From representation to (abstract) form generation

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Student work by Dimitris Sotiropoulos (8th semester 2005)

The work presented in this article is an example of the dynamic relationship that can develop between a software tool and its user, which disproves the notion that modeling software is merely for representation and shows instead that the exploration of modeling software as a generator of form can become a powerful factor that leads to creative design.

The student carried out his investigation within the context of an introductory to 3D digital modeling class for students of the 8th semester of the Master of Architecture program. The class was structured in such a way that the digital modeling tool and techniques were taught and used not only as a descriptive medium of architectural forms, but most importantly as a means for investigating spatial, formal, structural, and perceptual questions. Within this framework, students were asked to build a digital model of their major project in the design studio of the previous semester (studio tutors: N. Marda and K. Moraites), which had continued into the current semester, with an emphasis on structural, interior design, and detailing aspects. The two classes were not required to be sequential, but the majority of students took the opportunity of adding a new powerful tool to their design arsenal and elected to take this course.

This year's major studio dealt with the study of a multifunctional cultural building within the dense urban fabric of the harbour city of Piraeus, which is close to Athens. The main target of the student's proposal was to design a building that can attract people not only during the morning hours, which are characterized mainly by the intense trafic of the sea transport companies' employees, but also at night, when there is less activity and the coastal zone is desolate. To achieve this goal, the program of the building included a variety of functions such as a cinema, a video club, a library, a café, a restaurant, a bar, a gym, a gallery, and an exhibition area. The desire to organize a diverse multitude of users and uses, not always compatible with each other, within a common shell led the student to experiment with the idea of "folding surfaces". These aim at achieving morphological and functional unity, while creating an impression of continuity, as the building deploys at several different levels. The movement toward and inside the building complex is guided by the undulating surfaces that not only define closed spaces but also support the continuous ascending movement within the building. This was an interesting project within the framework of a studio that employed rather conventional media, namely sketches, drawings by hand or computer, and cardboard models (see figures 1-3).

