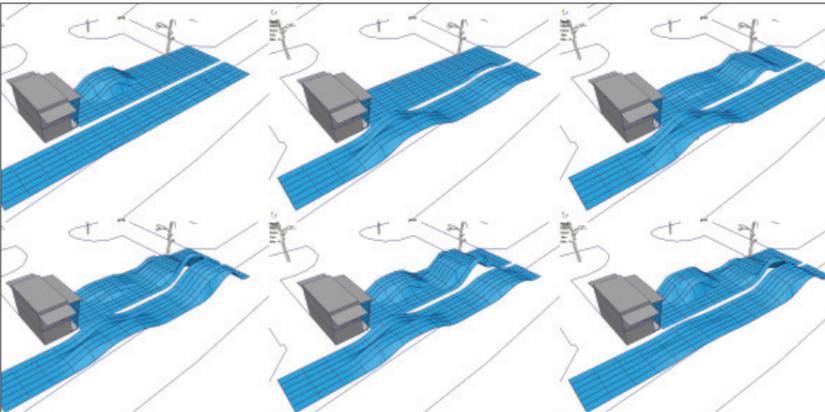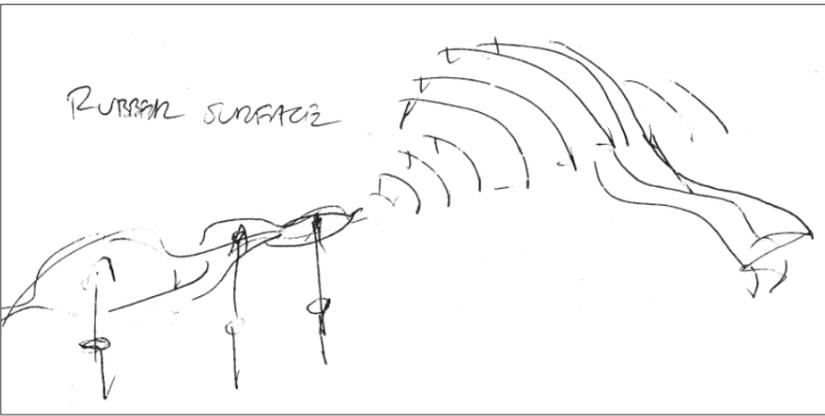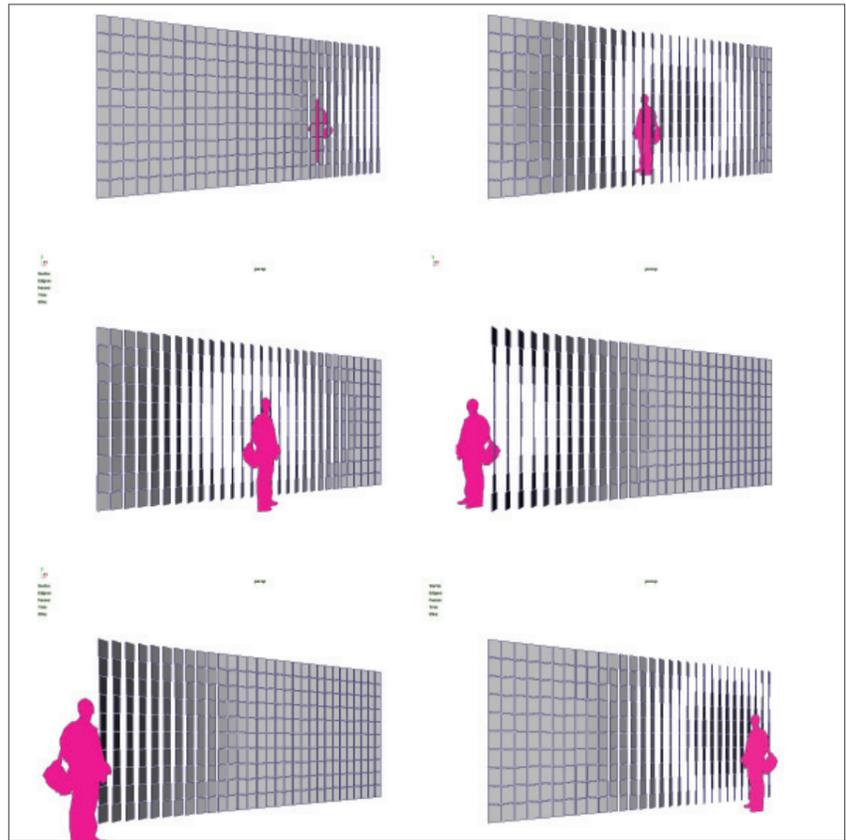
05 TWO FINAL PROPOSALS
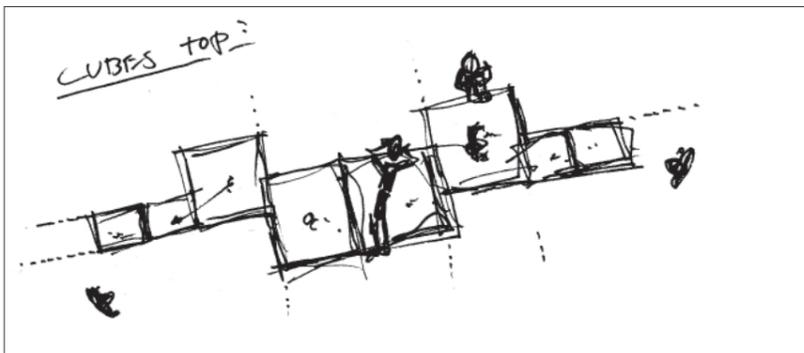
After having gone through most of the experiments, design techniques and specific design proposals which have been developed during the semester, the following will present two final suggestions to specific design solutions which embody the findings of the theoretical approach.

