Sensitive transformations of physical territories

Digital and material procedures in designing

Anastasios Tellios¹, Stylianos Psaltis²,
¹²Aristotle University of Thessaloniki Greece
¹http://www.arch.auth.gr/english/main-page/staff/faculty-members/tellios-a.html
¹ ttellios@arch.auth.gr, ² ps.stelios@gmail.com

Abstract. This paper focuses on two issues concerning advanced architectural design techniques. The first issue has to do with design methodology and more precisely with the analysis of the fundamental ‘components’, which might compose a fragile place or environment and bear a clearly distinctive character. The second issue is related to a more architectonic agenda and concerns the consequent creation of a holistic architectural product, aiming mainly to the basic architectural concept of ‘inhabitation’. Furthermore, concerning the overall process, the idea of metabolism is becoming the central point, when referring, both to the attempt of conceiving a specific natural territory within the digital realms, and to the architectural form-finding process.

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ARCHITECTURE AND ITS NATURAL ENVIRONMENT
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RESURFACING AN INTERLACED GROUND
Nature in its entirety could be conceived in two ways, either through its peculiar, bizarre and wild development, or through its vulnerable, fragile and gentle fertility. An attempt is made through this scheme to conceive the ‘mad’ natural genius. This genius has to do with possible transformations, varying through time and space, mainly defined by the basic natural factors. It consists of undetermined organizations, as a result of complex correlations between natural systems and phenomena, concluding in uncertain biomorphic effects. Those particular consequences can be observed on a wide range of scales, in where multiple and variable organic (referring to both animals and plants), chemical and other natural ‘activities’ take place. With respect to both the collective morphological appearance and the functional expression of individual entities, those activities follow
a background dynamic balance, resulting in layering of logical actions, spontaneous desires, unfinished acts, random circumstances and finally material actions-reactions, in a condition of perpetual mutation. Finally, as a result of being in a condition of indeterminacy and morphologic uncertainty, the localization of any spatial reference point (even transient) is impossible (Figure 1).

This continuous triggering of different scenarios and additionally their consequent alternation express the most disturbing aspect of natural reality. This reality is elusive and incomprehensible, causing phobic reactions. The consequent outcomes act as heterotopic organic structures or as “other” places, despite their powerful identification with a particular territory.

The proposed site is a hybrid situation between both real and imaginary landscapes. It ‘begins’ to exist where different natures meet. By employing scenarios of varying environmental elements merging together, an unrecognizable, yet believable landscape is created. Such a synthesis constitutes a personal interpretation of a rather atmospheric approach of similar environments. This approach is implemented more through an intuitive, mnemonic rendering, rather than through a realistic and photographic reading of the place. A ‘narrative’ territory emerges through this subjective infiltration. Specific natural elements, that dominate the personal perception, ‘reconstruct’ the new environment. Thus, it generates a projection of the real environment onto the imaginary.

SCENARIO DEVELOPMENT PROCESS

In order to achieve the above aspirations, a specific process of exchanging stimuli between various tools and materials is followed. Thus, particular attention is given not only among a certain amount of digital tools and methods, but also to a variety of analog experiments, which focus on the production of natural
models, using mainly raw materials. More specifically, a series of artistic images under a narrative approach is produced at an initial stage (analog process). Those images focus on this special relationship that is developed between the architectural organism and the immediate surrounding environment, suitable for its development, as shown in Figure 5.

Then, following a digital logic, the use of respective tools is divided into three stages, according to the concept of metabolism, as it has been referred earlier:

- Analysis of the main attributes of a specific place: natural elements, natural processes, memories, human implications, etc.
- ‘Infiltration,’ processing and digitalization of them not only to a conceptual level, but also to a morphological and design level
- Reproduction, emergence and revival: creation of a holistic architectural product that encloses the totality of the “new” natural and artificial environment and all possible inhabitable space.

**DIGITAL METABOLISM OF ANALOG FORMATIONS**

The overall idea of ‘metabolism’ penetrates the logic of the form-finding procedures. More specifically, in the initial stage a series of physical models were produced in a pliable material (clay). This reflected the process of searching plastic pre-forms, that later through the use of digital technology and advanced design tools will be analyzed and realized as a specific architectural form.

The concept of physicality pervades the specific process, this time through the act of handcraft, as a method of creative and investigating force, in the micro scale of fingers. Within this framework, both the ‘handling’ of the matter and the physical (or even chemical) attributes of the specific material, are the major factors that determine the final form, and consequently the produced architectural construction. Architecture is, thus, capable of revealing its primitive substance in all stages of its development and ‘growth.’ While this remains the main task in the overall process, the following associations, such as functional, cultural, symbolic, or even spiritual architectural values, are applied to the project in the degree that they have already been mastered through the user’s subconscious. These values are expressed (to the possible extend) under the spectrum of a so-called ‘fingers and muscle intelligence’.

In the second stage, digital ‘intelligence’ is applied to the previously produced material formation in an attempt to enable it to mutate into an architectonic shell. At this point it is worth mentioning that the concept of the specific matter transformation (from the a-tectonic concrete clay formation to the wooden architectonic shell) lies in corresponding theories of material transformation, such as what German architect Gottfried Semper called ‘Stoffwechsel’.

*Figure 2*

Sensitive transformations: digital-material hybrids.
a term that could be translated as ‘matter-changing’. This theory, according to Semperian matter-change, implies a kind of ‘metamorphosis’ of object, throughout the change of the used materials through history. Consequently, in the specific transformation of matter, the indisputable geometric accuracy, the constructional perfection and the architectural functionality, are all ‘blown’ to the digitized volume.