Figure 1

Figure 2

Figure 3

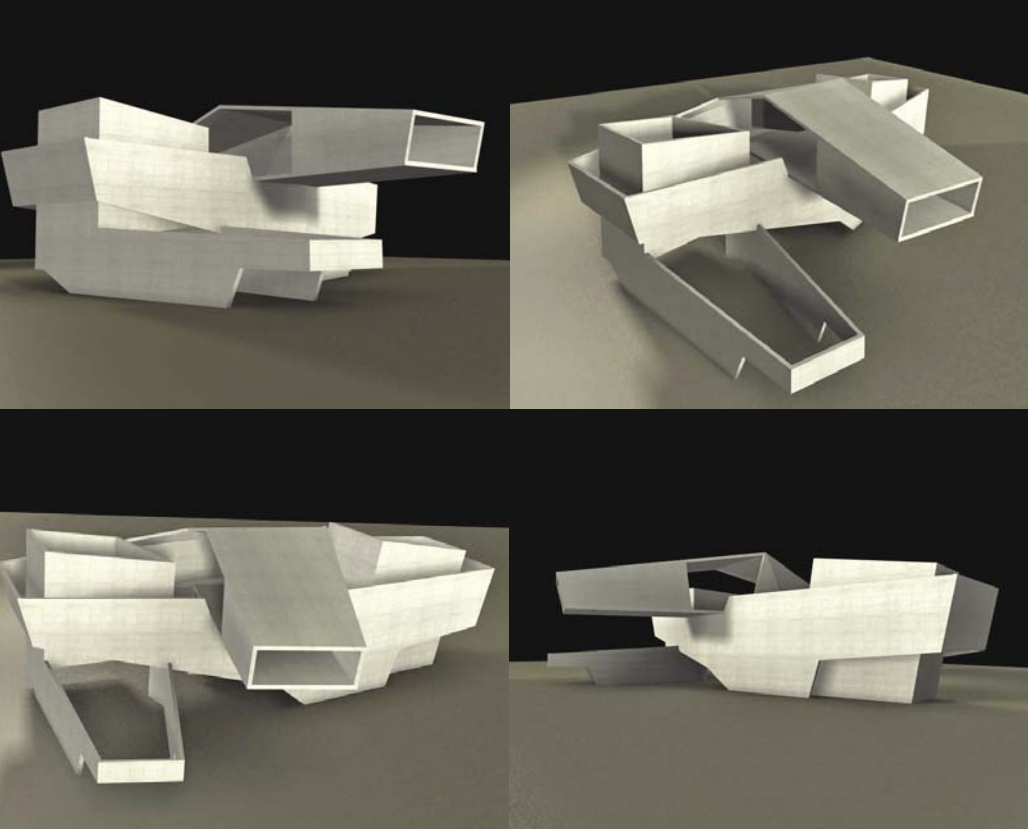
Figure 4

From this point on, the student's thinking transformed from an actual representation to an abstract conceptualization. This process went through three stages. The first was the construction of the digital 3D representation with the use of **form•Z**. As the student had already reached his basic design decisions, he concentrated on developing his digital "interpretations," which included renderings, detailing, as well as additional experimentations with alternative schemes for lighting, color, and materials (figure 4).

During the second phase of interior detail design, the student places his emphasis on the dividing panels (of an undulating form) that define the closed units within each floor (such as the sanitary spaces). The student enjoys accentuating reflections and shapes that can intensify them. He discovers that the shape of a dividing cell made of a continuous metallic surface in the plan, offers intensely deformed reflections (figures 5-6). After the completion of these stages, which satisfied the course requirements, the student decided to further his research, and I quote his own words: "*The 3D model of this project was my first model using* **form•Z RadioZity**. *The potential of continuous surfaces occupied my mind after this project was finished. … I wanted to discover more about the aspect of the form and how this idea could go further using 3D modeling. So these models attending the main project are my experimental work, on a form based level, and they are in a way a continuation of the first project*."

Figure 5

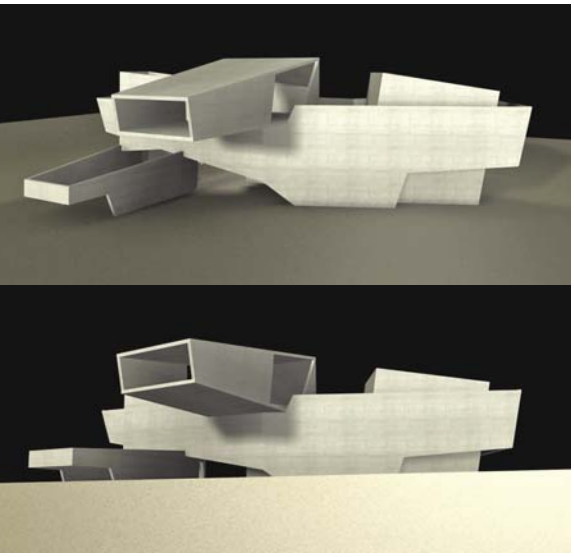
Figure 6

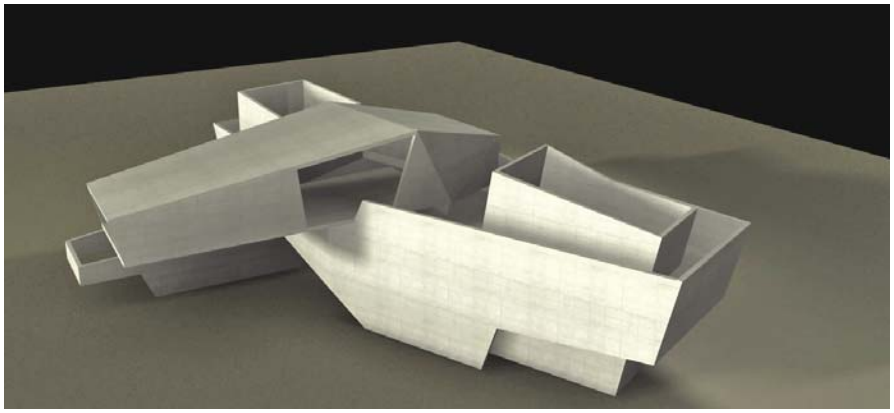


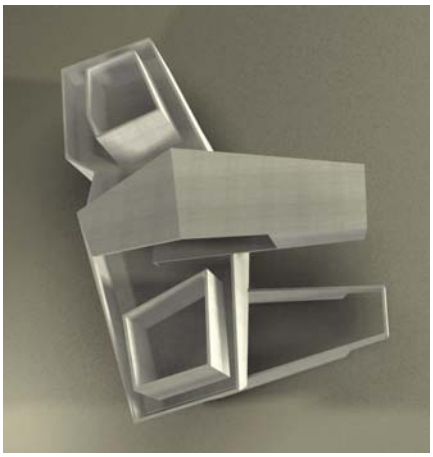
This is most interesting because it is a direction the student chose on his own and was not suggested by the class. It stemmed naturally from his own thinking and it represents an endeavor intended to test his ideas. The result was the following three small research projects on form generation, which are illustrated by a series of sketches and renderings, step-by–step.