The first is the final iteration of the actuated brick system. It is interesting it the way in which it is geometrically under the Cartesian code of design, but in its performative capacity to literally move, it in way breaks free of the Cartesian space into the space of relations. Furthermore it has the capacity to bypass the "body-subject" by its ability to perform by reacting to the movement and presence of people and thereby generate the "interference which will disrupt the preconscious processes of time-space routines".
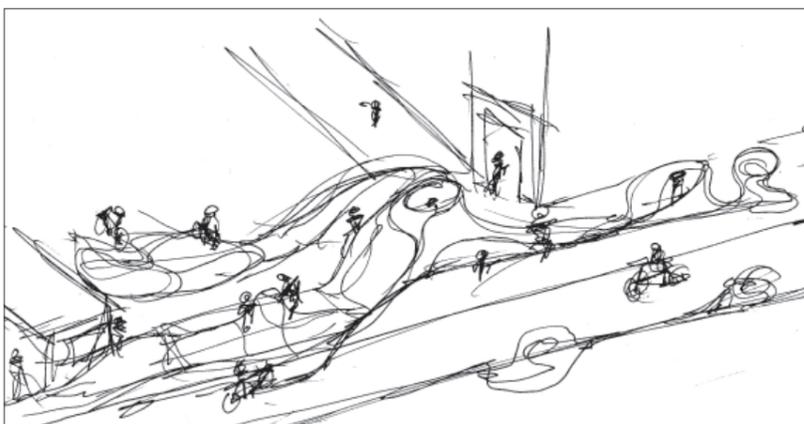
The second suggestion employs a number of techniques from the dependency chain, specifically the use of tomographic Isosurfacing in conjunction with contouring. The isosurf approach can be seen as basically the inverse way of breaking the Cartesian grid when compared to the actuated brick system approach. Here it is the complex topologies and fluent shapegrammers which break free of the Cartesian grid. This is however also the problem with the Isosurfaces, their constructability. Enter the picture, contouring. As we have learning through the design exploration contouring has the capacity to describe basically any topology, and within a reasonable price range too as it can be manufactured using planar fabrication. These facts combined with the material performance of the Moiré effects make the Isosurf/contouring technique a top candidate for possible construction on the site.

For the purpose of demonstrating this, here at the end of the report, we will perform one final experiment by contouring the Isosurface also known as Knuckleboy and seeing which effects it brings.

