

Weaving Shadows

Dressing Bodies and the Landscape

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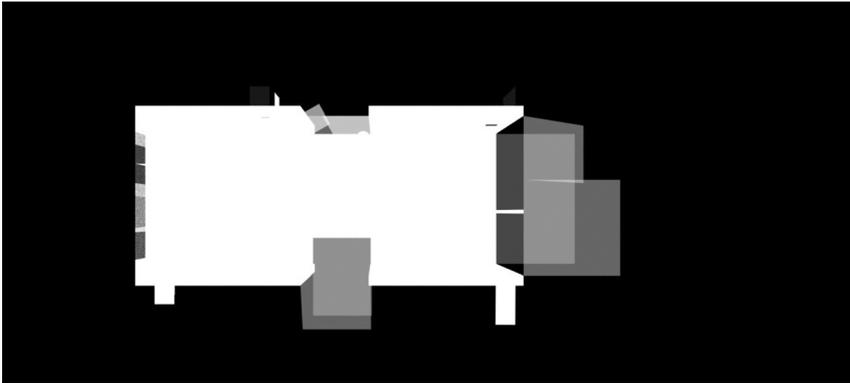


Figure 1: Third iteration of the Weaving House, plan

ABSTRACT

My design-based research investigates architectural fabrics, in spatial enclosures between the body and the city. It draws inspiration from the rich associations between dressing and building, in order to question the hermetically sealed architectural envelope. Identifying interstitial and in-between spaces as places where seams exist in the architectural fabric, my work investigates environmental comfort, beyond the strict engineering approach. A particular research focus is shadows and shading, conceived as ephemeral architectural fabrics which dress the city, the body and the landscape.

Architectural envelopment and comfort are here explored as multi-dimensional qualities of inhabitable space, place and the environment in the context of a rural landscape in the Mediterranean, using the example of the design for a summer house. The house uses contemporary parametric tools to engage with environmental site conditions, while cutting-edge digital technologies are employed for the fabrication of its metallic 'cloth'.

Tectonic arrangements of semi-enclosed spaces suggest a possible sustainable future in architecture, where the boundaries between exterior and interior are continually negotiable, and where bodies freely inhabit both sides of the 'architectural fabric'. Within the contemporary context of parametric digital design and fabrication there is an opportunity in further enhancing this vocabulary of bodily envelopment.

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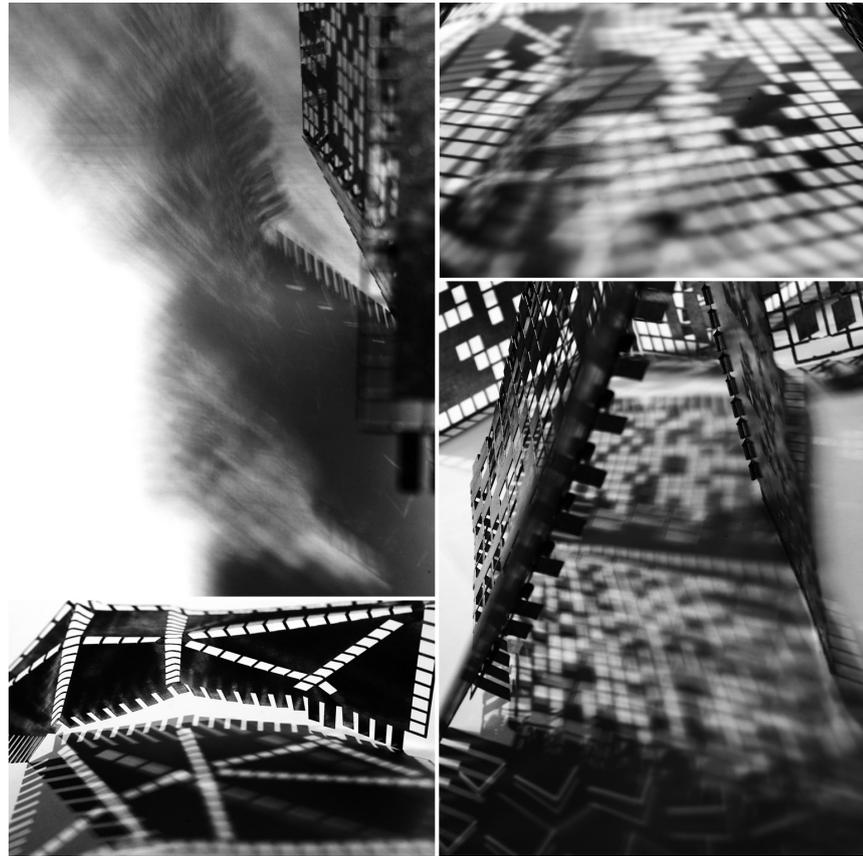
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Figure 2: Textile fabrications 2009



