PERFORMATIVE AGENCY OF MATERIALS

Matter agency of vernacular African pattern systems

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Abstract. This paper investigates an agency of materials through a design methodology that follows Martin Heidegger’s process of “Entbergen” or “unconcealing” as a non-instrumentalist understanding of tools and materials. This investigation takes place through the design of a children’s theatre in South Africa where material innovation for architectural components is needed. The research studies vernacular African patterns and their inherent behaviour when transferred to materials. The transference of pattern systems to architectural prototypes is discussed alongside the discussion of their technical and architectural performance criteria. Following Heidegger’s theory of “Entbergen” (“unconcealing”) the paper will demonstrate how making in this methodology becomes an “unconcealing”, which includes both digital and analogue means, linking the four causalities - causa materialis, causa formalis, causa finalis, and causa efficiens – through the agency of material within an integrated process between all four causes. Making becomes a process in which form is generated through interventions within fields of forces and currents of materials, taking cause and agency into account, and standing in opposition to methods that are defined by a premeditated notion of an ideal outcome.

Keywords. African patterns, making, design build, design methodology.
1. Introduction

John Wood (2007) argues for “brief, local utopias” as a network of connected, pluralized, bottom-up “micro-utopias” that achieve global synergies through design. Such “Micro-Utopias” are more tentative, temporary or truncated versions of the picture book utopias. Within these “Micro-Utopias” design is not just understood as aesthetic, but also as an ethical, social practice to benefit society – building up upon ideas of John Ruskin and William Morris (Burcikova, 2007). Design becomes “metadesign”.

The Guga S’Thebe Children’s Theater, located in the Langa community (the oldest township in Cape Town) could be seem as a form “metadesign”, where craft is used to create a physical and cultural environment with lasting impact. This paper reflects upon the design methodology that was used to design different parts of the building with the focus on the design of performative interior elements. This methodology was also used in designing other parts of the building such as the exterior skin. The paper will first – briefly - introduce the project of the Guga S’Thebe theatre and then explain the design methodology and its transference to the design of acoustic absorbers and diffusers for the interior of the theatre.

2. Guga S’Thebe children’s theatre

The Arts and Culture Centre Guga S’Thebe attracts local children, adolescents and artists, as well as international tourists. One of its additional programmatic needs is a large multi-purpose space. The new space facilitates local theatrical productions, concerts, church services, marriages and festivals.

The Guga S’Thebe children’s theatre is a design build project by multiple international universities working with the local community and practitioners, which creates a cultural "village" through interior and exterior performance spaces. By combining recycled/re-used materials with earth construc-
tions, this project creates affordable and transferable building prototypes, which can be reconstructed easily by inexperienced and shortly trained labourers and adapted to other building typologies. Cape Town, with its big harbour, opens the opportunity to re-use locally found shipping containers. Single shipping containers are used everywhere in the townships to provide safe and inexpensive shelters. Unfortunately, containers perform very poorly climatically. A system of loosely stacked sea freight containers surrounds a central theatre space. The container's structural performance is maximized by minimal modifications. The poche (container walls) incorporates spaces such as backstage areas, a soup kitchen, spectator balconies, a recording studio, an exterior stage and other facilities.

3. Methodology

3.1. THE FOUR ARISTOTELIAN CAUSES

Aristotle is the first philosopher to introduce the four types of causes for movement or change, which give answers to the “why” questions of: causa materialis, causa formalis, causa efficiens, and causa finalis. Aristotle explains the four causes using different examples for each cause in his book Metaphysics:

The causa materialis, the material cause, is “that as the result of whose presence something comes into being” (Aristotle, Metaphysics, 5.1013a) referring to that of which something is made of. Aristotle uses the example of a statue, which is made from bronze. Bronze is the causa materialis for the statue. The causa formalis, is the “form or pattern; that is, the essential formula and the classes which contain it.” (Aristotle, Metaphysics, 5.1013a) Aristotle’s example is the form of octave, which is determined by the ratio 2:1. The causa efficiens brings something to be by opposing form onto matter or “that which produces is the cause of that which is produced, and that which changes of that which is changed”. (Aristotle, Metaphysics, 5.1013a) The causa efficiens of a table is the carpenter or the child’s cause is the father. Causa finalis is the “end” or the purpose: health is final purpose of taking a walk. (Aristotle, Metaphysics, 5.1013a)

3.2. HEIDEGGER’S CRITIQUE

Heidegger, in “Die Frage nach der Technik” (1954), criticizes this Aristotelian model, which focuses solely on final products and referred to as the hylomorphic approach, as purely instrumental. Here the cause is described as an affecting force. Affecting in this context means achieving success. Leaving the causa efficiens as determining all other causes. In that context
Heidegger points out that the Greeks know causality as fault, responsibility or indebtedness.