ACTUATED BRICK SYSTEM V.3.0

In this final iteration of the actuated brick the focus has been put on how to rationalize the system. First of this mean that the system now is more similar to the Voronoi variant from a few spreads ago, in that it is no longer one continuous field of small bricks, but instead clusters of bigger (23,5cm and 48,5 cm in diameter) cubes. In talking to the actuator producer Linak we figured out that an appreciate actuator for our purpose with actuate up to 60cm. This information has also been fed into the system. Finally the proximity parameters have been tweaked so the actuation comes to a complete stop as the person arrives at each actuated cube.
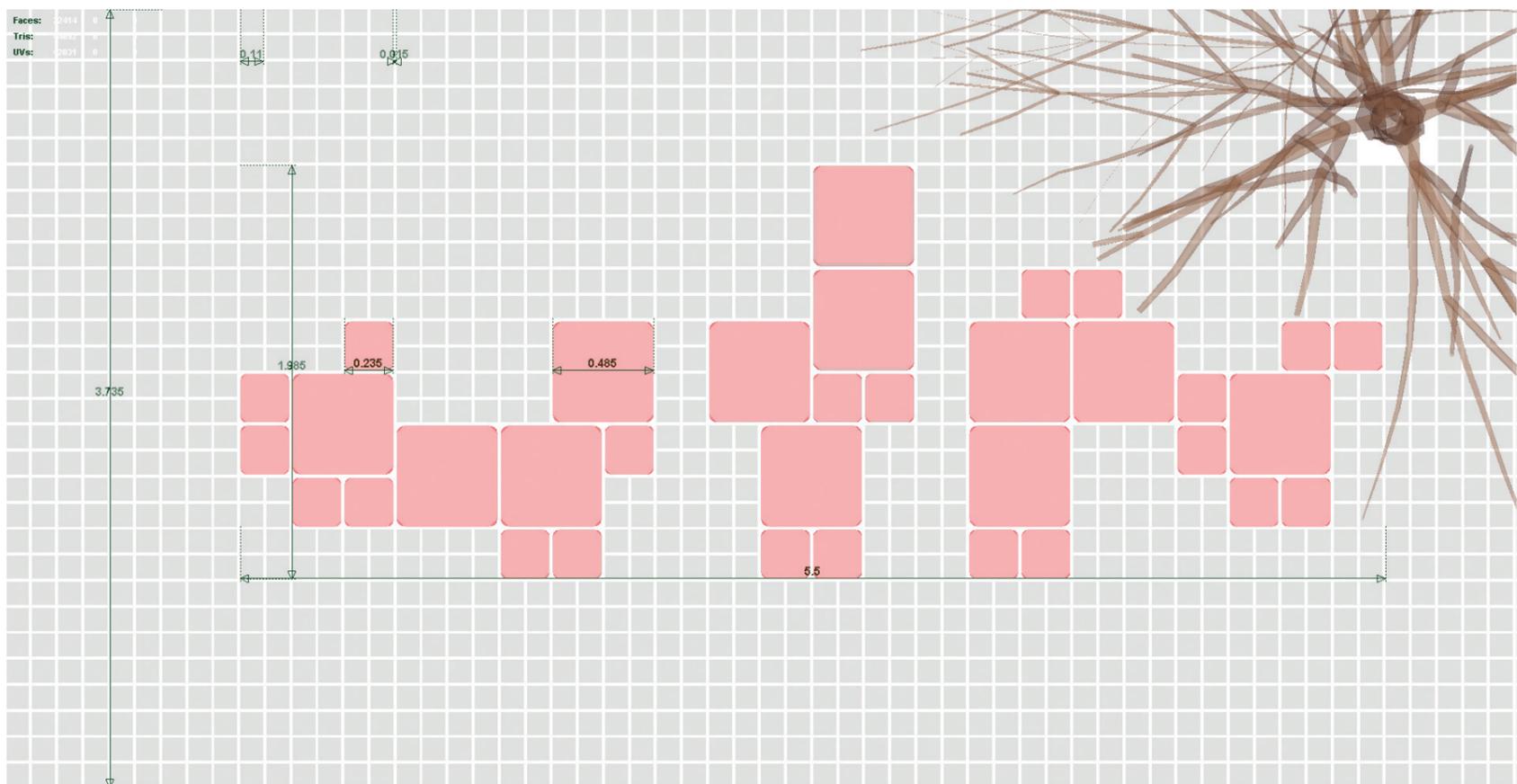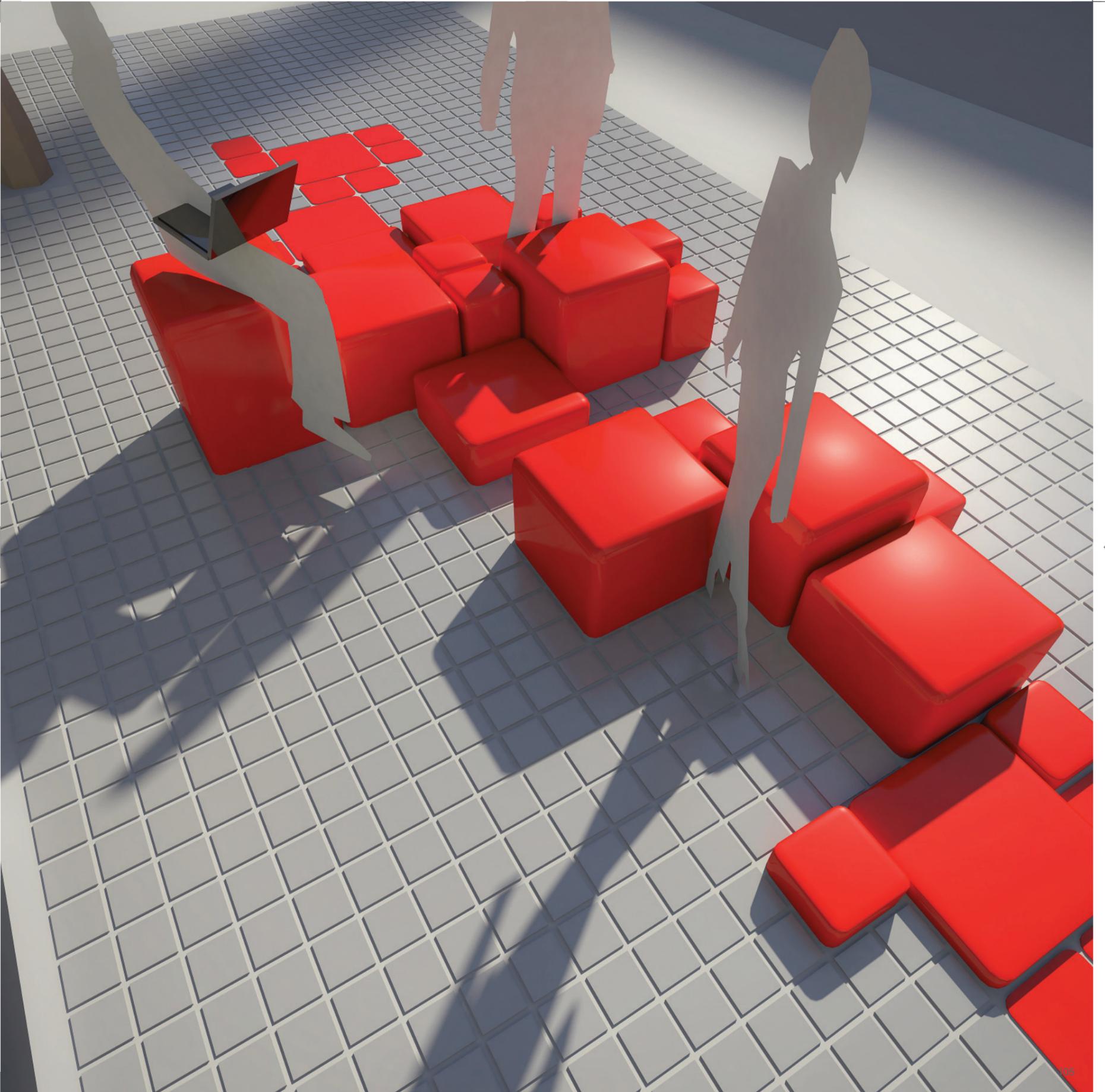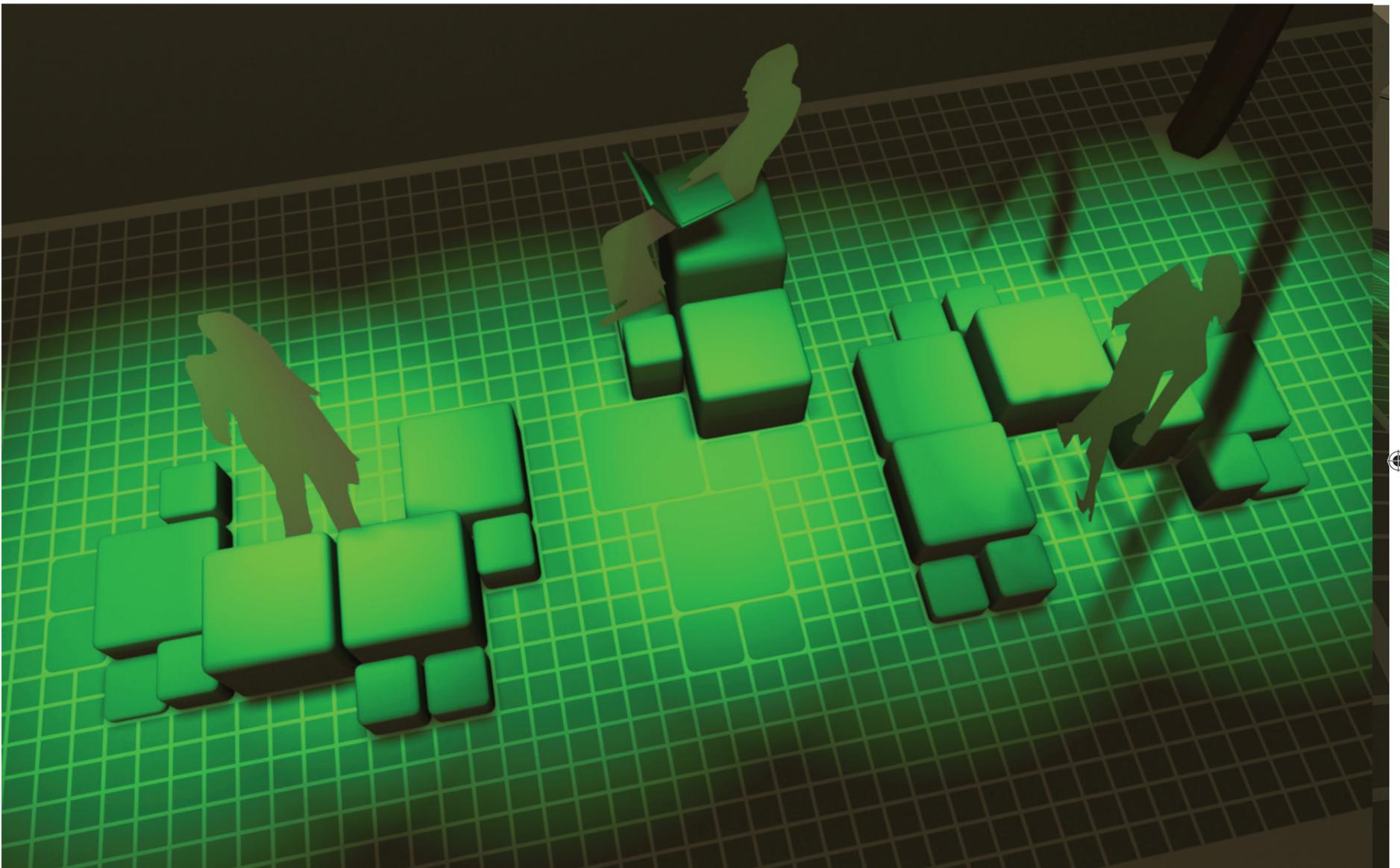
