Design Ground - An Iconic Tactile Surface

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Abstract

This paper forms an intermediary summary of a project which aim is to suggest an alternate methodology for utilizing additive Rapid Manufacturing (an evolved rendition of Rapid Prototyping), for the conceptualization and fabrication of design and architecture. It plans to do so by establishing a methodology that is innate and a direct reflection of the additive RM production process. The project also aims to address the seemingly divisive discrepancy between the process of digitally conceiving a design and the intrinsically somatic way we perceive it. Such aims are explored through a surface design that is not predominantly guided by visually derived nodes but instead relies on a form of ‘tactile iconography’ as a means for expressing and amplifying various qualities and elements found in its vernacular. The resulting design would be very difficult, if not impossible, to make by any other means.
Introduction

“The entire body may ‘know’ a dance. In such cases, knowledge is all the more likely to be physically inscribed, without an overtly intellectual component.”


The project was instigated based on two defining parameters.

Firstly, to produce a sensorially inclusive design. To produce a design that ‘looks’ beyond visual, or visually derived, stimuli. To allow the haptic (touch), auditory (sound), kinesthetic (motion), and all the substrata of such perceptual formulations (temperature, vibration, pitch, treble, rhythm, obliqueness, texture, friction, etc.) to play a more involved role in the conception of a design. To produce a design framework within which such aims can be achieved...

Secondly, to use Rapid Manufacturing (RM) in the formulation of the designs conceptual foundation as well as for final physical fabrication. To, through the conception of a design, suggest a way in which this quite remarkable, and still evolving, technology could be formulated in a way that reflects and utilizes its intrinsic qualities instead of merely mimicking alternate fabrication methods...

Project Catalyst

“Wittgenstein liked to say that the most difficult problems are the ones right in front of our eyes, the ones we don’t see as problems. Those are the ones we have to struggle to perceive.”


The project was initially constructed around a competition brief provided by the Swedish flooring company ‘Pergo’. The brief was left somewhat undefined, requesting its participants simply to design something ‘innovative’, and that such novelty should happen in/ on the plane below ones feet.

How such an open brief was developed for this particular project was initially prompted by the, to some extent peripheral, qualities of the paved surface around the neighborhood of London’s Exhibition Road in South Kensington, an area occupied by number of the city’s main museums and galleries. However, it wasn’t necessarily the more, call it, ‘highbrow’ aspects of this locale that were of interest, but the more peripheral marks of human/ urban occupation – the blots of discarded chewing gum that seemed to saturate the streetscape. There must have been thousands, tens of thousands, hundreds of thousands of these, predominantly off white, specks carpeting the main segments of the road and flanking sidewalks.

Observing these blots closer it was interesting to note how one could decipher their approximate location on the road simply by their shapes and the patterns they formed. Very dense around and just outside the sidewalk curb. Dense, but more pronounced, by pedestrian crossings; less dense and elongated by the main or central footpaths; and sparse by the inside (building side) of the sidewalk.

These patterns, somewhat suggestive of Braille (the tactile reading and writing method used by the visually disabled), provided the initial clue for how to proceed.

What if, instead of merely passively interpreting these aforementioned patterns, one would provide them with meaning, immerse them with performative attributes that could inform one of their immediate vernacular on a more planned and specific level? Could one, by manipulating such patterns’ surface and consistency, create an additional strata of, non-intrusive, sensory stimuli that, ideally, would not only enrich the streetscape on a purely perceptual and affective level, but craft something that could also act as a functional tool for conveying empirical information to those with, and without, a sensory disability? Could the surface be made to perform an amplifying role in clarifying the features of its immediate environs?

Design Implementation

“As the most ancient and largest sense organ of the body, the skin enables the organism to learn about its environment. It is the medium, in all its differentiated parts, by which the external world is perceived.”

*Quote from Ashley Montagu’s book, ‘Touching - The Human Significance of Skin.’*
How such concerns were put into practice required that the aforementioned gum-patterns be conceived within a more regimented framework. This entailed that the initially more randomly distributed gum-blotches were conceived as a fish-scale like array of small tactile components that allow for a surface with a binary and directional pattern (the surface is smoother in one direction, and ‘rougher’ in the other).

