WALL CURTAIN, FINAL OBJECT IN 1:1 SCALE

STENOVÝ ZÁVES, FINÁLNY OBJEKT V MIERKE 1:1

Photo Foto: Anders Ingvartsen

Wall Curtain
On the Idea of Soft within the Digital and Fabrication Realms[1]

Stenový záves
Koncept mäkkosti v kontexte digitálneho navrhovania a fabrikácie[1]

Danica Pišteková

Projekt *Wall Curtain* (Stenový záves) sa zaoberá ideou mäkkého v digitálnom, ako aj vo fyzickom priestore prostredníctvom výpočtového navrhovania a navrhovania na základe simulácie. Reálne a virtuálne prostredie sa navzájom optimalizujú a stretávajú na rozličných konceptuálnych, sémantických, materiálových a technologických úrovniach. Pomocou skúmania niektorých textilných techník sa textilná membrána reguluje a uvádza do výpočtového rozhrania, kde tieto techniky dokážu kontrolovať virtuálnu sieť, a tak simulovať vlastnosti textilu pri šití. Sieť, mriežka potrebná napríklad na vyhotovenie techniky žabkovania, a mriežka (*mesh*) 3D programu sa stávajú rozhraním, miestom komunikácie, odovzdávania a prekladu informácií medzi počítačom a fyzickým svetom alebo medzi rôznymi mierkami so schopnosťou flexibilne meniť rozlíšenie. Mriežka tak prestáva byť iba opisom geometrie, ale stáva sa dynamickou infraštruktúrou, dobre informovaným miestom transformácie.

V architektúre existuje množstvo príkladov využitia textilu v rôznych mierkach od odevov až k pneumatickým štruktúram. Projekt *Wall Curtain* však objavuje nové typy mäkkých priestorov a uzavretí, ktoré stoja mimo štandardných kategórií architektúry, interiérového alebo odevného dizajnu. Zaoberá sa vzťahom tela, jeho odevu a vrstiev, čo ho obklopujú (napr. interiérové textílie, architektúra zvnútra – izby, steny, okná). Rovnako sa pýta, ako do architektonického, tradične skôr trvácneho, tvrdého a pravouhlého možno integrovať dočasné, dvojito zakrivené, poddajné, mäkké, vysoko personalizované či haptické. Proces úzko súvisí so spôsobmi zapisovania, kým architektúra používa ortogonálne rezy, odev sa vytvára pomocou strihov, rozkladaním obálky do 2D reprezentácií, modelovaných pomocou švov do potrebného tvaru. Tu sa ukazuje príležitosť prehodnotiť procesy notácie, zhybridizovať ich do nového komplexného systému, ktorý dokáže flexibilne reagovať na nové formy a požiadavky.

Myšlienka textilu ako základu architektúry sa objavuje aj v teoretických prácach významných architektov. Gottfried Semper v druhej polovici 19. storočia formuloval svoj *princíp odievania* a zaoberal sa tiež textilnými technikami, ktoré videl ako abstraktné a schopné prestupovať rôznymi materiálmi a mierkami. Adolf Loos na prelome 19. a 20. storočia zase tvrdil, že na počiatku bolo odievanie a najstarším architektonickým prvkom sa stala prikrývka.

Textilnej vrstve sa nedá vyhnúť, sprevádza nás v podobe prikrývadla, keď spíme, obrusu, keď jeme, koberca, keď kráčame, či odevu, nech robíme čokoľvek. Textílie tvorili súčasť našich interiérov od nepamäti. Závesy oddeľovali posvätné miesta od profánnych, v byzantských chrámoch počas špeciálnych príležitostí dekorovali textilom miesta pod ikonami, v stredoveku sa objavili na stenách tapisérie. V lete mala hodvábna vrstva ochladzovať, v zime vlnené tapisérie chrániť proti chladu zo studených stien. Neboli však iba izoláciou, tiež reprezentovali a rozprávali príbehy. Populárnymi v tom čase boli aj posteľové závesy. Vytvárali akúsi miestnosť v miestnosti a chránili pred chladom, prievanom či hmyzom. V 19. storočí sa textilné vrstvy používali aj ako scénografia na vytvorenie exotickej atmosféry ďalekých krajín, no koncom storočia, vplyvom hygienických opatrení a zavedenia kúrenia, textil ako obal z interiérov zmizol.

Záves v architektúre sa stal znovu populárnym v dvadsiatych rokoch 20. storočia, a to ako závesová stena (*curtain wall*), keď vonkajšia obálka budovy prestala prenášať zaťaženie, lebo vnútorná organizácia sa stala dostatočne stabilnou. Bol to výsledok rozvoja materiálov, hlavne ocele. Závesovej stene to umožnilo používať ľahšie materiály a otvoriť fasádu do okolia.

Názov projektu Wall Curtain (Stenový záves) sa hrá s touto terminológiou a odkazuje na novú úlohu, ktorej sa textil môže chopiť. Kým *závesová stena* zdôrazňuje svoju subtílnosť prirovnaním k tenkej, takmer neviditeľnej záclone, ktorá môže byť odstránená bez vážnych dôsledkov na konštrukciu, *stenový záves* chce získať naspäť svoju hodnotu a relevanciu. Dokáže sa správať ako stena, oddeľovať priestor, chrániť pred slnečným žiarením či dokonca ho kontrolovať. Neostane nepovšimnutý či podriadený architektúre, nebude nasledovať jej krivky, ale stane sa autonómnym v súčinnosti s okolitými silami. So svojimi vlastnými pravidlami stavia nový priestor pre rozličné telá, ktoré doň vtláčajú svoje stopy, a tým ho spoluvytvárajú.