INTRODUCTION

This paper presents a process of design research into environmental design and digital fabrication. A series of experimentations for a summer house project in the Mediterranean offers the opportunity to consider notions of comfort in inhabiting the natural landscape alongside key references in architecture, and a cross-disciplinary understanding of the practice of negotiating boundaries, between architecture, textile-making and fashion.

This research aims to explore comfort as a multi-dimensional quality of inhabitable space, place and the environment, in the context of the rural landscape (Figure 1).

THE FABRIC OF ARCHITECTURE

The research is initially stimulated by an interest to understand the similarities between building and clothing, between architecture and fashion. Meanwhile discovering a rich and widely researched topic I found this association to be fundamental. Both literal and metaphorical meanings of fabric are important in this consideration, since the word fabric is often used to suggest a building (the building fabric) and a city (the city fabric), or a social situation (the social fabric), all being locations of life and human activity. A point of departure for the exploration of architecture's relation to fabric and fashion are the unique research, built work and extensive writings of Gottfried Semper and Bernard

Rudofsky. Their ideas form a historical and thematic continuum – they are both Austrian, while Adolf Loos acts as the intellectual link between them (Loos, 1982) – in underlining aspects of environmental design and fabrication with regards to textiles and fashion.

Semper's (2004:32) treatise 'Style in the technical and tectonic arts or, Practical aesthetics' places textiles first in hierarchy of tectonic materials, with another important part of the book dedicated to metallurgy. Two theories are fundamental for my research; first, the *Stoffwechshelthese* supports that qualities attributed to one material can manifest themselves into others, as a kind of tectonic phase-change. With the support of contemporary digital fabrication, computation and through modulation this principle can be applied to infuse a textile essence to different materials (Cache, 2000). Second, the *Bekleidung* or principle of cladding supports that architecture is a form of dressing and a building is a piece of clothing, i.e. a dress. Subsequently, a phenomenological understanding of the architectural fabric links materials to aesthetic phenomena (Hartoonian, 2006). Finally, coloration is considered as a form of building dressing.

THE FABRICATION OF TECTONIC AND AESTHETIC COMFORT

Similarly, in my work, shadows are considered as a form of aesthetic dressing. The series Textile Fabrications (Figure 2) paired with experiments in textile design, photography and photograms is a first exploration of tectonics, techniques and technologies for the design of the summer house. This design exploration of shadows and comfort involves digital fabrication with sheet metal. In a digital design and fabrication sequence thin metal sheets were manipulated into textile forms; they acquired softness and bended, were perforated to become porous and let in the light and air. And they were photographed together with the shadows they produced, revealing an aesthetic quality in creating a play of shadows. The shadow is linked to an object via a line and thus a permanent connection, a seam, exists between the two. Each two-dimensional material plane fashions an additional immaterial plane linked to it and, thus, a three-dimensional shaded space may be constructed from them.

These experiments exploring surface textures, material processes and fabrication principles lead to understand construction as the fabrication of tectonic comfort between materials and their immaterial counterparts. Also, aesthetic phenomena like shadows and shading are intrinsically linked to fabrication and a definition of an aesthetic comfort which, in turn, implies human delight.