The overall system has also been fitted with RGB-lights which also are responsive to proximity. Meaning that during the night the system will flare up and down as people pass by. Thereby catching their attention and hopefully engaging themselves
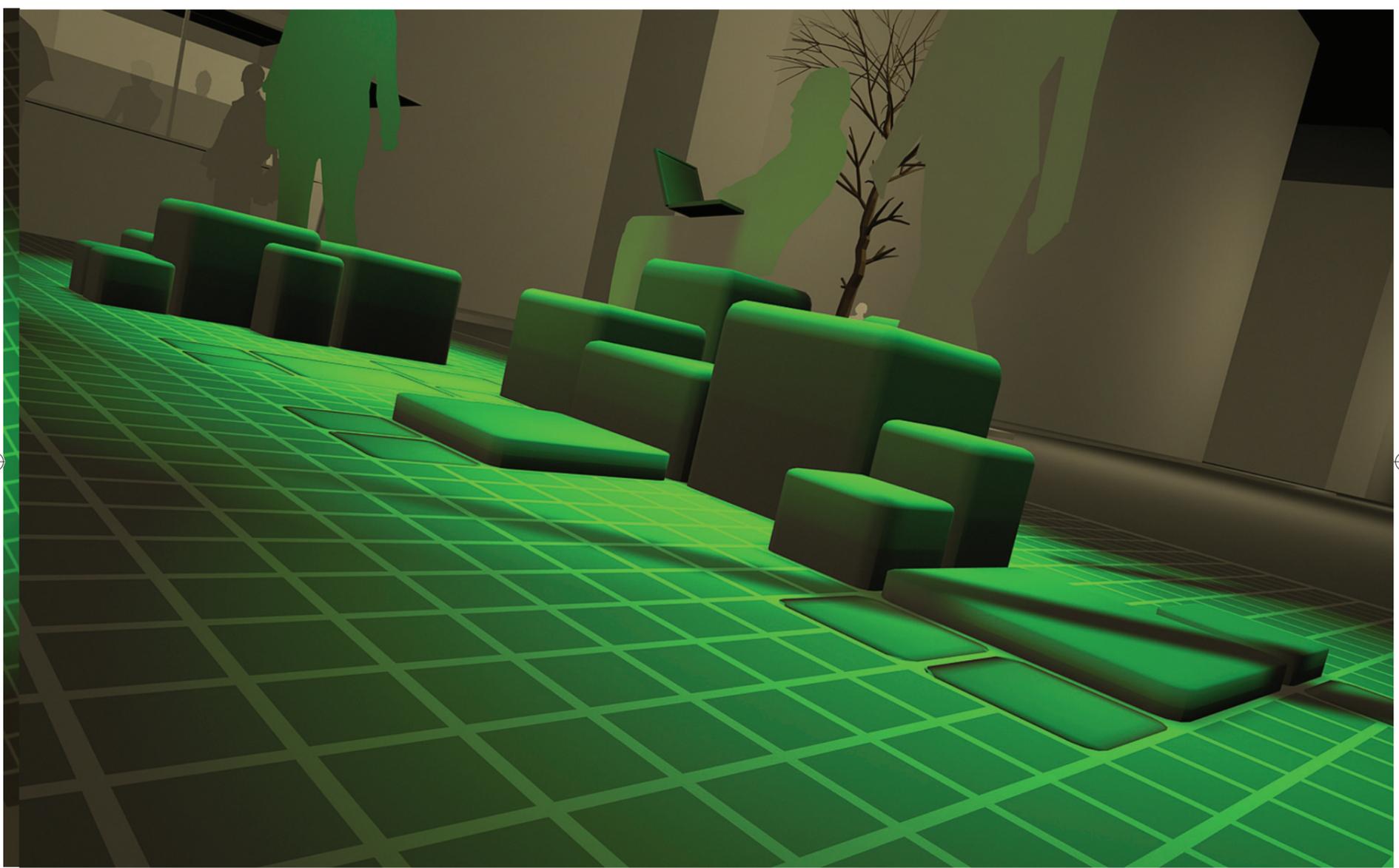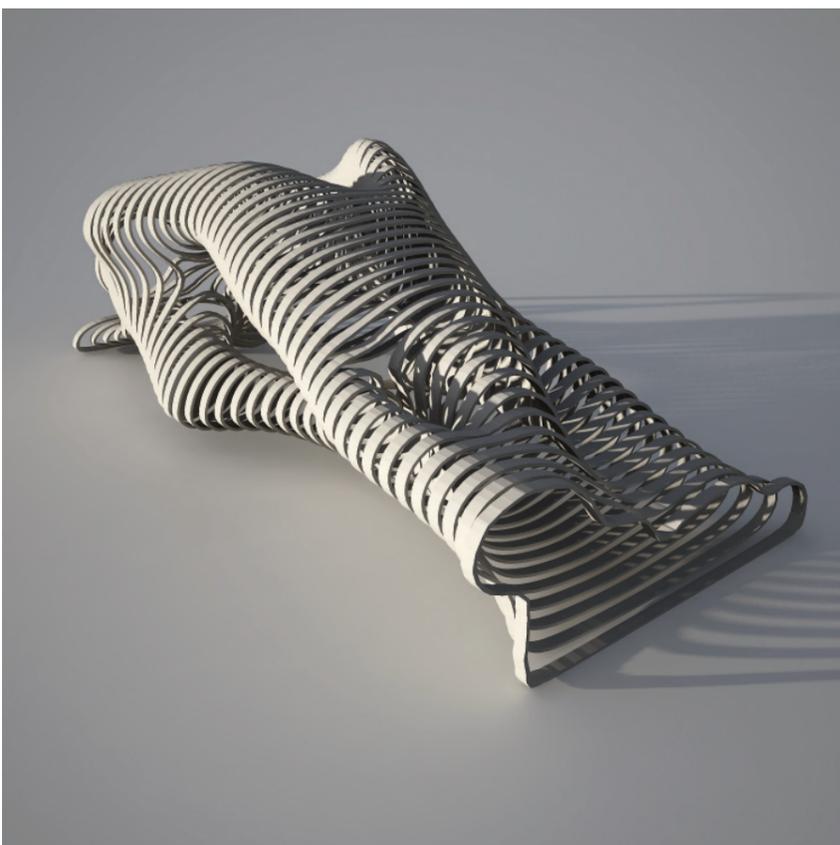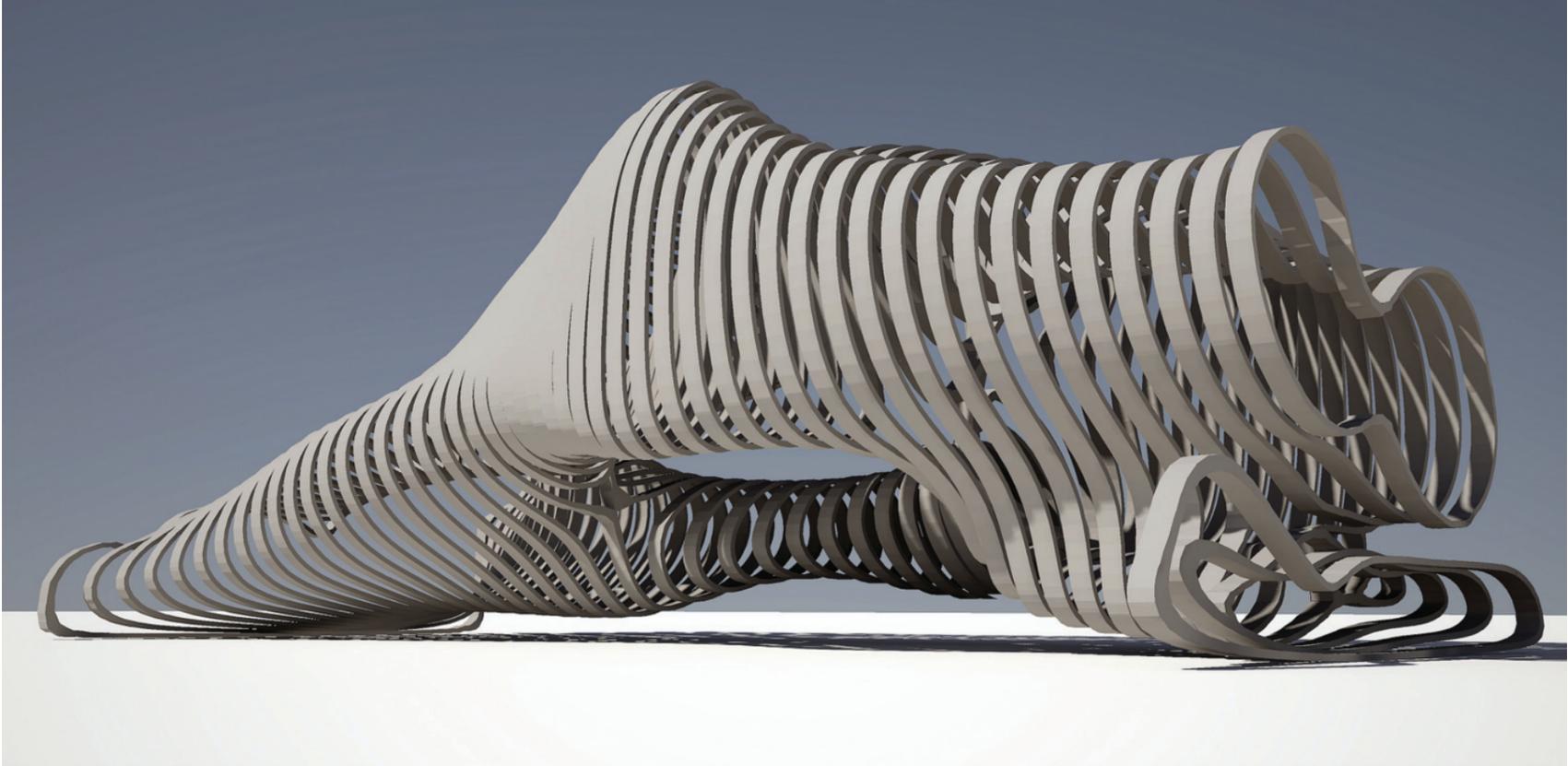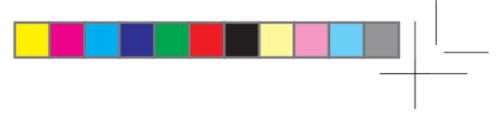
CONTOURING KNUCKLE-BOY