Výpočtová časť projektu je úzko spätá s materiálom. Virtuálna ihla prechádza mriežkou a spája jej rozličné body. Skúmaný povrch simuluje vlastnosti textilu, zahýba sa podľa rôznych nastavení a sily „nite“, ktorá ním prechádza. Dva odlišné body sa tak môžu stretnúť v rôznych vzdialenostiach. Vzniká *virtuálny steh*.

Nástroj bol skúmaný pomocou viacerých techník šitia. Žabkovanie je ozdobná technika pracujúca so silou nite na vytvorenie špecifického rytmu záhybov. Má silnú dekoratívnu

vizualitu, ale jej proces je vysoko kontrolovateľný. Virtuálna aj fyzická reprezentácia používa mriežku čiar a bodov. Sledovaním určitých pravidiel, spájaním bodov kolmo alebo diagonálne, vzniká mnoho sofistikovaných vzorov.

Ďalšou možnosťou formovania membrány pomocou digitálneho šitia je vytváranie odševkov. Tie sa používajú na tvarovanie odevu na telo s jeho konkávnymi a konvexnými krivkami. Transformujú 2D plochu do 3D objektu. Keďže telo tu nie je hlavným parametrom, odševky sa musia aktivovať inak, simuluje sa preto nafukovanie, sila vzduchu a elasticita materiálu.

Metódou *digitálneho šitia* sa vytvára objekt formovaný *virtuálnymi stehmi.* Proces simulácie tu nefunguje ako analytický nástroj prichádzajúci na konci procesu, ale je rovnocennou súčasťou projektu už pri raných fázach navrhovania. Významnou časťou projektu je tiež vyrábanie prototypov v rôznych mierkach a materiáloch. Tie skúmajú vzťah medzi predpokladaným a vyrobeným. Po formovaní a simulovaní 3D objektu v počítači prichádza problém rozkladania tvaru na 2D reprezentácie, preto sa práca zaujíma o vytváranie strihov, ktoré sa testujú a vyrábajú, aby spätne informovali výpočtovú kalibráciu. Tento neustály dialóg medzi dizajnom, simuláciou a fabrikáciou vyúsťuje do nových, netriviálnych a dobre informovaných riešení a ukazuje, ako možno znovu premyslieť tradičnú materiálovú kultúru a zaužívané postupy architektúry.

Všetky spôsoby rozkladania sa testovali pomocou šitých prototypov, keď sa indikovalo najviac problémov, ktoré spätne poskytli hodnotné informácie počítačovému modelu. Ukázalo sa, že strihy sa môžu plnohodnotne testovať iba v mierke 1:1 a vo vhodnom materiáli, ktorého výber je otázkou už prvých skúšok, keďže v skutočnosti sa s textilom nedá pracovať v iných mierkach, nedá sa zväčšovať alebo zmenšovať.

Všetky obmedzenia predstavujú dôležité vstupy v procese vývoja strihov. Každý krok je mimoriadne komplexný a obsahuje niekoľko ďalších čiastkových úloh. Výsledné rozkladanie objektu do pásov, z ktorých každý jeden je unikátny, prináša poriadok a kontrolu nad svojvoľnosťou textilu, a zároveň odkazuje na určité vlastnosti typické pre textil ako vzorovanie či farebnosť.

Výsledkom procesu je nový interiér, vrstva, priestor v priestore, mäkká obálka, ktorá nepatrí do sveta tradičnej architektúry ani medzi poddajné interiérové textílie a uniká aj telesnému privlastneniu. Chce dokázať, že priestorom medzi odevmi a stenami nie je bezvýznamné prázdno, ale ďalšia autonómna vrstva plná intenzít, priestor patriaci sebe samému. Otvára tak otázky pre nový typ proxemiky, kde sa už viac nemeria interpersonálny priestor, ale priestor medzi telami, ľudskými alebo architektonickými, a vrstvami, čo ich obklopujú. Projekt obracia pozornosť od problémov funkcie a použitia ku vzťahom vnútrajška a vonkajška, povrchu a obalu, steny a záclony. *Wall Curtain* predstavuje svet, kde už nie je rozdiel medzi obliekaním si šiat a vstupovaním do priestoru. Aké by to vlastne bolo žiť v mäkkom priestore?