BLACK FABRICS

'On the threshold, the point where light and shadow cross, lies the sanctum of art [...] this is a treasury of shadows. Everything that consists of light casts a shadow. Our work is shadow work, and it belongs to the light.' (Luis Kahn)

Figure 3: Shadow weaving

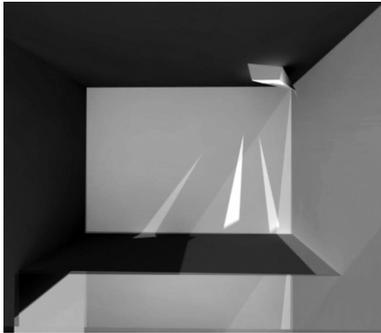
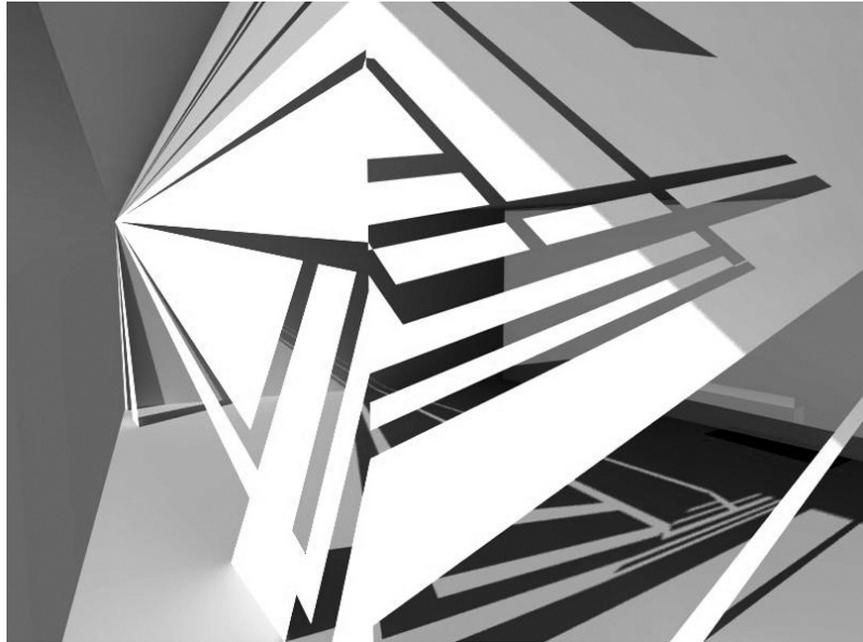


Figure 4: Horizontal weaving

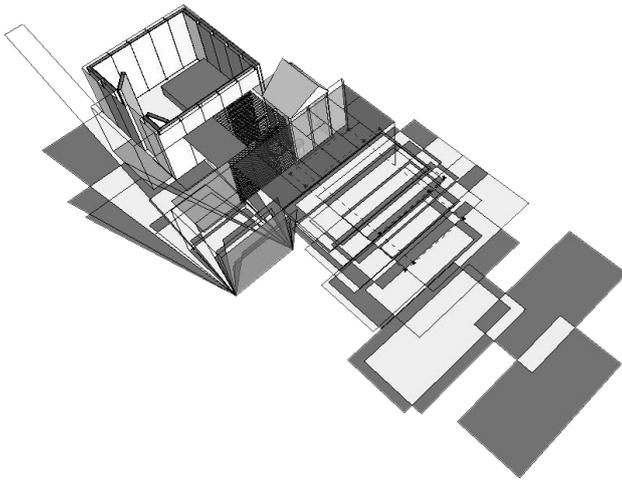
Through these design experiments I discovered that shadows are a form of aesthetic dressing (Figures 3 and 4). Shadows are associated with the colour black although they actually consist of many different shades of grey. A research on shadows in the fields of architecture, art and fashion confirms the large differences and aesthetic apprehension between different cultures. For Kazimir Malevich's *The Black Square* series black represents the supremacy of pure feeling, while Junichiro Tanizaki's (1977) *In Praise of Shadows* places the essence of Japanese aesthetics in the appreciation of shadows in everyday life, associated with a particular sense of comfort. Similarly, the dark space of the shade in warm climates evokes a feeling of environmental comfort, in particular thermal comfort and a sense of coolth. Black clothing in nomadic tribes in the Middle East and Africa, and the Bedouin black tent are woven and worn comfort, modifying the micro-climate of the interstitial space between the wearer's body and the cloth.

