

SENSITIVE DESIGN EDUCATION IN A DIGITAL ENVIRONMENT

construction of a novel framework for design and fabrication issues

Reconciliation

Due to the experiments, the approach we develop aims, on a scientific aspect, to bring together a practice of digital design and modeling (virtual) and a mastery of the material (tectonics). It is driven by a reconciliation approach between design and fabrication. These both aspects are connected in an iterative relationship. This is what we call the 'design-to-fabrication continuum' concept.

« digital modes of design, representation and manufacturing reconcile the dual nature of design process that has traditionally oscillated between drawing and making, visual and material ».

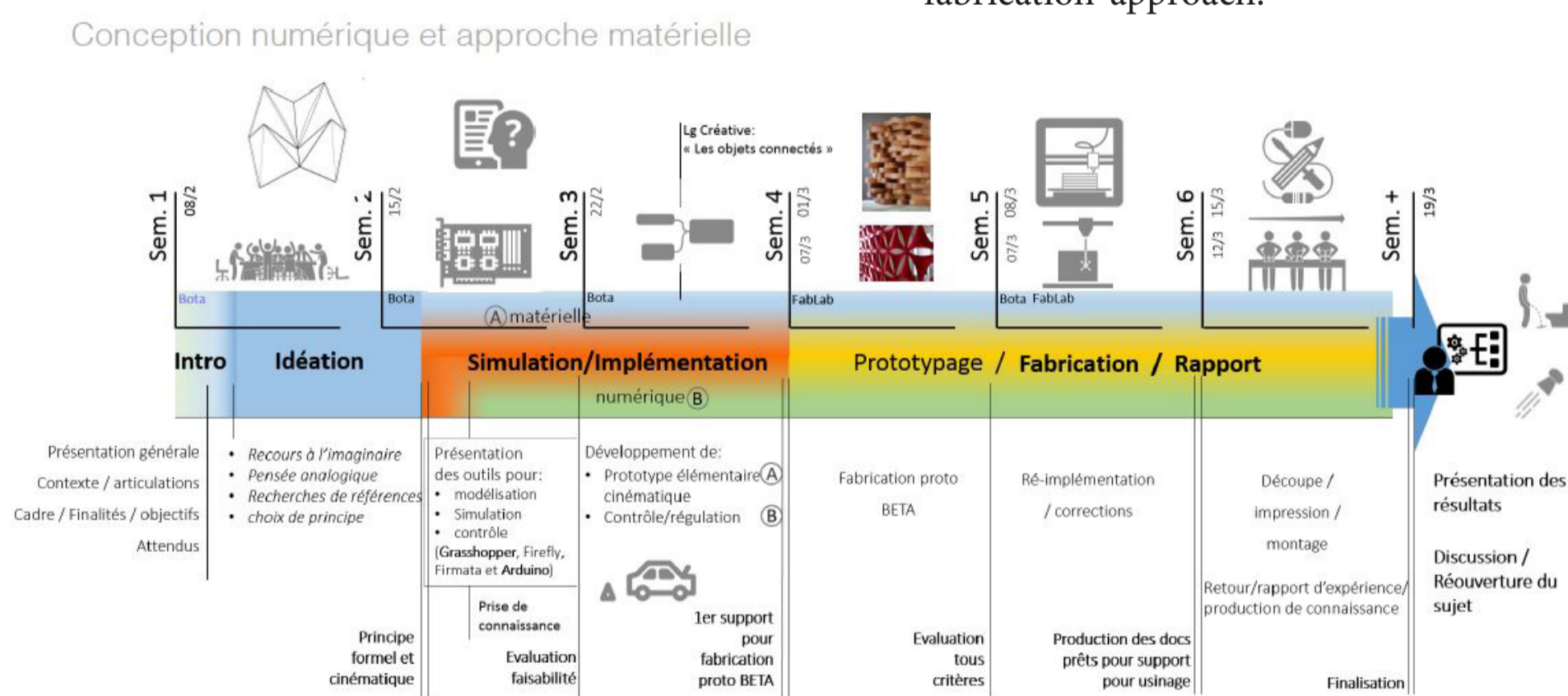
Tepavčević, B. (2017). Design thinking models for architectural education. The Journal of Public Space, 2(3), Special Issue, 67-72.