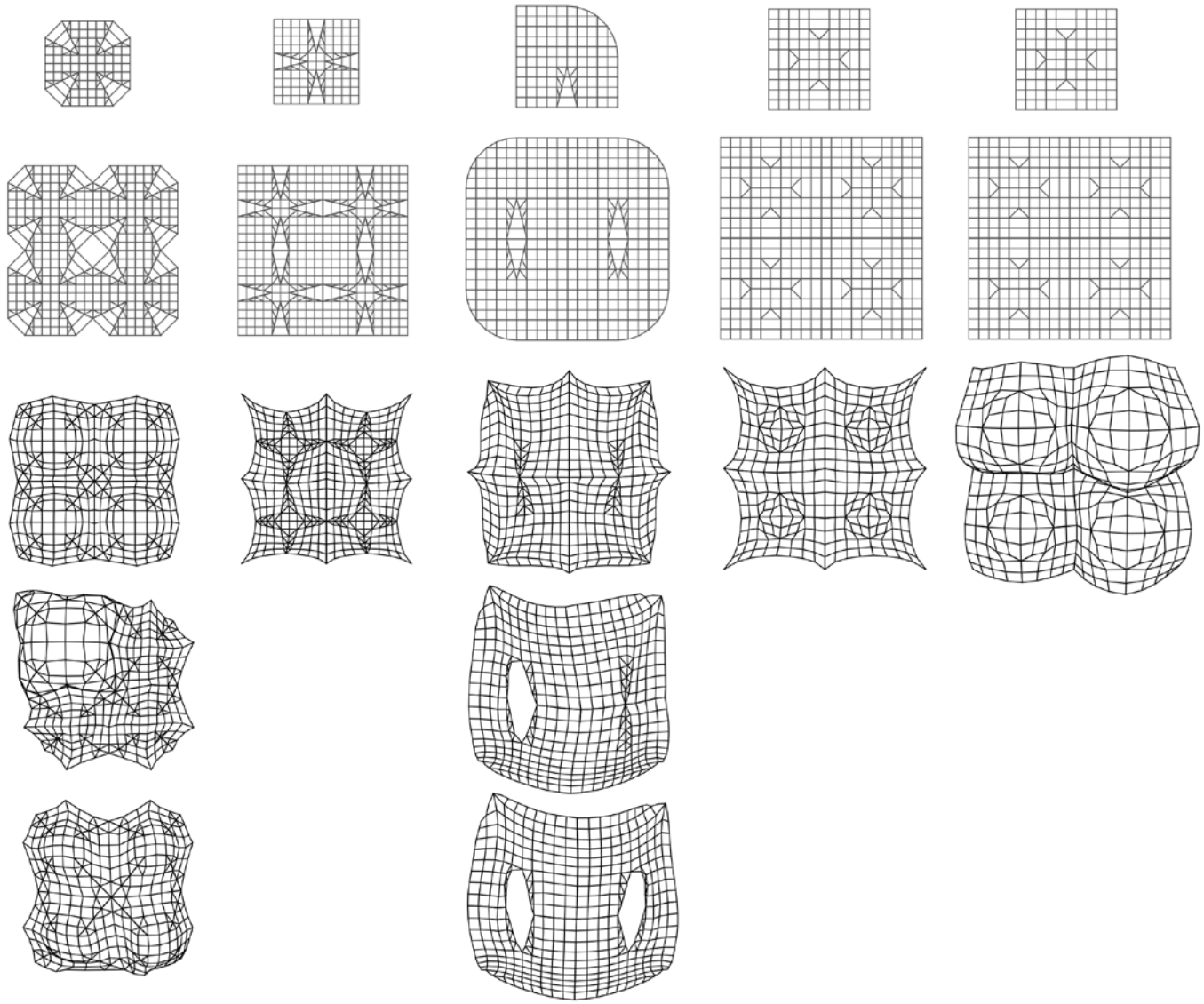
Introduction

The project investigates soft spaces in the current context of computational design and simulation-based design. Moreover, it challenges the role of textile layers in interiors and the relationship of architecture and the human body. These questions are explored through textile probes and prototypes in the range from intuitive and formal sketches to highly complex models and full-scale installations. The project uses virtual simulation of the textile properties not simply to analyze or evaluate their final behaviour, but to include simulation as an equal tool at the very beginning of the design process.

The project operates within the concept of the soft in both physical and digital worlds, so that the two optimize themselves, and encounter each other on different conceptual, semantic, material or technological levels. Beyond the application of computational to material levels, it equally implies the transfer of ideas and techniques from physical handicraft back to the virtual realm. As a result, the concept of *digital sewing* and the *virtual stitch* has been developed. By this process, the shape is formed, then subsequently disassembled to 2D unfolded representation, and afterward connected together into the structure of an aggregate, where every piece is a unique element.

The research examines a new type of a soft space or enclosure, which stands outside the standard design or architectural practices. We know several types of textile usage on different scales, from clothes through interior textiles to tensile and pneumatic architecture. However, this particular project focuses on the relationship between a garment and a room, both of which form an envelope around the body, in order to explore the wrapping in between them. In consequence, it defines a new category of proxemics not dependent on the amount of space between people, but on the space between a body (human or architectural) and the layers around.

The new envelope is not a dress anymore, although it dresses a body, and it is not yet architectural in the classical sense, although it gathers. It is seen as an autonomous space, a space of its own. It shifts the attention from function and usage to the problems of inside and outside, of surface and cover, of the curtain, wall and partition. It fills the room, dresses it, while the human occupation and interaction are still allowed. The project introduces a world where there is no difference between putting on clothes and entering a space. What would it be like to live in a soft space?



DIGITAL SEWING – SIMULATION OF USING DARTS AND INFLATION

DIGITÁLNE ŠITIE – SIMULÁCIA NAFUKOVANIA A POUŽITIA ODŠEVKOV

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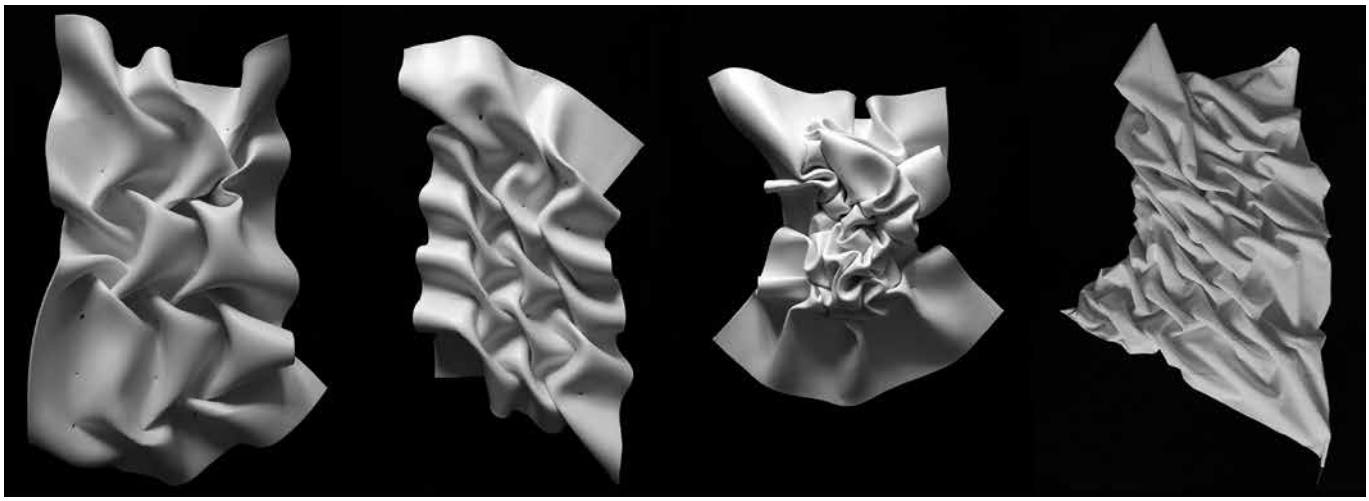
The Wall Curtain project demonstrates how a constant correlation between design, simulation and fabrication leads to new unorthodox spatial solutions and a rethinking of our material culture and practices. At present, architects are not just creators of buildings, but also design materials, tools and processes, an effort closely related to interdisciplinary overlappings and revealing their hidden interdependencies. In consequence, the construction and investigation of different collaborative concepts broaden the traditional limits of our discipline.