This surface could consequently be ‘enriched’ by applying simple binary ‘deformations’ to the core pattern. The scales of the surface could be made (gradually, as on a sliding scale) smaller or larger, thinner or wider, more or less pronounced, etc., according to various predetermined and intuitive haptic iconographies. This fish-scale pattern could also be curved towards, and obliquely angled, to show and insinuate various surrounding features (as, say, the entrance of a building or an approaching pedestrian crossing).

One could even, by manipulating the consistency of the fabrication material (something that is possible thanks to the minuteness and accuracy at which one can control the composition of a material through this technology), change its tactile and even auditory qualities. I.e. by making the surface more or less dense, and by patterning such consistencies according to various utility and performance based configurations, one can make the surface ‘feel’ and even sound different (when walked upon) at various locations.

How such features are actually applied is explained further in the following chapter, however here it is worth noting that the paradigms within which the aforesaid notions have been conceived in have

Figure 1. The project was catalyzed by the ‘field’ of discarded chewing-gums on London’s Exhibition Road. These patterns were used to suggest how the consequent patterns of the surface should be implemented.
Figure 3. An example of how the surface properties could be affected – here by setting up a truss matrix which constraints were determined by the properties of both the fabrication process and its accompanying material. Here this entails that the make-up of the designs truss based structure can be adjusted according to a responsive algorithm that can be attuned to reflect particular tactile traits, such as softness, elasticity, or a variety of different textures... This aspect of the project was developed in conjunction with Sean Hanna and Siavash Haroun Mahdavi from University College London, the Bartlett (school of architecture) and Department of Computer Science all been guided by a framework set by what the relevant technologies (both software and Hardware based) allow for. This entails that the size, patterning and modulation of the designs become somewhat arbitrary – for to fabricate the design(s) it is its mass and volume, not its complexity or the repetition of a set formulae, that matters. Here there is no need for a fabrication template (entailing a set of identical pieces) as for the RM machines it is equally laborious to produce two (or more) alike pieces as it is to produce a number of, roughly equal in mass and volume, but still drastically different components. This is both the processes advantage and its crux, as the seemingly almost infinite freedom this means of production seemingly entails, it still needs to be defined and thus confined, according to some form of predetermined parameters – a protocol that is still in need of further revisions before a set, almost innately settled, modus operandi has been established.

**Design Application**

“Smooth surfaces invite close contact, while rough materials such as hammered concrete generate movement in wide radii around corners and more careful, tentative movement through corridors. Changes of texture often signal special events and can trigger a slowing or quickening of pace. It would be possible to generate a whole choreography of movement through the composition of textural changes alone.”

How such aforementioned interests could be applied in a design is illustrated in the example below.

In a generic streetscape four key nodes of a pedestrian sidewalk are recognized: the main (or ‘spine’) path of the sidewalk, the entrance to a building, the curb, and the area of a pedestrian crossing.

Applying the aforesaid principals to each of these four key locales the various surface properties could differ as follows:

- **The main path of the sidewalk:**
  - Directional (fish-scale) pattern applied along the main spine of the pedestrian passage.
  - ‘Medium’ porous consistency.(1)
  - Level, horizontal, surface.
  - Surface sound ‘A’ (generic surface sound).
- **The entrance to a building:**
  - Directional fish-scale pattern towards the entrance of the building.
  - More solid surface consistency than along the main path.
  - Slightly convex slant (surface obliqueness) towards the building entrance.
  - Surface sound ‘B’ (a ‘harder’ sound than sound ‘A’).
- **The curb:**
  - Directional, skewed, fish-scale pattern.
  - Higher, more pronounced, texture.
  - Surface level slightly higher than along the main path (the surface is oblique down towards the main spine of the sidewalk).
  - More solid surface consistency.
  - Surface sound ‘D’ (more ‘hollow’ than surface sound ‘A’).
- **The pedestrian crossing:**
  - The fish-scale pattern fades into blister paving.
  - Slight, gradually increasing, concave surface tilt towards the crossing.
  - ‘Softer’ surface base consistency.
  - Surface sound ‘D’ (more ‘muted’ than surface sound ‘A’).