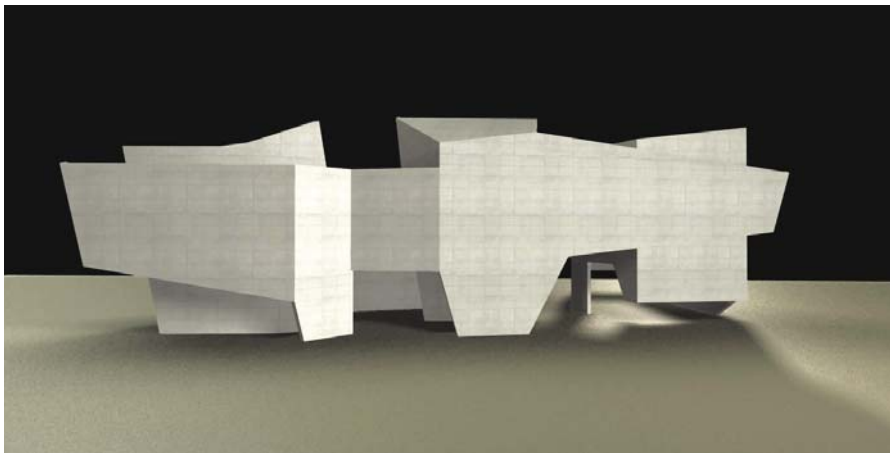
Research Form 1

To create this form, a folding surface is used, which is divided into more surfaces that are again folded so as to define different spaces. This project relates directly to the initial studio project, but the surfaces are treated more freely (see images on this page).