Further, the project poses the question: how can the *textile logic*[2] influence the architectural practice and what are the consequences for integrating double curved surfaces, pliability, highly personalized and defined spaces, specific tectonic principles or sensual and haptic aspects. These topics are, at the same time, linked to the means of notations. Architecture uses plans and sections on an orthogonal basis, while the fashion design industry employs garment patterns, which traditionally emerge from the flat surface and represent unfolded envelopes of the body, subsequently shaped by darts and seams.

This approach of researching the new type of an in-between soft enclosure has to find its own way for recording, since standard ways of representation in architectural design prefer the static and permanent. It brings an opportunity to rethink or hybridize both the perspectives (unfolding and orthogonal cutting) and to establish a new complex system, flexible enough to react to different requirements and ideas (moveable, curved, ephemeral, sensual).



SAMPLES OF SMOCKING TECHNIQUES

VZORKY VYROBENÉ TECHNIKOU ŽABKOVANIA

Authors Autori: Danica Pišteková, Petras Vestartas

When textile meets architecture

We are surrounded by textile layers every day. We cover our bodies, we use blankets and duvets when we sleep, tablecloths while eating, carpets while walking, tents and umbrellas to protect ourselves against the external conditions. Similarly to how we cannot escape architecture, it is impossible to avoid textile surfaces.

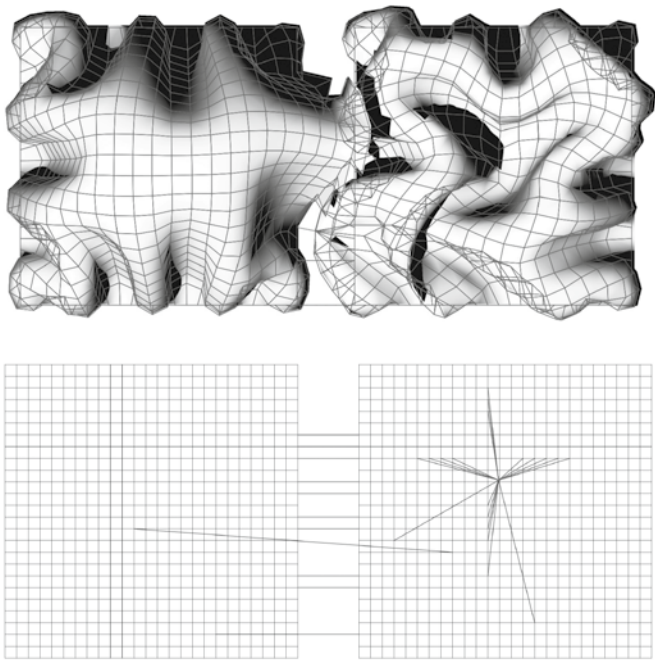
Textile layers have had a long history in our interiors. In ancient times, curtains were used to divide sacral spaces from the secular: Byzantine temples used to be decorated with embroidered textiles placed under icons, especially during special occasions. In medieval times, new arrangements of the textile layer appeared in forms of tapestries on walls. During the summer period, a silk layer provided cooling, while woolen tapestries protected against the cold walls during the winter. Hence, they were used as a heat insulation, but they also absorbed smoke and odors in smoking rooms and were places for representation and narration of stories. Bed curtains were also popular in medieval times, creating the textile spaces enclosing the bed from all sides like a room inside a room to protect its inhabitant from cold, dust, insects or draft. Curtains became more refined in the Baroque era, when luxurious fabrics as silk, brocade or damask were widely used. In the 19th century, the textile layers created an exotic atmosphere towards the theatrical curtaining of ceilings and corners. This fashion vanished at the end of the century due to hygienic restrictions and introduction of heating, when the warm textile walls were no longer needed.[3]