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Application of aforementioned principles within a design (exterior)...

Thus, to illustrate how such concerns can be applied in practice, the above outlined methodology is applied to a, somewhat generic, streetscape...

In the illustration below four typical nodes of a street are defined:

A) Is the main pedestrian spine along which most of the streets users stroll...
B) Indicates the entrance to a building...
C) Indicates the area flanking the curb...
D) Defines the area of a pedestrian crossing...

Figure 4. A generic streetscape in which four key nodes are recognized.
Even by the application of such a reduced taxonomy of iconic nodes an almost infinite variety of interpretative options and variations of patterning cold be applied to the surface. The inherent flexibility of this parametric process also allows for the adjustment of the surface for a variety of different formats, be these for interiors (entailing a ‘toning down’ of the surfaces coarseness), to even applying these principals to a wall surface (as briefly outlined below).

A number of physical prototypes have also been fabricated, both through the use of a Selective Laser Sintering (SLS) machine, and a Stereolithography (SLA) machine, allowing for the testing both the tactile surfaces operational, wear & tear and function related, practicalities, as well as the surfaces more ethereal characteristics, how it actually ‘feels’ and how easy or intelligible the surfaces intended expressive qualities actually are.

Additional Adaptations of the Design

“The hands of the sculptor are independent organisms of recognition and thought; the hands are the sculptor’s eyes.”

Quote from Juhani Pallasmaa’s book, ‘Polemics - The Eyes of the Skin.’

As insinuated above the project has also explored additional means for how the principals examined could be adapted to serve a variety of other purposes. These include developing the Ground Design in more, call it, ‘expressive’ ways to, say, change its color when the surface get dangerously hot (which would be useful when in the vicinity of a stove), or, by making subtle indentations in the surface, make it form, when it rains, ‘Designer-Puddles’ in the shape of images letters or paths. It could also be conceived in the format of a wall surface, a continuous organic relief of sorts, that would allow one to perceive or read things through the use of ones palms and fingers. Even further applications are being explored – the potentials for such parametric conceptions seem to be almost limitless...

Conclusion

In conclusion, the aim of the project is to establish a way of designing something that utilizes and is instigated by digital (CAD) based means, here
through the use of Rapid Manufacturing, but does so without omitting the more innate sensory qualities of what usually makes one respond and appreciate a design (its physical presence, things such as its texture, apparent weight, or even the subtle ‘sounds’ it makes). By considering all the various tactile, auditory, in addition to the more obvious visual, aspects of the design already in the initial (digital) conception stage of the project, along with attempting to tie such considerations in with the process used for actually fabricating the design, hopefully a more accomplished way for how one could achieve a more sensorially provoking and invigorating end result is implied.

The design is still in the process of being implemented. Currently we’re in the process of scaling-up, testing and fine-tuning further the aforementioned assumptions. But hopefully the final realization of the design will act as a non-intrusive, yet, for those actively seeking or are just generally more perceptually aware, subtly inciting additional source of either empirically informative or just purely pleasurable stimuli that would provide an additional enriched strata of embedded data that could reflect and interact with its users and environment without adding further to the already saturated clutter of the urban fabric.

The intent of the project is to suggest a somewhat deviant approach to how architecture can be perceived and conceived. Its aim would not be to exclude the other senses from the equation but to create a more comprehensive and attuned understanding of how, what we usually define as ‘touch’, could be included more inseparably into the grammar and vocabulary according by which we read, define, design and build our ‘architecture’ by. By utilizing something as immediate as touch as a catalyst for the brief the hope was to form the foundations of a more personalized and distinctive approach for how to understand and define our built environment. An approach that transcends beyond the purely pictorial (conceptual) and ocular drive that seems to saturate so much of what we today conceive of as architecture into a realm more in tune with how we actually sense things, both within and outside ourselves.
Notes

(1) Here terms such as ‘medium’, or ‘sound ‘A’, are used as purely, hermetically comparative, expressions that are only referential to each other instead of some more generic (haptic or tone based) standard.

References