THE FABRICATION OF COMFORT

The concept of comfort is challenging because of the inherent difficulty in defining the term. While, very often human comfort conditions in the built environment are understood as clearly defined goals based on readings of temperature, humidity and air velocity, by doing so, they inevitably become highly prescriptive. In reality, additional factors such as clothing, mood and social context can be highly crucial in affecting the sensation of the human comfort condition. The pursuit of comfort, for example, prompts yearly, seasonal and daily patterns of nomadism and adaptive methods of sheltering. Comfort is connected to the human senses and is, thus, intrinsically associated with architectural materials, tectonic design and furnishings. It is, nevertheless, a highly subjective sensation.

In the design of the Weaving House, comfort is explored in a rural context as a dynamic quality of space. Bernard Rudofsky's (2007) ideas of simple

Figure 5: Time sequence of shading, four-dimensional nomadic fabrics



living and his house designs are introduced in a contemporary context. The work of Rudofsky furthers that of Semper in understanding the architectural fabric and the aesthetics of comfort from a socio-cultural viewpoint, since *'architecture is not just a matter of technology and aesthetics but the frame for a way of life – and with luck, an intelligent way of life'* (ibid:11)

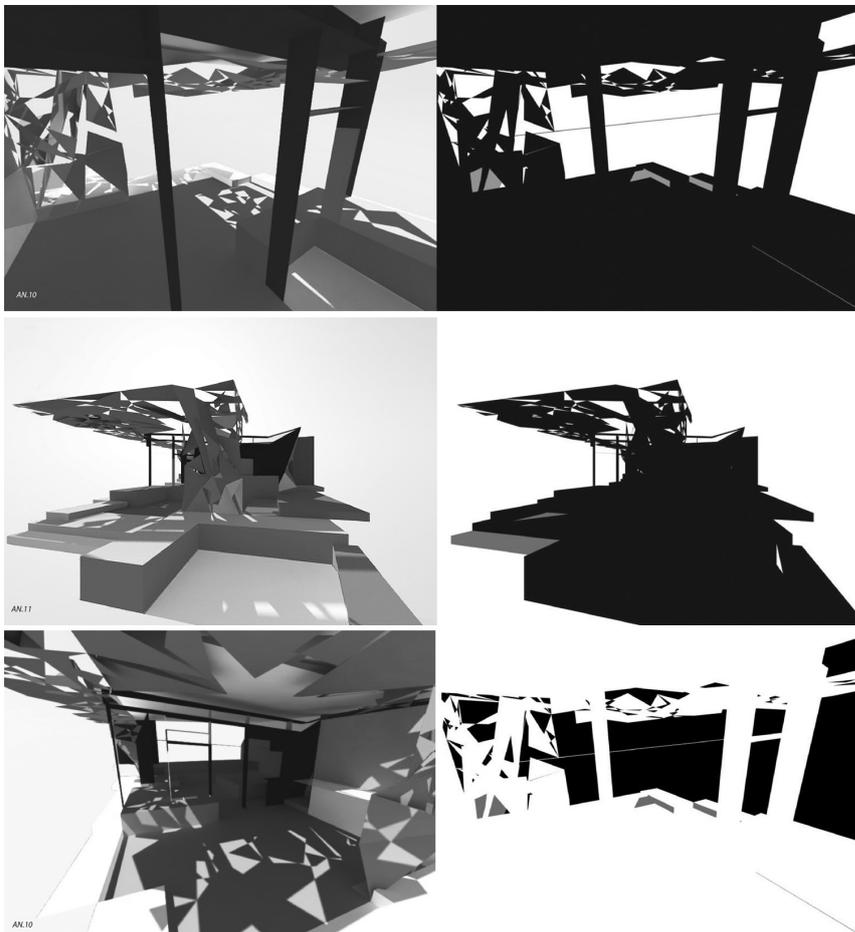


Figure 6: Eleventh iteration, shadow tailoring of the Weaving House

Figure 7: View from the site across the bay



Rudofsky's ideas were shaped through extensive travelling, a nomadic lifestyle and largely through living experiences in Japan and the Mediterranean. The houses he designed were conceived as a collection of individual rooms, always connected to the outdoors, featuring roof-less or wall-less spaces and semi-enclosures, challenging conventions about what is considered appropriate, public and private. While his built architectural vocabulary remains deeply modernist and that of the solid white wall, his texts, photographs and exhibitions reveal a much richer design palette. There is an opportunity here in revisiting Rudofsky's architectural vocabulary of semi-enclosed spaces in the contemporary context of digital textile fabrications.