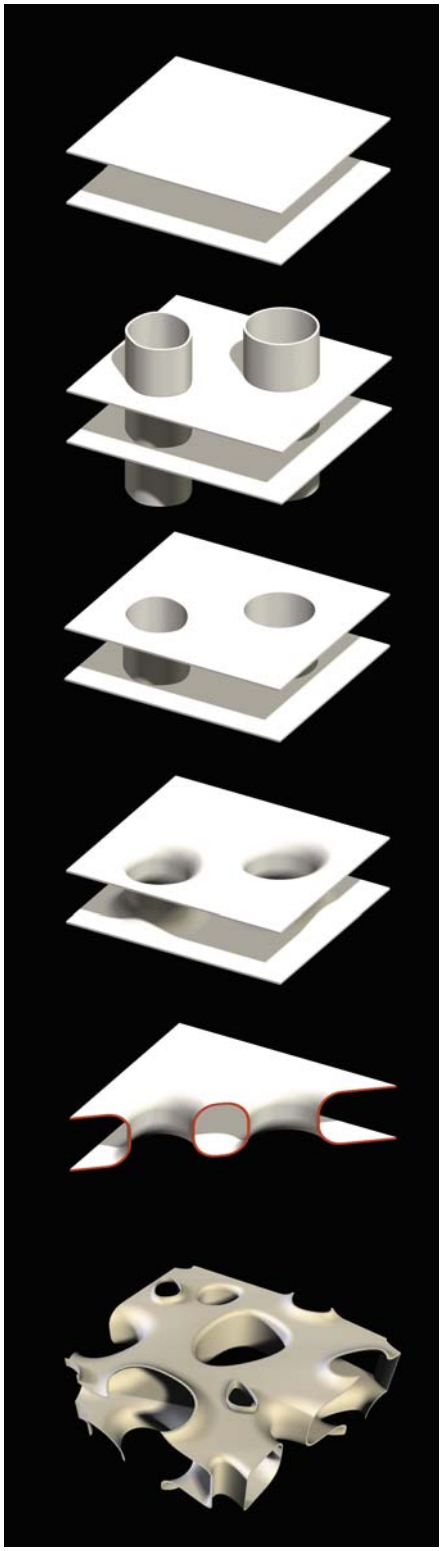


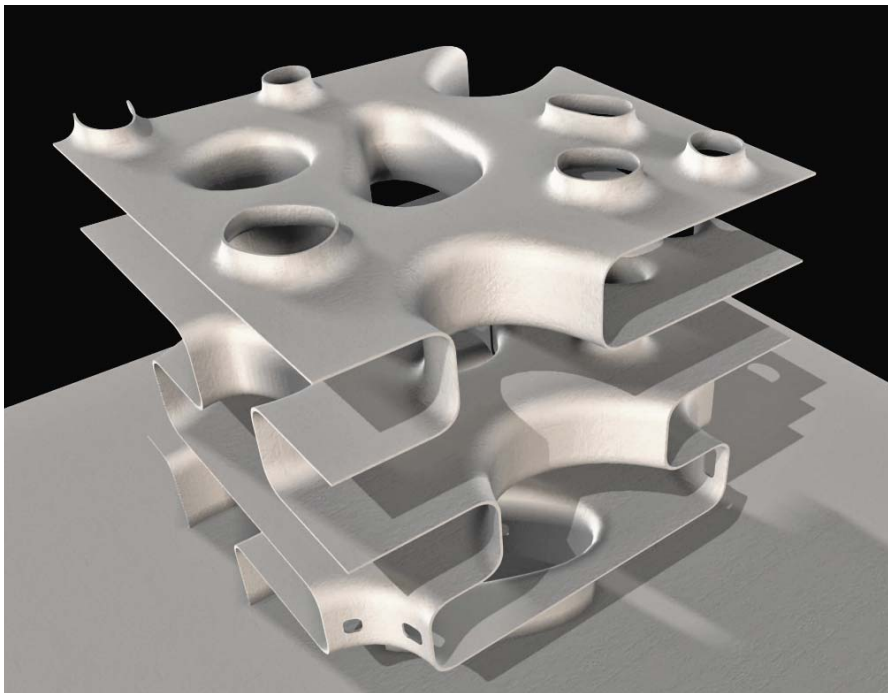


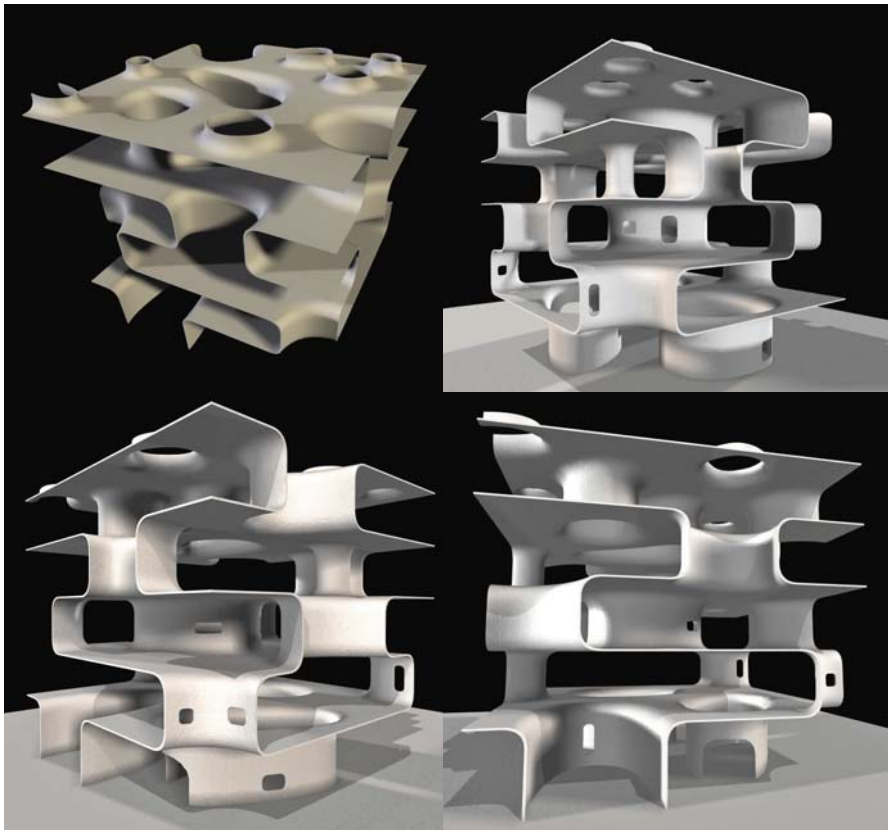


Research Form 2

This research project is about a four-story structure characterized by an organic relationship between its horizontal surfaces and vertical tubular elements that "grow out" of the surfaces. This happens in such a way that one seems to evolve from the other through some kind of a transformation. In a real building, the vertical elements could be nodes of vertical communication or lighting (see images on this page).