Again in response to Aristotle’s four examples, Heidegger gives one example - tying all four causes together in one example of the silver chalice.

Matter / *causa materialis*: Silver is the material from which the bowl is made (hyle). Therefore, the silver is indebted to the cause. So the chalice owes the silver that from which it is made.

form / *causa formalis*: Secondly, the silver chalice is indebted for its appearance in terms of its shape and appearance (eidos) of its “chaliceness”. Its eidos is a formation of its “chaliceness”.

telos / *causa finalis*: But in addition to those causes the silver chalice has been produced to be used - for sanctification and offering. The silver chalice is defined through the boundaries of sanctification requiring a specific performance. A salad bowl or a vase will not do.

*causa efficiens*: The silversmith is complicit in the existence of the silver chalice. His complicity is based not purely on its role as a maker in terms of the effect of making - not as efficient cause.

The silversmith reflects upon and links the first three kinds of indebtedness, and brings them into being. The three previous kinds of cause are indebted to the planning of the silversmith, who decides if and how those causes are unconcealed, how their being comes into appearance. The craftsman’s responsibility is the poeisis, the bringing forth or revealing (unconcealment) of the object, which was beforehand hidden or not present (Greek : aletheia; Latin : veritas truth).

Heidegger makes two changes to Aristotle’s approach: first, there is continuity and resonance between the four causes implied through the example of the silver chalice – one object’s event, not four; and secondly, there is a reversal within the order of the causes - *causa finalis* and *causa efficiens* switch places. The *telos* becomes the fourth cause.

In this text Heidegger assigns agency to all contributing causes and clarifies that it is through the interrelating with other causes that the maker becomes co-responsible for emerging design (Bolt 2007).

3.3. RESEARCH METHODOLOGY

The presented research and its application to the children’s theatre are based on a procedure that tries to incorporate an agency of material where matter, formation, and performance are in conjunction with the maker: a *textility of making* (Ingold 2010).

The materials studied are textiles: Through diagramming, textile systems are transferred to architectural materials. The method proceeds in the follow-
ing 4 phases, in which the maker deploys the four causes in an interrelated process.

Phase I – textile patterns: In this phase textile pattern systems are studied as materials through parametric diagrams and understood in their consequences as material resulting from their process of making. This investigation informs the causa formalis and causa materialis.

Phase II – from 2d to 3d: Through diagramming each textile material system develops into a 3-dimensional configurations or formation.

Phase III – artificial equivalents: Different technological, artificial equivalents with specific performance requirement are proposed and tested. Architectural systems are considered and are constructed in consideration of different scales and scalability linked to the design of the Guga S’Thebe Theatre. This includes performance testing, if needed. Actual materials are considered.

Phase IV – on-site construction: In this last phase students and local workers for the Guga S’Tshebe Theatre work on site in South Africa. Instead of one individual maker, the setup of the project is constituted by a diverse team, which operated within a highly constrained time frame.

4. Matter agency

In this section two different pattern systems are explored with an account for how the methodology was employed within these examples. The discussion in this section shows design work in preparation for the design build project in South Africa.

4.1. ADIRE

Adire - from Yoruba, Nigeria - is an indigo dyed fabric with intricate white figures. The dyeing process uses the resistance of starch, raffia or thread to prevent the colouring of the certain areas. Two fabrics, 2.5 yards x 1 yard, are sewn together to form customary, patterned women cloth (Horn 1996), which show geometric lines using one or more of the followings elements: dots, circles with varying radii, triangles or rectangles with infill, parallel lines with sometimes variable line thickness, intersections of lines and circles. The special character and beauty of the fabric is created by the strong contrast of the blue and white colour and by the effect by blurring edges.

Five different patterning techniques for indigo-dyed fabrics can be distinguished. The Raffia Resist /Adire Oniko (1) is a technique for tie-dyed fabric using raffia ribbons, which are tied around the fabric in order to stop the fabric from absorbing colour. The blurring effect can be controlled in this technique by supplements such as beans, stones, seeds or other small objects that
are tied inside the fabric during the dying process (Gillow 2003). The Pleat Resist (2) uses pleated cloth that is tied before dying. It is soaked or painted on one side of the pleats to create a stripped pattern. The stitch resist / Adire alabere (3) uses threads as resist. The printed pattern technique (4) applies pattern through stamps. The starch resist / Adire eleko (4) applies starch to resist the dye through a stencil or by hand.

Figure 2 shows an overview of a variety of explorations that start with different patterns and their implied materiality. The diagram then is informed by materiality and allowed to form accordingly, while making and application are simultaneously considered. Within the context of Heidegger we could say that each pattern is unconcealed (Entborgen).