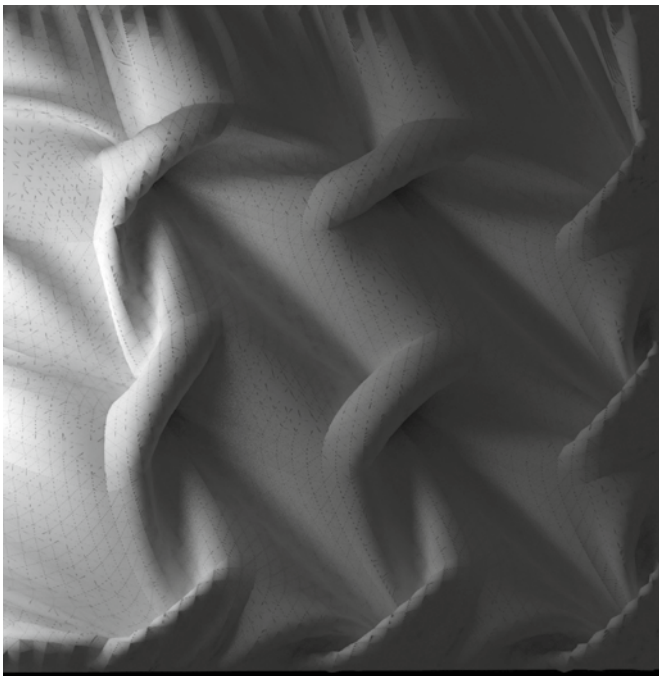
The significance of the interior textile layer disappeared when people started to inhabit more stable and firm dwellings, much as the transformation of nomads to settlers can indicate a transition from the dominance of textiles to the importance of architecture.[4] Still, according to certain remarkable architects, the origin of architecture lies precisely in textiles, in form of a blanket on the lying body as kind of a second skin, as Adolf Loos claimed,[5] or a mat, woven or leather, as the primary layer superior to its construction, demonstrating Gottfried Semper*'s dressing principle*.[6] Furthermore, Semper viewed the genesis of architecture itself as grounded in textile techniques. The methods of weaving and knotting do not have to result in a woven fabric, but by using different materials, a wall or a cladding can emerge. Since the technique itself is abstract, it is thus able to pass through several materials and scales.

In Semper's theory, the cultural importance of the textile wall exceeds the significance of the structural, as the construction was used merely to support it and stabilise its position. Here the textile art and architecture meet and split at the same time to evolve into more complex disciplines.

At this point, we can see analogy with the curtain wall. Since the rise of Modernism, the outer covering of a building is not structural any more: not needing to bear any structural load, it can use lightweight materials and thus open its space to its surroundings. The inner organization, as a result of material development, is stable enough, being mainly steel.

The title of the project, "Wall Curtain", plays with the term and refers to a new role it can assume. If the curtain wall points out the thickness of the outer layer while comparing it to a thin, almost invisible curtain which can be removed without any significant influence, the Wall Curtain





DIGITAL SEWING – SIMULATION OF PULLING AND FOLDING

DIGITÁLNE ŠITIE – SIMULÁCIA ZAŤAHOVANIA A RIASENIA

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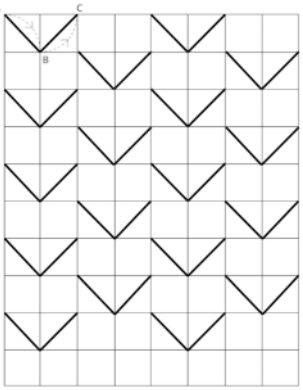

DIGITAL SEWING – SIMULATION OF SMOCKING TECHNIQUE

DIGITÁLNE ŠITIE – SIMULÁCIA TECHNIKY ŽABKOVANIA

Authors Autori: Danica Pišteková, Petras Vestartas

wants to win back its relevance and value in an interior space. It is able to act as a wall, divide a space and still protect from the sunlight or unauthorized views, and even control it. The Wall Curtain will not remain unnoticed or subordinate to architecture. It will not follow its curves to serve and obey, but instead to live its own independent life, though based on the forces surrounding it. With its own rules, it builds another space and invites us to visit and experience its inner organism, providing depth to accommodate different bodies, which imprint their traces and thereby co-shape its performance.

The situation of contemporary architecture seeks to find new textile purposes, leading to a more autonomous position. Textiles can fulfill many needs that architecture is not able to satisfy immediately. The medium creates various spatial situations, escapes the logic of rigid construction, changes the acoustics or reflects the trajectories of our bodies.[7]

At the same time, the material of textiles has come a long way. New technological components can be implemented into textile structures directly during the process of weaving or knitting, where even the smallest thread can be highly controlled. As such, the inputs are structurally interconnected. Lights, sensors for recording sunlight, sounds or movements: with these elements, the textile layer becomes a highly informed medium through collecting, analyzing, and responding to data. Textiles are entering new areas of fabrication and application that connect traditional technologies with those only recently developed – hence resulting in highly customized and specified materials which challenge the standard purposes and start to belong to the world of computational discourse with a focus on performance and response.[8]

Regulating textiles. The stubborn meets the regulated

The computational part of the project is closely tied to material, using the assistance of the Kangaroo engine, a live physics instrument which helps to simulate, optimize and form-find in Grasshopper interface.[9] Accordingly, the simulation of the textile behaviour and explorations with the *digital sewing* were carried out, this being the process where a virtual needle penetrates a mesh surface and connects different points, i.e. vertices of the grid. The investigated surface behaves in accordance with the setting of various possible levels of creasing the membrane and strength of the strings. The two vertices then meet in one point tightly, connecting two surfaces or two points of the same cloth (zero string). In the case of different settings, the effectiveness of the string can be weaker, where it is not pulled fully to the touch of the points, so the "thread" marks the distance between them.

The virtual stitch emerges by this process and the mesh surface is creased by the set level. The stiffness of the textile is simulated in forms of various folds or wrinkles. The process is very playful and one can try to work with multiple layers, holes or a stitch force. While exploring the tool, several techniques of working with membranes have been found. Smocking is an embroidery gathering technique using stitching to create areas of tension and release which allow a garment to fit and to be flexible at the same time. It has strong decorative visuality while its arrangement can be highly controlled. Both the computational and physical representations use grid or dots as the starting layout. Following the defined rhythm and using simple rules, by connecting the dots or corners the smocking pattern can be made in many sophisticated ways according to the selected path. Stitches can follow the edge of the grid plane or run diagonally. In prototypes, the thread uses knots to stabilize the fold, or runs throughout the cloth allowing different densities of gaps and creases.