In these initial experiments with contouring the geometry patterns begin to emerge, particularly the shadows being cast through the structure and hitting the ground. The width of the ribs are however too wide to display any Moiré effects, and could not be made from planar fabrication.

TWEAKING KNUCKLE-BOY

In these contouring sessions the rib width and gap has been tweaked so the Moiré patterns begins to emerge.
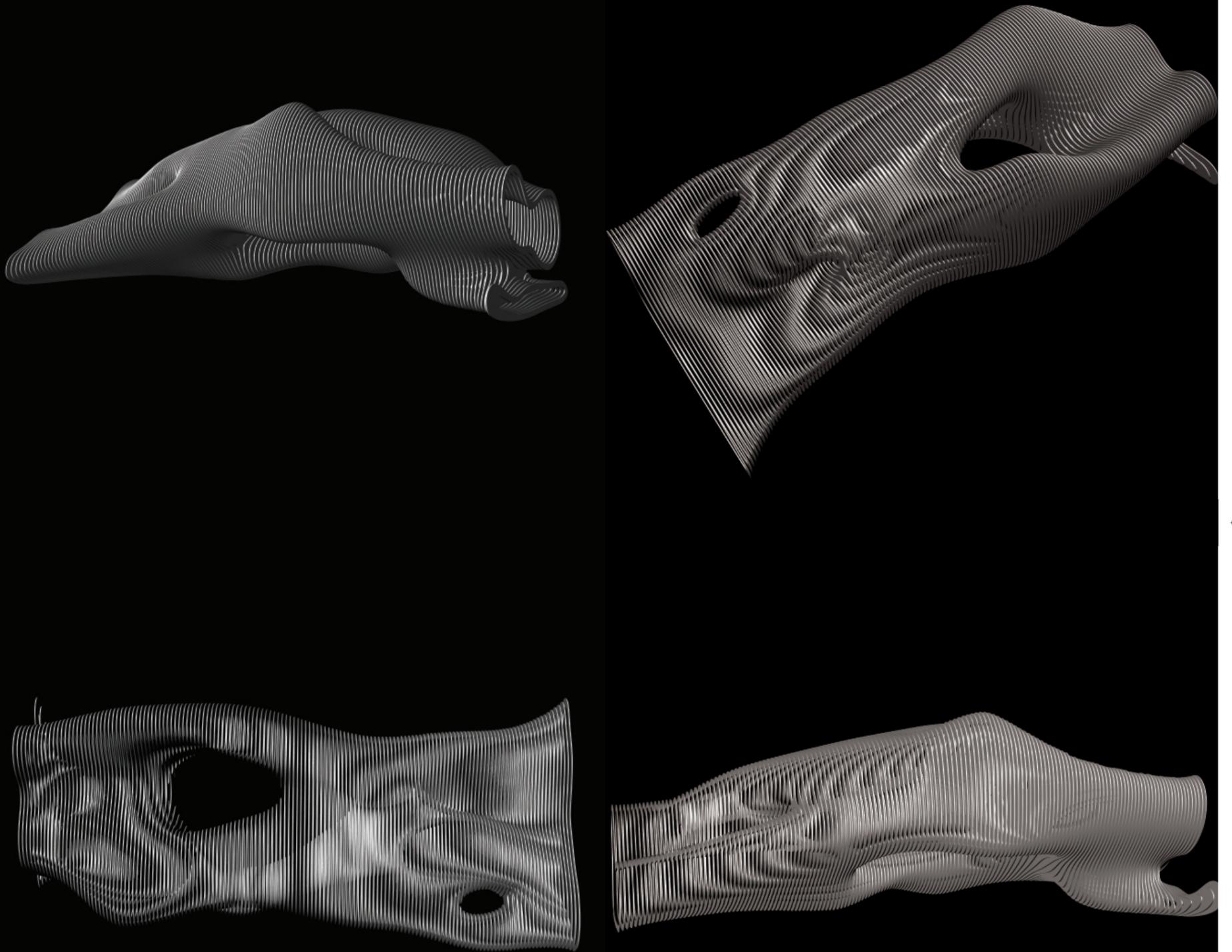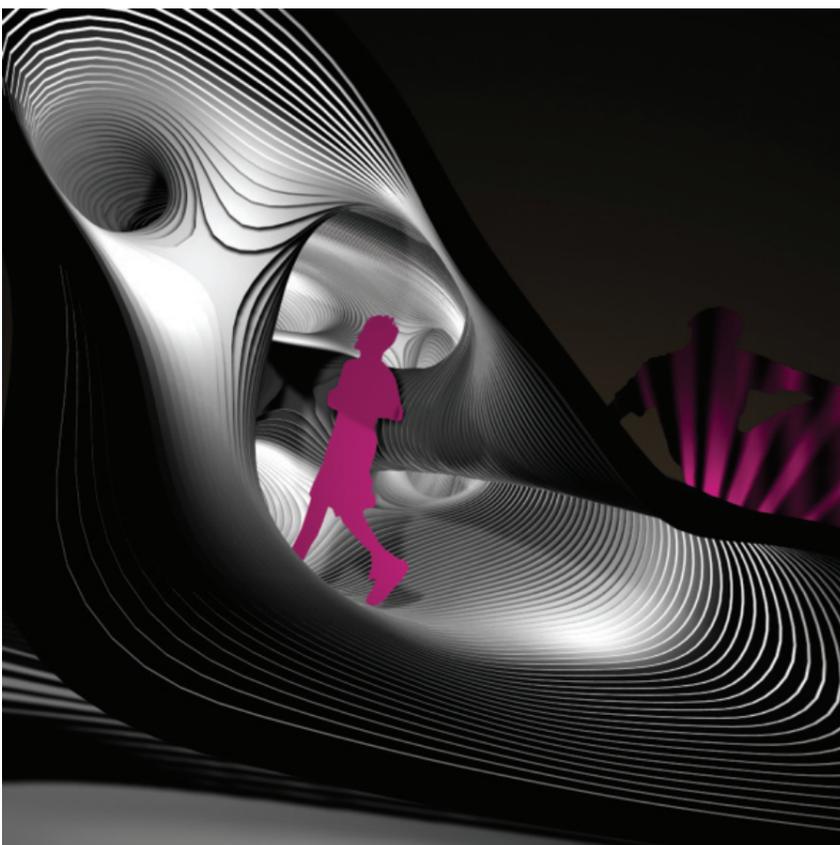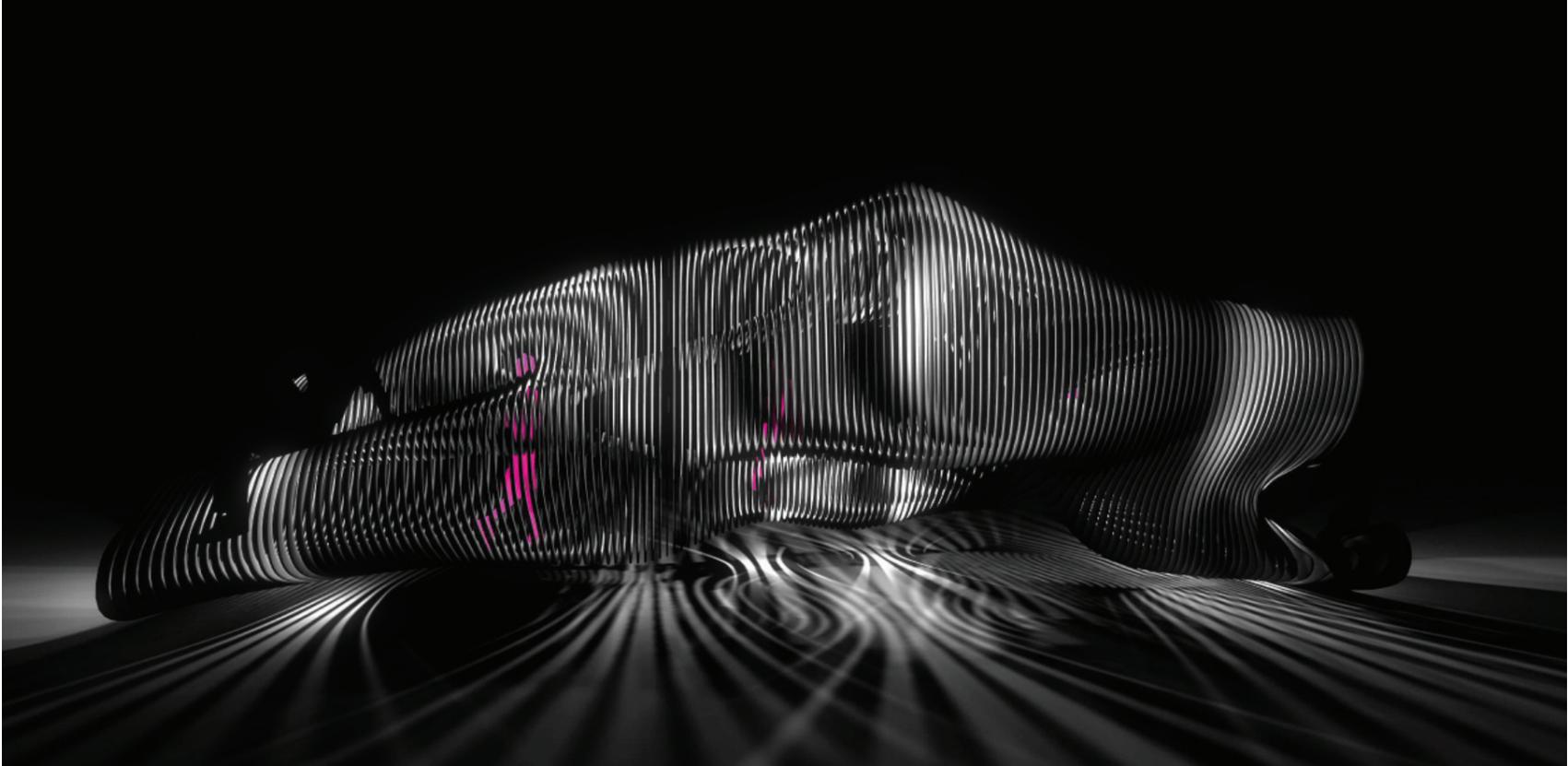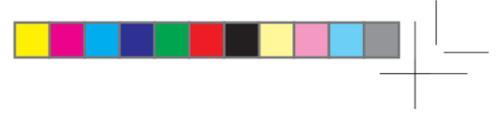
LIGHTING KNUCKLE-BOY

In these final images the structure has been fitted with a dynamic light system similar to the one used in the actuated cube set-up. The Moiré new becomes extremely visual as rays of light flow through the ribs. In a further development of the system it could imagined how these lights could act as barometers of flow running through the area. The structure would light up in a certain colour as a car passes another as the metro runs through the site underneath.
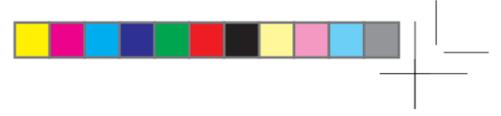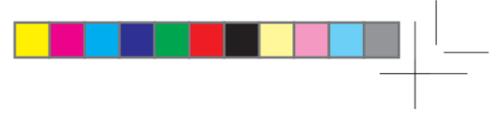
CONCLUSION AND REFLECTION_