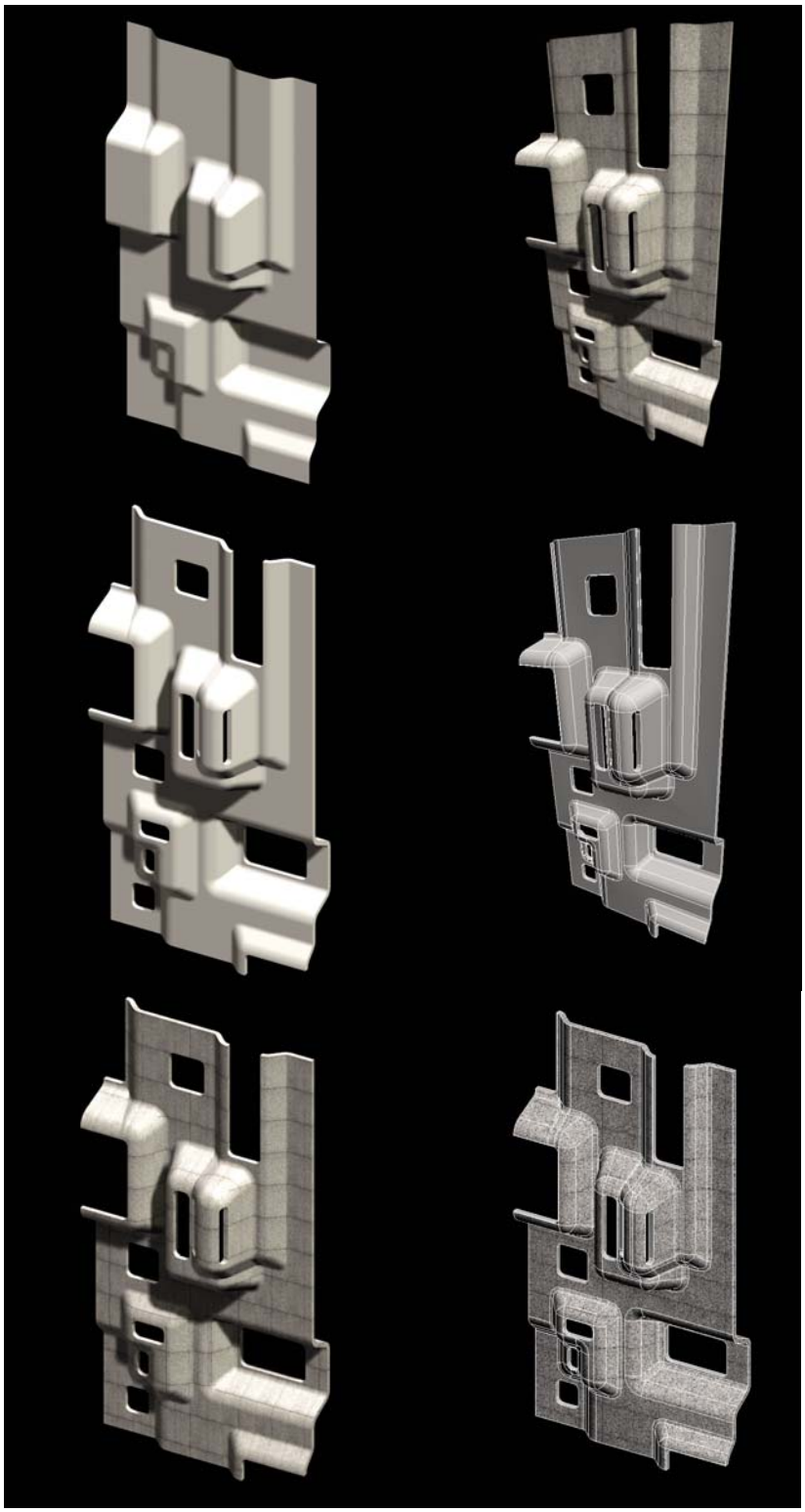


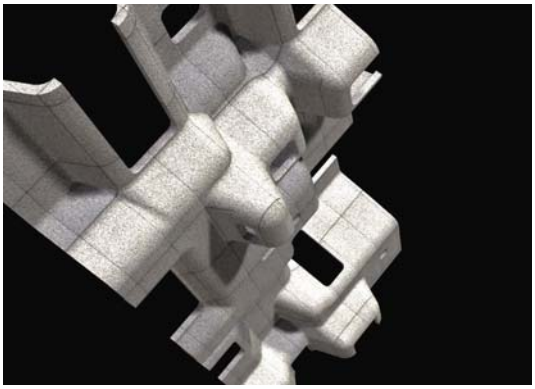


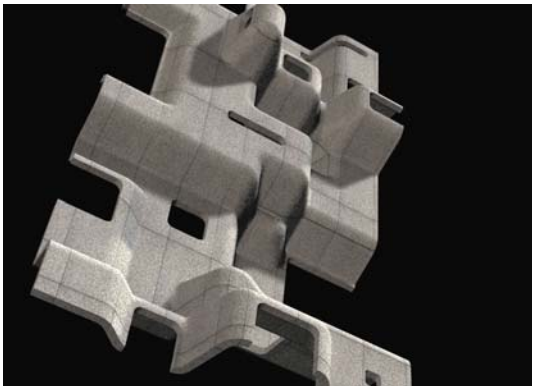


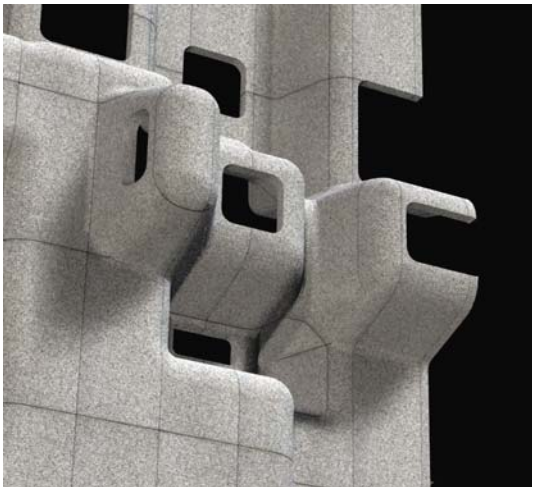
Research Form 3

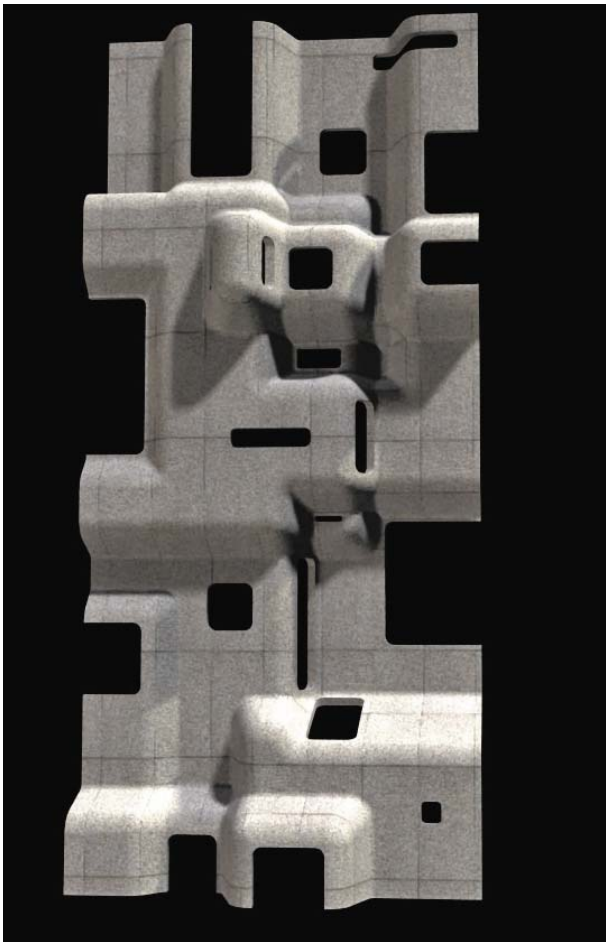
In this project the surface of the skin of a building is exposed to forces. These forces are perpendicular to the surface of the façade and push or pull points of the surface with different force intensities. This results in deformations, which are subsequently smoothed out, producing a visual effect that is organic rather than with rough edges. At the end openings are added to the planar portions of the deformed surface (see images on this and the next page).