Another possibility of shaping a membrane through digital sewing is to use darts in the form of folds or cutouts. Darts tailor the garment to a body with its concave and convex curves (shoulder darts, waist darts, bust darts), and transform a flat, 2D textile material into a 3D object. It is usually created by 3 points or 2 sets of information. The vertex of the triangle shows its length, while the edge points represent the amount of folded or removed material.[10] Here again, the virtual needle connects the opposite points, the vertices of a dart, and generates a surface which is no longer flat. Symmetrical multiplying of a dart creates different modules which can be integrated into more extensive clusters. As the human body is not a parameter in this process, the darts have to be activated by another force. Therefore the simulation of inflation is applied here, to explore the extreme conditions. The material properties are changed and the results show various behaviours of the module according to the strength of air, material stiffness and its elasticity.

It is obvious that the mesh, as a collection of polygons and vertices, acts as an interface between the physical and the digital. As a result, it not only describes geometry, but turns the mesh into a changing infrastructure with ability to adjust the right resolution according to the desired scale.[11] Hence it becomes a complex, unstable entity full of intensities and possible transformations.

Although each technique has its own unique way of specification for the description of the manufacturing, it is mainly seen as a design tool for form finding and explorations, integrated into the early design phases. In consequence, additional digital instruments were created and self-coded to shift the virtual configuration to the next stage of unpacking and preparing the fabrication.

The dialog of the real and the virtual

The Wall Curtain is formed to the exact measure of a given room, including a window on the shorter side. The choice of an exact site ensures the direct application of the computational rules and provides a relatively objective environment for reviewing and comparing the digital behaviour to its physical representations. The object covers the entire back wall with the window and blurs the corner to divide the space to several subspaces: the entrance space of the room, the in-between space inside the two textile layers, the gap between the window and the installation itself, and finally the area underneath the outer bump of the curtain. As a result, the project influences the space and stimulates a new choreography.

Although the shape was formed through digital sewing, none of the specific techniques were used. The stitching produces the basic distribution of enclosures and volumes considering the context, and the forces generated by the activators of the structure.

SIMULATION AS A DESIGN TOOL
SIMULÁCIA AKO NÁSTROJ NAVRHOVANIA
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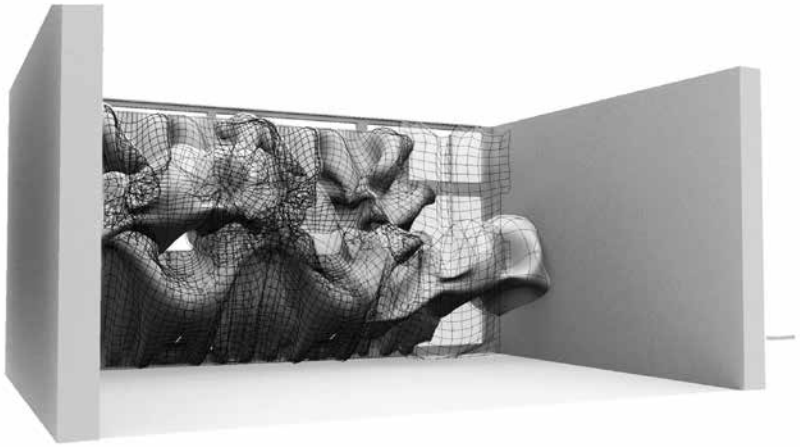
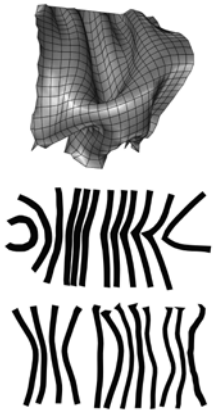
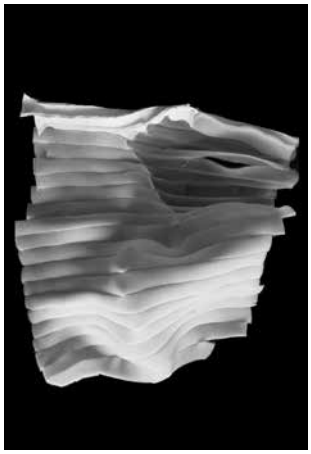


FIRST TESTS OF UNFOLDING A SHAPE
PRVÉ TESTY ROZKLADANIA TVARU
Author Autorka: Danica Pišteková





After forming the object by digital sewing, the question arises of unfolding the shape. While the fashion industry uses several methods of creating the right cuts for the body, Wall Curtain has to dress the room and still have it remain habitable. Thus it must take into consideration several different elements: the site, location of the windows or height of the ceiling and other forces like inflation and human interaction. Consequently, various ways of pattern making were investigated in direct relation to physical prototypes in different scales and materials. These processes feed each other and optimize themselves. Since it is a 2D unfolded representation, the unfolded pattern is seen as a new way of marking and fabricating architecture.

The striping method was chosen to impose the visible order onto the naturally arbitrary performance of the fabric. It gives a system to the willful activity, yet on the other hand it recalls some features related to textiles, such as a striped motif or density of seams. As such, an aggregate is created, formed by plenty of separate elements, all of them unique and exclusive.

The patterns were always tested in reality, so most of the problems were indicated during the analog sewing. The process provided valuable information for the reverse calibration. Excessively sharp edges, or too many corners meeting at a single point, cause bulges or holes, while pieces that are too narrow or too small are hard to cut and handle with such a large amount of segments. While the first explorations were scaled down to evaluate the overall response of the material, it soon turned out that the outcomes cannot be judged completely without being undertaken in 1:1 scale and in the appropriate material. Bearing in mind that textiles cannot be scaled, the real-scale tests are crucial and the types of the final textile materials need to be chosen during the early stages of the manual investigations.