The initial goal for the thesis project was to develop novel design techniques which should be implemented into a concrete and detailed design proposal. This goal has only been partly fulfilled. Even though an abundance of design techniques have been developed none of them have been implemented to the level which was originally intended. This has not happened for several reasons:

The project initially set out to build on top of the knowledge gained and design techniques developed during the 9th semester project. This was to be a foundation for the thesis to act as a contribution to the research project conducted by Bo Stjerne Thomsen and the municipality of Copenhagen. In this context my role was primarily to develop digital design techniques which could be employed in concrete design proposals. Already here, from the very start, there was something problematic about this collective situation. By not setting up specific guidelines for "when are we working on the communal project" and "when am I working on my thesis project", in combination with not having a firmly enough defined framework (such as a specific site and type of design, static, actuated, mediated etc.) this led to indecisiveness and confusion setting in about the direction of the project. (As exemplified right now, which project am I referring to here: the thesis or the research project?). No one is really to blame for this situation and in the clear vision of hindsight I should definitely have been better at setting up personal guidelines for my contribution to the research project. In direct continuation of this a more focused and structured approach might have led to more concrete design proposal. But then again it is hard to be structured about something when, you are unsure about what the agenda is.

So much for the negatives.

Despite not resulting in some finalized design proposal, the process of experimenting with and developing digital design techniques instead resulted in a comprehensive methodological approach to digital form generation – the dependency chain of techniques as presented on page 61. As such this process might actually be worth more as a contribution to the research project, as it instead of suggesting just one specific solution begins to suggest many. This means that the techniques of the dependency chain now can be seen as a sort of recipe book for developing both complex geometries, simulating responsiveness, and strategizing for fabrication.

The goals of creating prototypes - physical and digital - were both met. Although it was hoped that a contouring model would be fabricated, this proved hard if not impossible without a lasercutter or waterjet. Furthermore the frequency of prototyped models was not as high as originally anticipated. This was mainly due to the rather big hassle of using the schools equipment.

It was the secondary goal of the project to gain a deeper insight into the humanistic aspects involved when we speak about performance in relation to what has been discussed in the project. In spite of the many techniques that have been developed during the semester (including the dependency chain itself) I believe that the thesis' biggest and most important accomplishment lies in the results of the theoretical approach. They now form an at once very complicated and at once very simple approach to how we might bring "the social" back into our urban environments by suggesting a number of concrete things we might consider when we design for the city.

Overall I see the thesis not so much as specific proposals for this and that. Its true value lies in the combination of the theoretical humanistic approach with the creative and technical knowhow of the digital techniques. I see these two overall aspects as a foundation for how we might begin to work intentionally toward social aspects by employing digital technologies in the space of relations; I see this as how we might begin to work with the new materiality of the social.

APPENDIX

TOPOLOGY_

Perhaps the most concise and poetic definition of topology as a concept is offered to us by Cecil Balmond. He simple refers to topology as *"the study of continuity – a forensic of connectivity"* (Balmond 2002). In this definition Balmond employs the parallel description of the study/forensics of continuity/connectivity, an optic that is directly derived from the mathematical origins of topology as a concept. Here it exists as a branch of geometry that begins with a consideration of the nature of space by focusing on the qualitative properties of geometries. This essentially implies the description of geometry by focusing on the continuity of its formalistic properties. This is opposite to a quantitative description which would concern itself with quantifiable (measurable in units) parameters such as scale, translation, degree and so on.

This is where notions such as continuity, connectivity and connectedness become important as they help describe and understand geometrical complexity on a very fundamental level. Typically a topological description would include defining the number of surfaces and edges in a given geometry as well as its so-called genus; the amount of holes or "handles" it has. For instance a rectangular plane would have two surfaces (one on each side), one edge (the perimeter of the plane) and a genus of zero (no holes). A cube would have two surfaces (one on the inside and one on the outside), no edges and a genus of zero. A donut would be described as having two surfaces (inside and outside), no edges and a genus of one (the hole in the centre).

Besides describing the qualitative properties of a given static geometry, topology also serves to explore the mutual properties of several geometries through the continuous deformation of a singular geometry. This concept is known as homeomorphism or topological isomorphism and essentially describes a morphological relation between geometries which respects topological properties. Two geometries with a homeomorphism between them are called homeomorphic and from a topological viewpoint they are the same (Wikipedia). Simplistically speaking, these geometries can be thought of as those that can stretch through space without tearing apart or sticking distinct parts together. This is for instance the case with the topological relation between a sphere and cube. Since they share the same topology they can be morphed into each other without tearing. A more elaborate case of homeomorphism is a classic example when speaking of topology; the coffee mug and the donut (or torus if you will). Although initially quite dissimilar the two geometries are topologically equivalent, deforming the donut into a coffee mug would simply require creating a dimple and progressively enlarging it while simultaneously shrinking the hole into a handle.

Besides these fairly straight forward geometries and morphological operations, topology also concerns itself with the study of higher degrees of abstract concepts such as for instance the Möbius strip. The Möbius strip is simply a straight strip which is given half a twist and connected in the ends. This procedure results in geometry with a topological description of only one surface and one edge, in other words there is no distinct inner or outer surface. Thus if you were to walk on the Möbius strip you would always be on the same surface in an ever ending loop! As one might expect, such geometrical curiosities have inspired many artists and architects, particularly since the rise of the industrial revolution and the general propagation of knowledge in the last 150 years or so. Among exponents of this movement, the Dutch artist M C Escher could be mentioned. In the mid to late 20'th century he became well known for exploring spatial subjects related to representation, science, infinity and various visual conundrums in general. Escher had a particular fondness for the Möbius strip and it features in many of his artwork.
These descriptions might seem trivial, but to really understand, appreciate and utilize the many digital tools and techniques we have at our disposal today a comprehension of topology seems exceedingly appropriate and to some extent essential.