Domains of activities

The activities fields concerned by these experiments are:

- learning-by-doing approach,
- Experimentation,
- Collaborative activities,
- Interdisciplinarity,

Design framework: a synoptical schedule



For answering at the same time to theoretical and educational fields, we develop a design framework. This one is regulated by a pedagogical schedule and runs on an iterative process.

This process supports both learning and creative activities. Due to iterative modeling, prototyping and feedback steps, it provides insights in order to refine the solution by re-implementation cycles.

At the same time, it allows in real time an evaluation of the robustness of the global approach by observing the nature of the different informations and the level of continuity between them (use of digital / analogic tool sets).

Educational Goals

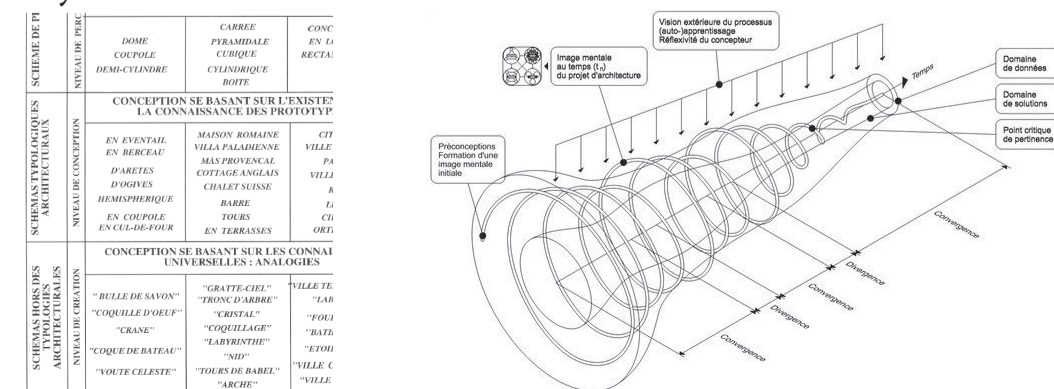
- Learn new accurate knowledge and be able to integrate complexity by the use of algorithmic and parametric thinking and tools into an already acquired design 'space',
- Apply new knowledge in specific and relevant skills, experiment and reason about:
 - formal-structural-material relationships,
 - design related to the use of digital devices (digital design thinking) in the service of morphogenesis
 - the digital design - fabrication continuum
- gain ability for:
 - managing shape in its links with the built reality in a hybrid design framework (digital tectonics),
 - „scientific“ reporting about the methodology of work (reflection on design thinking),
- build the designed object in real scale and evaluate the architectural results regarding to the design intents. (spacial, material, structural aspects).

Methods: Digital Design in Practice

As a prerequisite for any design activity, we explain to students the meaning of this specific educational practice and the interest of using the 'digital design-fabrication' approach.

Exposing design frame

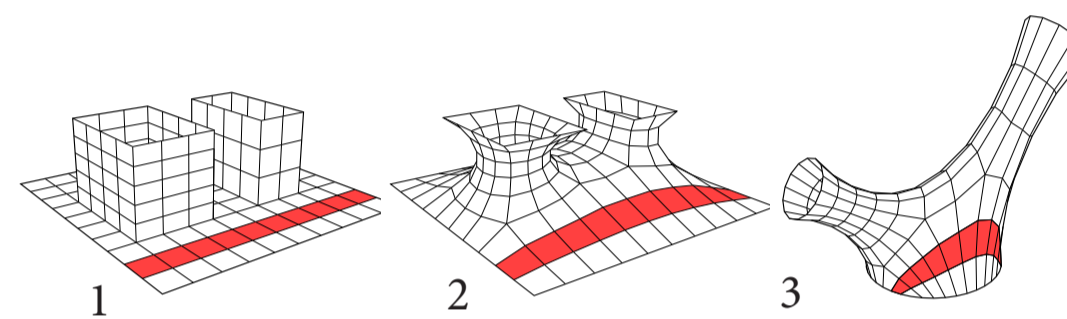
As a first step, and theoretical principles, we sketch a historical background in which parametric modeling appeared and was developed. We highlight the concept of parametric (which existed long before the arrival of the computer) as a thinking and imaginary 'rule-based' process to obtain a synthetic and complex solution versus a type of architectural object.



