POLITECNICO DI TORINO
SECOND SCHOOL OF ARCHITECTURE
Master of Science in Architecture
Honors theses

Operatic Operations: The application of parametric modelling techniques to the design of a new Opera House in Istanbul

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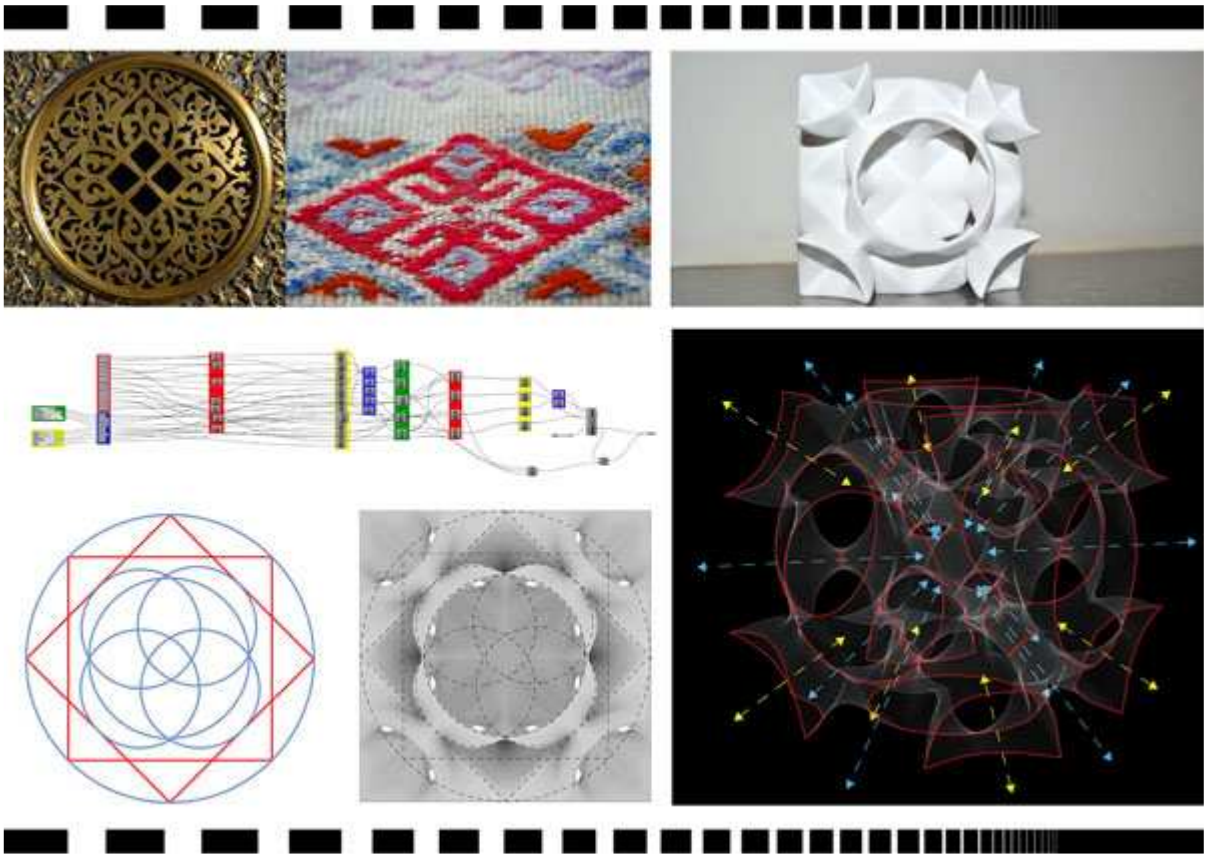
In recent years, several designers and architects are confronted with the problem of minimal surfaces, with the intent to achieve stylistic and compositional extremes ever more innovative. A minimum area is a surface, studied in differential geometry, which has zero mean curvature at every point: in nature, examples of minimal surfaces can be obtained by soaking in soapy water a frame of iron of any closed form.

Detailed studies on the potential of minimal surfaces in architecture are thus born: several American universities are investing in this area, and many teachers are conducting classes in which students can learn the advantages of these interesting surfaces.

This thesis is concerned with testing and test the capabilities and limitations of minimal surfaces through the design of an Opera House, as part of such a context historically and architecturally interesting as the city of Istanbul (Taksim Square).

The process to reach, starting with minimal surfaces, the construction of a building functioning both in external and internal as in is not easy. Once I have built a single cell through the use of programs that use a language based on parametric algorithms (Grasshopper ®) I have studied the variations related to changes in the cell parameters; later I proceeded to the study of more cells connected between them and their connections, and I have examined the interiors, in order to place the desired tasks appropriately and allocate an appropriate function to each cell. Finally, I have had to understand how cells and their respective changes, dictated by the internal functions, could affect the shape of the building, so as to be able to design a harmonic structure in all its parts.



The cell-base obtained by the construction of the algorithm

To integrate the building and its functions with the surrounding urban structure, I have identified some points attractors in the area: according to the results obtained I have defined those areas which, in the final project, have been the connection between inside and outside and then the main entrances to the area.
In a second step I have followed the boundaries dictated by the buildings that surround the area, keeping a minimum distance of 10 m. It has therefore come to define a form that's insertion in the lot in a harmonious way, without integrating with the existing cracks.

The terminal building is obtained on four fronts:
• The main entrance to the west, overlooking Taksim Square and houses the main lobby, offices, rehearsal halls technical areas, and links to the main theater and the two secondary theaters
• the secondary entrance, to the south, which houses the secondary lobby, offices, rooms for television equipment rooms, and links to the main theater and two auditoriums;
• the mall, to the north, which houses the shopping mall, restaurant, the games room, equipment rooms and links to the multiplex cinema and exhibition space;
• the theater, located at the center. It is contained within a box suspended and supported by a complex system of arches and pillars.

Inside view of the main theatre

A long and articulated external shelter links, in addition, this complex of buildings and squares, obtaining a compositional and stylistic continuity. Finally, along the square, and the coverage of the Opera House, through the use of architectural elements such as flooring and windows, there is a progressive variation of the circle to the square, and again the square to the circle: these changes mark the whole project and give to the complex a refined unit.

External views of the Opera House

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