THE SPACE OF THE SEAM

Following Semper's principle of dressing, Rudofsky confirms that 'sometimes the borderline between clothes and habitation are blurred, as between a raincoat and a pup tent', his interest in fashion and clothing are again understood through the aesthetics of comfort and delight. He is critical of fashionable tailored clothing which rejects the shape and natural movement of the human body and is uncomfortable (Rudofsky, 1972), admiring the simplicity of clothes that require little effort in making and wearing.

In both fashion and architecture design revolves around a manipulation of seams, an art in connecting the different parts or materials to a whole. In either disciplines, this links to ideas about comfort. For Semper seams are opportunity for artistic expression rather than problem, in making 'a virtue out of necessity'. The seam is an integral and crucial part of a fabric, as it signifies the interstitial; a boundary condition, transition, the joint or the separation of surfaces and space. However, rather than being considered

Figure 8: Weaving with the landscape



a problem, obstacle or side-effect the thesis takes the position that seams are generators of the fabric's specific properties.

The standard architectural envelope is understood to be a manipulation of seams where climate and weather are often to a large extent excluded. This defensive attitude to nature is comparable to the analogy in fashion of constructing a tailored suit or armour, with a high number of seams. On the other hand, as is the case in vernacular cultures and also in Japanese designer fashion dressing is conceived as the process of wrapping a single piece of woven and uncut fabric around the body. Wrapped clothing has fewer seams or is seamless. It allows more freedom and emphasises the body's movement. In contrast to tailoring, it takes a less defensive attitude towards the sun.

WEAVING SHADOWS, DRESSING BODIES AND THE LANDSCAPE

From the most advanced woven technical fabrics to the most primitive handcrafted pieces of cloth, the principle of weaving remains essentially same: the combined effect of a structural warp and a non-structural softer weft. Interestingly, in primitive cultures, weaving is a direct reference to the movement of the sun, where a light fabric is woven across surfaces and in space, in cyclical rhythms between solstices and equinoxes (Martin, 2007).

In the Weaving House, the warp is the sun and its fixed motion in the sky and the weft is the nomadic movement of inhabitants, who seek comfort in the shade, motivated by everyday rituals of sleeping, eating, bathing and a sequence of inhabitation based on variation. The aim lies in configuring space in order to freely inhabit the landscape and dissolve the boundaries between inside and outside (Figures 5 and 10).

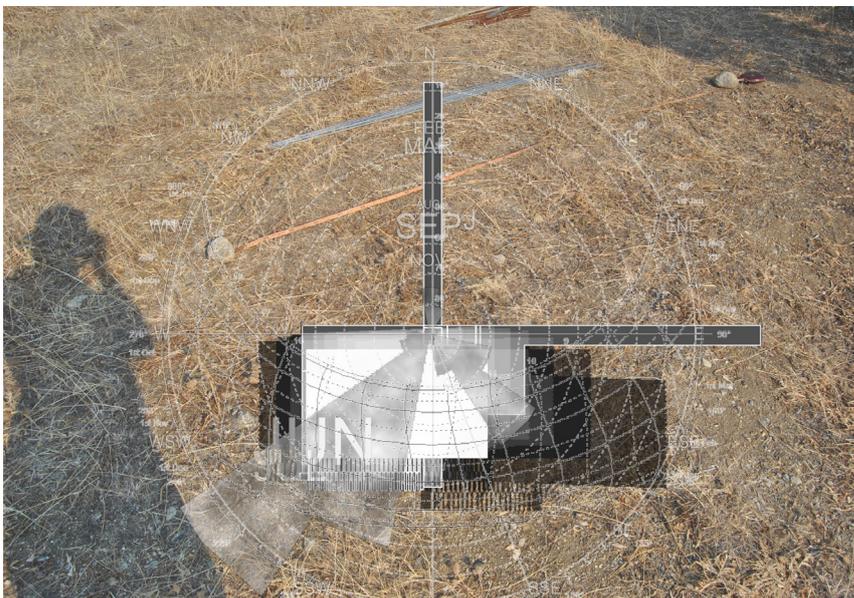


Figure 9: Plan of house, with projected shadows, sun-paths and wind-rose diagrams