All these limitations are important inputs for the digital pattern development. The striping method without in-between embedded pieces and sharp edges and with more gentle, continuous lines solved the issues. Every step of the process is very complex and contains a certain number of sub-tasks. Once the shape is unfolded into the appropriate pattern pieces, it becomes crucial to

TESTS IN 1:1 SCALE AND INTERACTIONS WITH A PERSON

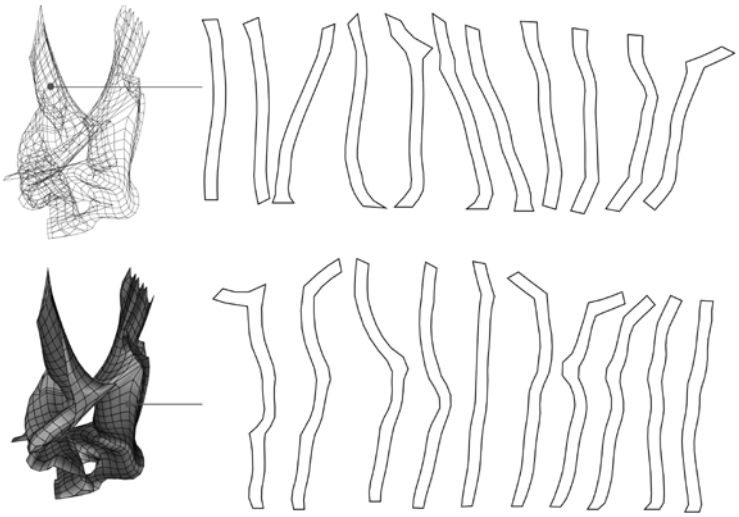
TESTY V MIERKE 1:1 A INTERAKCIE S OKUPANTOM

Photo Foto: Michaela Jakobsen

TESTS IN 1:1 SCALE AND INTERACTIONS WITH THE SURROUNDINGS

TESTY V MIERKE 1:1 A INTERAKCIE S OKOLÍM

Photo Foto: Danica Pišteková



SIMULATION TEST WITH TWO LAYERS

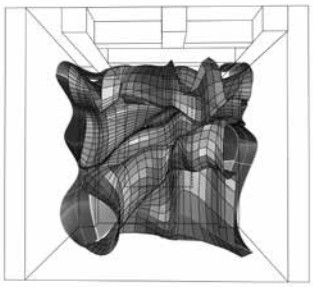
TEST SIMULÁCIE S DVOMA VRSTVAMI

Author Autorka: Danica Pišteková

TEST IN 1:1 SCALE

TEST V MIERKE 1:1

Photo Foto: Danica Pišteková



THE FINAL SHAPE OF FORM-FINDING

FINÁLNY TVAR PROCESU HĽADANIA FORMY (FORM-FINDING)

Author Autorka: Danica Pišteková

THE FINAL UNFOLDING TO STRIPES

FINÁLNE ROZLOŽENIE DO PÁSOV

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EXPLORATION OF THE BACK LAYER

SKÚMANIE ZADNEJ VRSTVY

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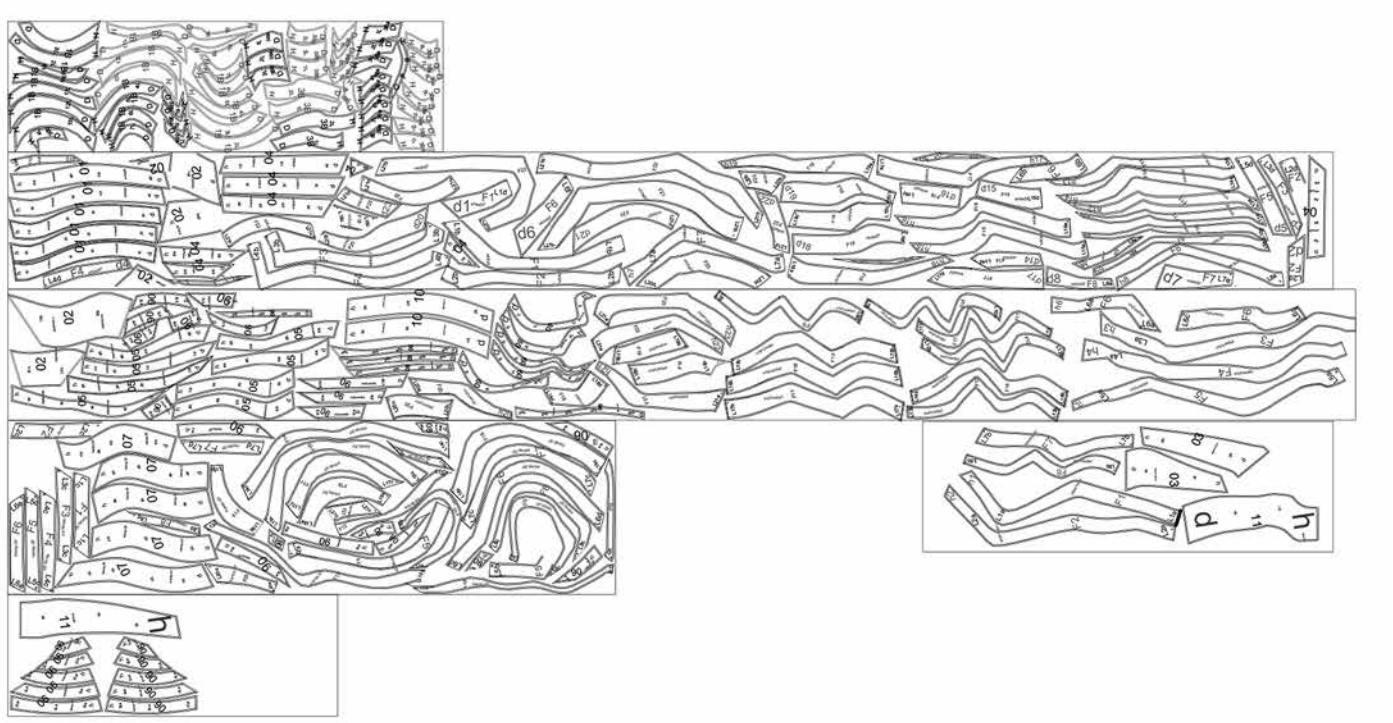

LAYOUT OF THE PIECES ON THE FABRIC

USPORIADANIE JEDNOTLIVÝCH KUSOV NA TEXTÍLII

Author Autorka: Danica Pišteková

create a suitable system of marking. The outlines need to be added to offset the distances from the edges to mark out the sewing path. Back and front sides need to be labeled so as not to confuse the seam side and the outer side of the cloth. And finally, the left and the right edges are tagged to secure the correct order.