The third option shown in figure 2 was selected for further exploration. In this pattern study circles with varying radii are made by using the raffia resist technique, which blurs the edges, constituting the pattern used in this sample. Through diagramming and scripting the centres of the circles and their radii were transferred to a 3-dimensional surface, which reads a small circle as smaller bulge and a larger circle as a bigger bulge. In parallel materials were considered and potential applications proposed. Considering locally available materials and potential re-use of material, the function of an acoustic absorber was explored. Figure 3 shows the material elements involved in the assembly: a wooden frame (15cm), a fabric cover, tensioners, and insulation.

The wooden frame was first built with plywood and later replaced with locally available used pallets from a market. The insulation was initially built using leftover felt. But acoustic calculations showed that the absorption of felt or other re-used waste products would not suffice as absorption for the large performance space. The acoustic calculations showed that the positioning of highly effective absorbers was needed for speech and theatre performance and that there was a need to prevent detrimental reflections from the rear wall, which would lead to echoes on the stage, if not properly absorbed.
Therefore, the following mock-up for the insulation was developed and tested: 10 cm mineral wool, foil (550g/m²), 5 cm mineral wool and fabric with a porosity of 35%. Testing as shown in Figure 3 proved a good acoustic performance. In combination with variable curtain 100 m² of wall and ceiling surface necessary reverberation times could be provided.

4.2. ADRINKRA

The second pattern system studied can be found in Adinkra textiles. Adinkra textiles are a rectangular toga-size cloth that was worn by the Akan people in Ghana and Côte d’Ivoire. As Adrinka originally means goodbye or farewell, those togas decorated with symbols were reserved for spiritual leaders and royalty mourning the dead. Symbols were chosen from a large catalog of graphic figures, each representing a concept or aphorism. Colours used were the darker colours appropriate for mourning. Now, worn by everybody, brighter colours can be found and symbols adapt to incorporate technological developments. Also, contemporary designers have started to use Adrinka symbols for decorating multiple types of objects.

The traditional fabrics were stamped with symbols that carved from Calabash shell onto strips of cloth, which are then sewn together to make large sheets that can be wrapped around the body.

The printer starts by defining a grid 2.7 x 3.6m on the fabric with a bamboo splint dipped into a thick dark sticky substance (a tar from boiled down
The next step is to apply a set of rows with different design motifs.

Figure 4. Adrinka patterns (left), prototype (right).

We can find a series of different techniques: We can see a simple grid, with one repetitive pattern, an alternating grid of two symbols, bands of symbols, a diagonal grid and combination of grids. The research of the Adrinkra material system revealed that the process of stamping is one of the most characteristic procedures that influence the making of this fabric. Diagramming this procedure as *causa materialis* opened the possibility to explore the behavior of stamping as a three-dimensional process with digital means. It was assumed that the material, which receives the stamp, is malleable first and can maintain its form afterwards. The project started by three-dimensionally stamping surfaces in Grasshopper and varying the height of the stamp - becoming the *causa formalis*. First material explorations were conducted in concrete and gypsum (powder). The three-dimensional surface of the moulds was cnc-milled out of plywood and a silicon mould was cast from the first mould to be used for the final concrete cast. The potential of this technique was in the possibility for the re-use of the moulds. Problems were encountered by the high weight of the tiles and fine-tuning the pattern’s performance aspects to meet acoustic criteria. Façade applications were unreasonable; therefore, interior applications for the theatre space were explored. From an acoustical point of view, the use of shipping containers was already very useful, since the containers exhibit certain diffusivity through
their corrugated exterior. In that sense the interior had already sufficient diffusing surfaces, but unfortunately the diffusion would always break the sound waves in the same way. Difference in diffusion elements was desired. At the same time, it was also a desire to create an interior in which the structure of the shipping container would still be visible and not entirely covered by acoustic absorbers, curtains, illumination elements and other diffusers.

Therefore, the potential for combining performance requirements was explored. Figure 4 shows a wall panel, which diffuses sound with varying angles and performance as light feature within the theatre space. The making is very similar to previous procedure, but the material is changed to a thermo-formable plastic with different colours, which can be used for illumination and sound diffusion simultaneously.

![Figure 4. Wall panel showing sound and light elements.](image)

5. On-site construction

On-site construction changes the causalities of making drastically. During the construction phase students work with members of the community learning how to deal with different construction materials and their specific applications in South Africa. The methodology provided a framework, in which changes could be made easily without losing the essence of each design. The short time frame of a 3-month construction phase and the constraints within the budget and availability of material provided another input to the design.

References


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