Learning accurate knowledge

Computer science in the architectural design core

- discovering and analysing training of parametric rules based modelling structure as a network of relationship (model as an algorithm, implementation, data management),
- exploring and training-free form generative processes (associative geometry) and versatility possibilities by introducing fundamental notions as topologic rules and mesh surfaces (1),



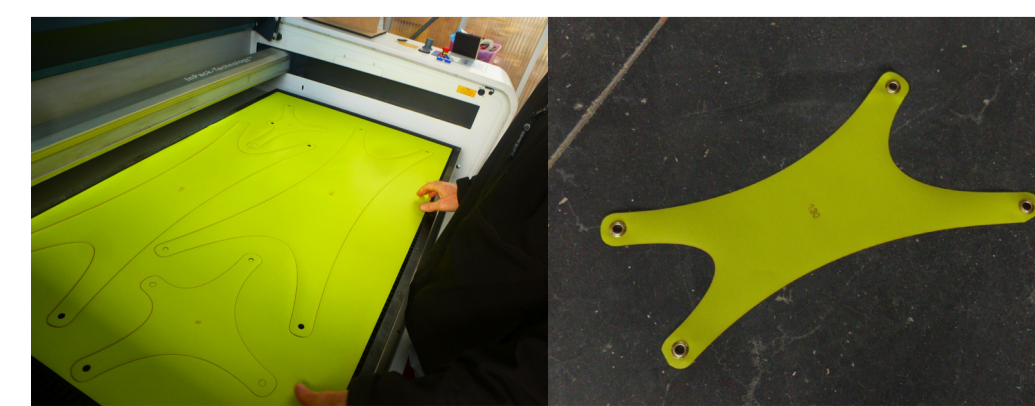
- learning to create generative topological surface (1) types and mapping (2) them on a target shape (3).

Parametrics in digital architectural design environment

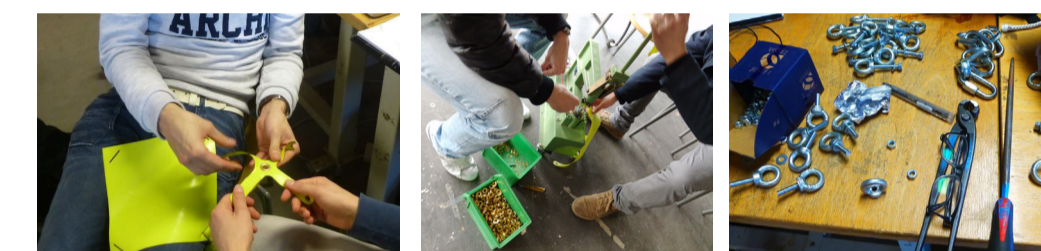
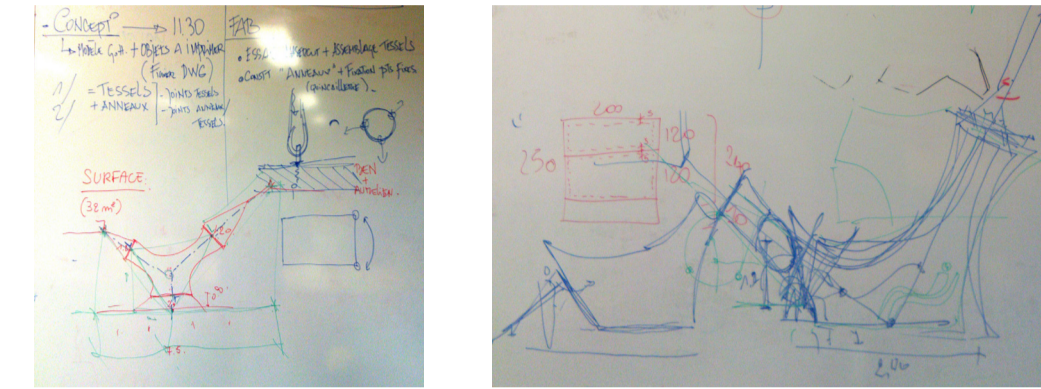
- Explore (new) shape behaviour: minimal surfaces
- Learning and experiment versatility by discrete surfaces modeling and pattern studies with the aim of fabrication possibilities,