The segments of the aggregate are further explored and divided horizontally into several zones of different transparency. As the object still partly fulfills the role of a curtain, its remains to control the sunlight and create areas of direct or dimmed illumination.

As a material, 3D spacer fabric is used in combination with paper nylon. The spacer fabric is the result of industrial experiments with textile warp knitting technology and its quality lies in its distribution of air, recovery, soft cushioning and very low weight and recyclability at the same time. If the smart usage of a material is the key issue in contemporary architectural research, textiles are but one material among many. Foldability, low weight, easiness to transport and the ability to create a space without applying enormous quantities tend to have less impact on environment and cost.

The Wall Curtain is created from surfaces with different thicknesses, while the material properties ensure the form, together with the in-between layer of inflatable cushions. As a result, the object not only is able to accommodate a human body, but also involve a body in a more abstract way, i.e. the dynamic, pneumatic layer, which is impressed to the surface.

WALL CURTAIN, FINAL OBJECT IN 1:1 SCALE

STENOVÝ ZÁVES, FINÁLNY OBJEKT V MIERKE 1:1

Photo Foto: Anders Ingvartsen

WALL CURTAIN, FINAL OBJECT IN 1:1 SCALE

STENOVÝ ZÁVES, FINÁLNY OBJEKT V MIERKE 1:1

Photo Foto: Anders Ingvartsen

Conclusion

The Wall Curtain is an inhabitable textile space within the space of a room, consisting of two layers with various interspace pockets. It is a drapery communicating with a window, as well as a tight tunnel for a living human body. This spatial curtain offers a completely different type of experience from the hard, orthogonal and squared forms of our most common houses, while remaining ephemerally atmospheric through the use of textile features such as stitches, translucency and play of the light, colour and softness. The project works with textiles using not only human hands and a real needle, but moreover the extracted rules of a technique to show that it is possible to control its instability and softness in both the physical and digital realms. As demonstrated, the textile space has the potential to become a proper part of our buildings rather than an inferior decoration, as it is perceived today. The new textile layer creates a lively interface between the facade and the room, the flat surface and the inner space, and includes the traces of the body accommodated in it, as well as the architecture in which it hangs.

The new layer enriches the architecture around it, while advanced features can be added to its interior or exterior. It could cover large glass surfaces and grow from inside to outside. It has the capacity to change and regulate acoustic, thermal and light zones in open spaces thanks to deep folds, highly customized cuts and material performances. This kind of space can also offer an intimate enclosure in crowded and noisy public areas, yet at the same time it has the ambition to be part of the building practice, a layer of a structure or building panels. Nowadays, the arrangement of a thermal insulation is hidden. But what if its quality and scale can be changed and its outer face folded, perforated or extended to the scale of a bulge or a room?

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Although highly speculative, the project as part of the CITA research platform presents a new reflection of design, one now seen as something very complex and dynamic. The digital territory allows the discovery of various scales and achieves a surprisingly high level of precision. A seam follows a stitch; the computational simulation reflects the textile properties by producing folds (micro scale) and through the tested patterns (meso scale) the segments for an overall shape are prepared, to construct an installation in real scale (macro scale). Consequently, the design process is not straightforward with a specific order, but instead contains inter-scale operations which provide constant feedback between each other.

Further, the Wall Curtain's contribution lies in the constructing of the series of actual prototypes. It shows that they are not built as a full representation of the digital outcomes, but instead become equal, well-informed parts of the research. The deviation between the computational prediction and the fabricated prototype provides valuable feedback for simulation calibration. Moreover, the failures or errors are integrated parts of the project with crucial importance. Some are repaired during the new iterations, but some are subject to external conditions that are so temporary or contextual that is hard to incorporate them to the digital setup. Fabrication, like measuring, cutting, sewing and installation itself, brings even more inaccuracies, but all of them enrich the project and provide a new layer of information and performances in order to gain even more surprising spatial significance.

In this project, architecture is filled with different soft proximities, and shows how spaces could be dressed, too. In the digital age, architecture strives for complexity, and it is completely understandable that it continually reaches for a textile material as a medium for its experiments. The micro scale of the textile structure determines the macro scale of the large objects and vice versa, making it almost ideal for investigation its possibilities in full complexity. Whilst the material and its properties are still more accepted than perfectly programmed here, the object becomes an independent piece of design taking all the previous expertise to the field of computation, where the stubborn material meets systems, codes, restrictions and rules. Creating an enclosure that is soft, colourful, well-controlled and light, the project introduces a consistent combination of concept, computation and design.

1 Author of the project: Danica Pišteková, Collaboration on computational part: Petras Vestartas, Supervisors: Mette Ramsgaard Thomsen, Phil Ayres. The project was part of the doctoral research Diagrammatic Genealogies (2013 – 2017) conducted at the Department of Architecture, Academy of Fine Arts and Design in Bratislava (supervisor: Peter Stec, Marian Zervan) and at CITA, Center for Information Technology and Architecture in Copenhagen (supervisor: Mette Ramsgaard Thomsen).

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