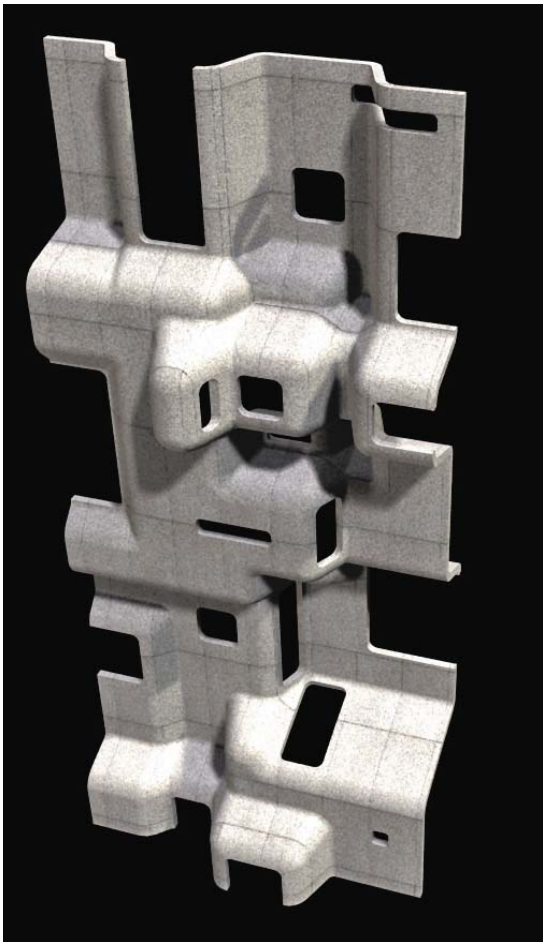












It is worth mentioning that Research Form 1 was not too abstract as it was still related to the initial idea of the student's design project. The intention of the student was to use the new software to learn more about folding surfaces, to discover more about their properties, and to re-evaluate the initial process using his new knowledge.

It is also worth observing that, within the limited time at his disposal, the student prefers to depart towards a research task that is more abstract and also more intriguing. By doing so he uncovered the great power of the digital tools and their unique ability to give visible form and physicality to a virtual entity. With the spirit of a craftsman [1] he follows the intelligent and playful character of a project that lends itself to improvisation and produces a useful result [2].

"*Ultimately the computer is a means for combining the skillful hand with the reasoning mind. We never had such a tool… At the same time computers let us turn the tables - to apply something of what we know about using tools to achieve richer symbolic processing. Metaphorically they let us get a hold of our ideas. Concepts become things we can't touch yet, but already we can look at them, and work on them as though with hand-held tools…*"
(M. McCullough, *Abstracting Craft*, p.81)

For the educator the above case can offer a motive for reconsidering the power of the software, which may cause him/her to revise his/her teaching method and approach. We know that new thinking and new tools may go together, but only rarely are an altogether new tool and an altogether new task invented simultaneously. Usually a new tool is employed to do things in the old well practiced fashion, whereas a new task is usually performed by means of existing tools. Thus, once again is confirmed that invention and innovation are most often gradual.

References

[1] MacCullogh Malcolm, *Abstracting Craft*, The MIT Press, London, 1998.

[2] Stickley Gustav, "The Truth About Work", in Sanders, ed., *The Craftsman - An Analogy,* Santa Barbara, Peregrine Smith, 1978.

Anastasia Pechlivanidou-Liakata is professor at The School of Architecture of the National Technical University in Athens. She is teaching Architectural Design. Founder and director of the Simulation Lab of the School of Architecture since 1998, she introduces digital design studio in her elective courses. Her research and post graduate classes focus on issues of perception and behaviour within digital environments. Co-author with Ioannis Liakatas of the book under print "The landscape of inhabited space." During 1985,1994, and 2004 she has been visiting scholar and professor at diverse universities in the States. Private Practice as Ioannis Liakatas & Anastasia Pechlivanidou Architects & Planners with more than 40 distinctions in architectural Pan-Hellenic and International Competitions (first prizes for the second Pan-Hellenic Competition for the Acropolis Museum, the Kalamata Municipal Cultural Centre, Convention Centre at the International Olympic Academy in Olympia) the two latter are built. She studied Architecture at the National Technical University in Athens, 1969 and took her MA degree at The School of Architecture and Urban Planning, UCLA, 1980.