Figure 10: The landscape

The project is a study of dressing the body in the natural landscape. Set in a rural site, this experiment tests weaving of shadows to create architectural inhabitable space. Shadow patterns form a particular style of body dressing. Because of the location and climate, dressing for comfort is minimal but dressing for modesty is still a concern, thus, shadows also form an aesthetic dressing for the body, in response to a social understanding of comfort.

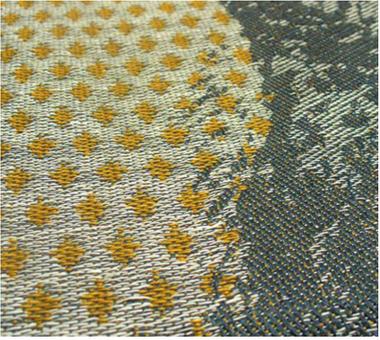


Figure 11: Jacquard weave

BODY, MACHINE AND LANDSCAPE

Inspired by weaving techniques, the design of the Weaving House is inspired by a study of looms. For primitive cultures the loom is a symbol of both the human body and the landscape. In the Weaving House the body weaves along with the landscape and shadows are dressing both the body and the landscape.

This design for a summer house in the Mediterranean, shadows create an ephemeral inhabitable interstitial space. Shadows from walls expand and contract and have a volume, 'a space we can occupy for a while' (Knowles, 2006) (Figures 5 and 6).

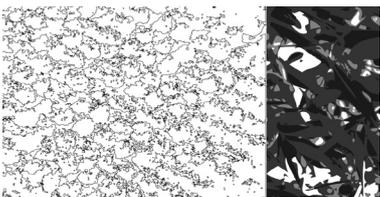


Figure 12: Extraction of digital textures, from olive trees and leaves

Through a series of design iterations the architecture becomes more ephemeral, essentially reduced to a framework, or loom, that weaves shadows (Figures 3 and 4). A permanent wood scaffolding or Semperian framework inspired by the structure of the original jacquard loom, is first placed on the site to receive the pre-fabricated walls and ceiling. The series of 15 or so digital iterations of the Weaving House do not represent a process toward optimisation to a final design but rather, to use the fashion analogy, form part of a collection of unique possible identities

WEAVING WITH THE LANDSCAPE

The site's main orientation is towards the East, where the seafront and bay view lie (Figures 7, 8 and 9). The surrounding hills are covered with olive groves and the site itself has several olive trees. This landscape does not change in appearance from winter to summer, only the rotation and height of the sun create seasonal variation. Climatic solar and wind data and the orientation of views drive the demarcation of programmatic spaces (Figure 10).

This project is developed in a digital environment, using scripting software to manipulate two-dimensional surfaces, to simulate three-dimensional shaded spaces and to visualise dynamic four-dimensional architectures. A direct reference is the binary aesthetics of the jacquard loom's perforated punch cards [Figure 2]. In the Weaving House, a woven fabric is generated from digitized images of olive trees, shadows or clothing (Figures 11 and 12).

CONCLUSION

This project is an exploration of ideas found in key historical architectural references that explore the themes of inhabitation in relationship to the landscape and natural environment. The methodology of research follows several parallel trajectories; historical, anthropological, cultural, visual, theoretical, cross-disciplinary, paired by empirical experimentation in making and observation. It is found to be an appropriate methodology in order to explore such a complex issue as comfort in architecture, and speculate the full spectrum of its implications in design, with regards to tectonic, aesthetic, spatial and socio-cultural considerations.

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