

Reflection

The Architecture-Nature Analogy
An Architectural Intervention in a New Babylonian Society

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This project initiated with a research in the abstraction and translation of natural processes into simple rules in order to use them in the development of computational tools. This was mostly done by trial and error and in relation to natural, computational and/or architectural references. The domain where those experiments were tested and developed were parts of the design.

The design started to evolve parallel to the research. It considered a hypothetical society in which the necessity to work has completely vanished as a result of the automatization of the economy. The aim was to transform an existing building from an industrial past in order to conform to such new kind of society. It would contain a program that provides technological additive manufacturing tools and aims to render them accessible through interactive user interfaces and human-robot collaborations. The virtually unlimited amount of combinations of additive manufacturing tools demanded flexible floor plans. These would be inhabited by an autonomous system which responds to the time specific needs of the building's users.

The main focus of the design was on the intervention which created a new route through the building. The approach to this consisted of a sequence of design steps. Those steps individually were developed in relation to the research.

- Morphogenesis: In this part the overall geometry of the routing was designed. It took into consideration the morphogenesis of plants. From an initial starting point, iteratively is check whether it can be copied to a neighboring position taking into consideration the slope of the routing, attraction to light, and repulsion from façade. The resulting point cloud was wrapped in geometry.
- Structure: This geometry was used as a base for the structure to be designed. This has been done with the aid of structural analysis of the geometry. The result was a collection of beams.
- Cross Section: Those beams are then analyzed to find the local utilization, which is used to inform the cross section of the beams.
- Details: The façade, relation between the new structure and existing cut floors, the railing, and nodes connecting the beams reciprocally and with the existing columns were designed as more specific elements of the structure. This has been done with the aim to continue the emerged architectural language of the new structure.

Evidently, every step was a continuation of the results of the former, which would result in a very top-down approach. However, it is desirable for the steps to be more reciprocally informed. Therefore an initial complete procedure had been executed in a relatively early phase, to gain the base input necessary for every step. This allowed for the steps to be designed parallel to some extent and created a feedback loop. Because of the parametric nature of the project it was relatively easy to process the changes made in any step in the others. Although this approach provided the ability of feedback loops the overall directionality of the process remained. The eventual top-down process with occasional feedback loop assisted the consistency of the design.

Every step individually stood in close relation to the research. The posed design issue had been used as a medium to develop the research on and vice versa the research had been used to inform the design step. An algorithm was written with the reference of a certain natural process and based on the specific design issue. With the use of this algorithm alternatives were created in order to reflect on from an architectural perspective.

This interconnectedness between the research and design has resulted in an evident reflection of the research in the emerged architectural language. The use of natural references in the development of the algorithms have resulted in certain art nouveau characteristics in the designed structure. However, rather than merely decorative, the structure is functional, performative and informed. The developed architectural language might therefore be referred to as digital or informed art nouveau.

During the research it became clear that it is important to consider the complexity of natural systems. In order to use a natural reference in an architectural design it is essential to abstract the aspect that seems relevant for the project or design phase. When the aim is to use the reference in the development of a computational tool this relevant aspect needs to be translated in simple rules and converted and implemented in the algorithm. Then it needs to be adjusted to the architectural requirements and complemented with specific desires. It is clear that through this extensive process the relation between the natural reference and architectural result becomes quite abstract. It becomes merely an inspiration in the development of a computational design tool. However, as is evident in the emerged architectural language, this method has been fundamental for the development of the project.

Because the research had been experimented within the domain of the design the resulting algorithms are quit specific. Architectural desires specific to this project as well as spatial and structural aspects related to the existing building are taken into consideration. Yet in essence they are wider applicable. The way the algorithms deal with environmental data might be useful in any scale or field of design.

The extensive use of computational tools in the design and the position of computational tools in the research relate the project to the robotic building studio. The influence of two workshops we have done within the studio are also reflected in the design. The first workshop focused on CNC milling with wood, of which the knowledge was later used in the development of the robotic manufacturing strategy of the wooden structure in the design. The second workshop focused on the design of a structural node. The research of this workshop has been continued in my project and resulted in the development of steel 3D printed structural nodes in the design connecting the beams reciprocally and with the columns of the existing structure. This research evolved to the level of 1:1 prototyping, in which the gained knowledge in toolpath generation of the first workshop became useful again.

The main ethical issues the project encounters emerged from the hypothesis of the society. With automatization often questions arise about job reduction and unemployment. Yet in a society with a fully automatized economy occupational obligations have completely vanished. Therefore, on an individual level, there is no necessity for employment. However, in such society other reasons for employment, as for example pleasure or social reasons, might emerge. This has been an argument for the method of construction of the structure. Technological advancements render completely automatized assembly feasible, yet it is left open to consider the current desire for employment. The assembly procedure will therefore be a human-robot collaboration, in which the proportion is determined by the desire for employment. The program is relating to this issue as well. The emphasis that is given to the desire of creative freedom in the choice of the program as well as its implementation is an evident result of this.