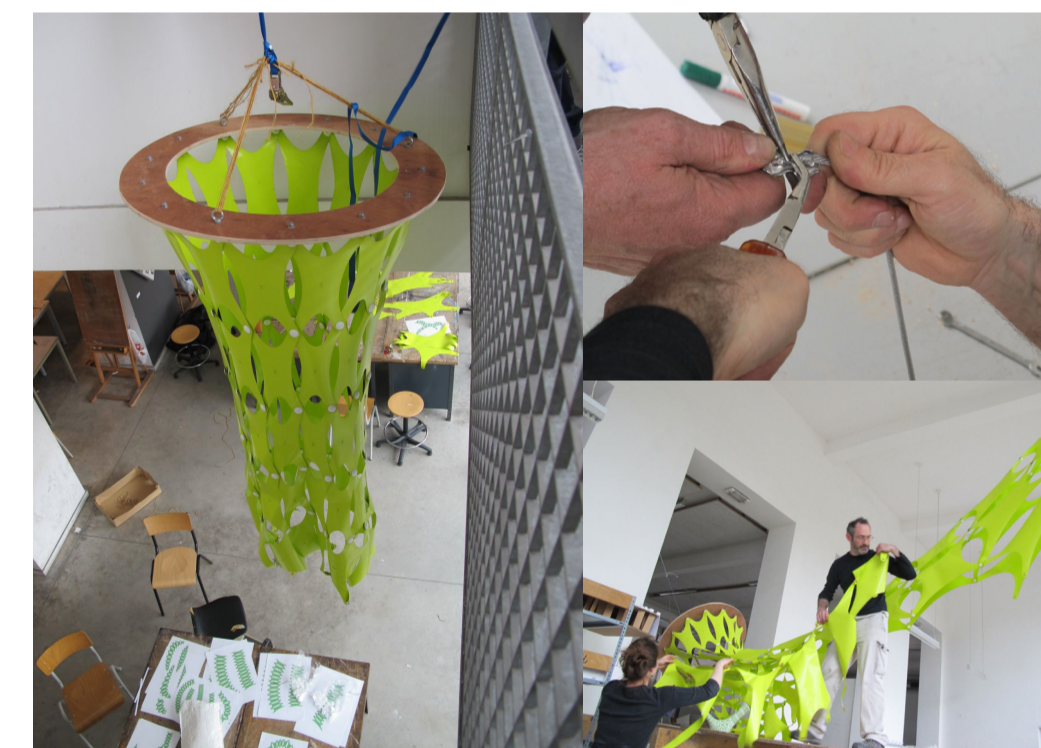
- Real scale prototyping elements for real perception of the model, assembly checking and material fabrication possibilities,



- Feedback from prototyping steps to the models by the use of hand-made sketches of details,
- implementation of new data generated by the material issues.



- Improving the logic solidity of the parametric model regarding the material issues and constraints (self-weight, resistance, plasticity/rigidity, ...).



Sensitive design education in a digital environment

Frédéric Delvaux - Architect - Phd student
Romuald Bianchi - Computer scientist

Université de Liège - Faculté d'architecture - URA
Liège - Belgium

Abstract

This research belongs to a series of learning-by-doing experiments in the last Master Degree. These experiments, on an educational aspect aim at having students discovering and exploring new design issues from the first steps of modeling to fabrication activities.

The approach we propose is based on fabrication oriented models at the early steps of design and aims on one hand at producing functional large-scale prototypes, and on the other hand at exploring and practicing tectonic matter.

As an example of these experiments, this poster presents the built result of one of them, an "immersive proto-space" called Xpanels.

To perform these goals, we focus on a design frame defined by new curriculum skills as

1. practicing digital computation as a « material » to inject into the core of the architectural design process,
2. being able to develop a hybridization of the fields of architectural design and computer science,
3. using parametric design tools as a specific way of thinking (including the challenge of abandoning traditional representations in orthogonal projection).

We explore and define how these three skills can extend design to support the practice of architectural design and we build a theoretical supplying for digital design