Summing up, the whole process is aligned to the following scenario: Analogue models (mainly clay models) are initially produced. In turn, they are digitally manipulated through the use of a 3d laser scanner machine and advanced design tools into a constant feedback to the previous stage. (Figure 3).

Then, aiming at the main model construction, further elaboration is conducted related to the examination of materials and the required construction methodologies. Thus, by using advanced design tools (such as rhino, grasshopper, etc), the geometry received from the previous stage is analyzed according to the constructional logic of complex organic geometries and doubly curved surfaces (Figure 4).

Following this stage, the final model is manufactured by using a ‘file to factory’ process according to which, the basic construction elements are cut on a laser cutter machine and after they were assembled manually.

**DIGITAL METABOLISM OF NATURAL COMPONENTS**

The main target behind the use of specific digital tools is mostly an attempt to frame all the natural and environmental characteristics, which are mentioned above. These natural elements are suggested to inspire the generation of key architectural components that will, afterwards, lead to the composition of a new man-built environment and territory. Moreover, during the process of their appointment to a digital environment and the following emergence of a new derivative, it is suggested that a new kind of architectural existence is created. In such an architectural line of production, an obvious intention is the development of a direct connection with its immediate neighboring microenvironment and the investigation of a possible interaction and interface between them.

Furthermore, extending the line of thoughts above, as far as the whole approach is concerned, the suggested architecture is enriched with an additional notion, that of metabolism. This term is referring to some specific transformations, which were initially applied on the existing site, so that a hospitable territory is produced, in order to make space for the new architectural organism to be

![Figure 3](image-url)
installed. As a result, as the architectural product emerges and is being produced by the elements of the landscape, at the same time it is actively reproducing that very landscape and to a certain extent is giving physical ‘birth’ to it. This all happens within the boundaries of an interactive and non-linear relationship.

An alternative relationship between architecture and nature is thus promoted, placing emphasis on the simultaneous production of architecture and its immediate environment. Such a bilateral relationship suggests, at the same time, certain strategies for architecture’s correlation to physical matter, setting as a target the direct domestication of nature, and its ‘gentle’ incorporation to the maximum possible extent.

Architecture constitutes an organism, a charming ‘creature’ with almost disturbing physical properties, which performs a specific number of basic functions. An organic composition, a kind of an artificial parasite, humbly adapted and ‘floating’ with tenacity within a fragment of the earth crust (Figure 2).

As the moral architectural issues are surpassed by default, the architectural construction is treated as the main survival apparatus, ‘demoted’ in its absolutely natural utilitarian role, complied with the brutality of the surrounding territory’s survival instinct. Thus the force of such an architectural ‘creature’ lies in its ability to assimilate the dynamic mutations of the surrounding territory and to follow its rhythm. This creates a new context of a heterotopian symbiosis (co-existence) and mutual improvement. Inside this lacustrian biotope, we can see the participation of architecture to the emergence of a relationship between knowledge or technique and the natural indeterminacy. This raises fundamental issues about the possible ways of inhabitation within its cumbersome and even pathologically inevitable materiality.

**IMPLICATIONS OF ARCHITECTURAL FRAGILITY**

Having aimed at the fundamental architectural concept of ‘inhabitation’, the obtained data deal with both the thorough examination of its meaning and
its enrichment with new attributes. This relates, simultaneously, to both the physical and the digital space. As a consequence, architecture is considered to be a hybrid of these two; a dynamic system, not merely interconnected with its surrounding environment, but also an important host, with flexible boundaries, where multiple natural elements are incorporated.

A new type of ‘inhabitation’ is therefore suggested. The theoretical approaches described above are further expanded by including architecture, technology (either digital or not), human beings and nature into a universal system, seeking for new spatial qualities upon the concept of inhabiting. Nature is partially faced as a human creation, and simultaneously as a foreign and strange entity, upon which material existence and life are based. Following these bipolar interpretations, nature in its entirety could be conceived either through its peculiar, bizarre and wild development, or its vulnerable, fragile and gentle fertility. This suggests, in both cases, a multi-sensory relationship with the primitive physical (vegetal or biological) body.

Under this light, what is subconsciously investigated here is a series of notions, so far only superficially touched by ‘digital architecture’s’ discussion: the insuperable, the imaginary, the mysterious, the emotional, even the illogical, the experiential or the subconscious and their possible projection within a virtual, digital space and world. A new field of aesthetic queries is raised, tending to challenge and maybe reverse well-established architectural demands.

Many practical and objective needs are being fulfilled by default, while personal concerns, obsessions and passions are those that lead creative architectural research constantly further. As a result, what is often suggested is a ‘pseudo’ self-repressing inclination, wishing to criticize or even deny the ‘sight purification’, a concept heavily established in mainstream architecture. This implies a fragile condition for architecture, a further tendency of avoiding a certain ‘visual hygiene’, flirting with sensationalism, with the ‘black’ and the ‘undetermined’, the physicality, the dark and the dirt. This comes to contradiction against a well-known pure formalism and transparent objectivism.

It narrates a deeper and more fragile kind of architecture, according to which the overall aesthetic spatial experience focuses on its relationship with desires, impulses and intense psychological states, implying in its essence more mazy, nocturnal, earthy, “maternal”, warm and enclosed structures, usually under the form of a primitive inhabitation.

**CONCLUSION**

In conclusion, a scheme for creation as the one described above, is considered to be an organic ‘fight’ between materials and human actions. A dynamic balance is generated, where estranged elements try to co-exist and are, ultimately, mutually affected. Every human action implies a natural reaction and vice versa. This takes place within a local micro-scale, where just as the human existence depends materially on the surrounding territory, at the same time natural elements depend essentially on human action, craft and labor.

**REFERENCES**


