



Structural and geometric concepts for architectural design processes

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The actual trends in architecture show more and more complex, irregular and seemingly “non-geometric” forms. It seems that the digital tools seduce the users to create anything possible. The more spectacular a building appears, the better and more innovative it is evaluated. Therefore we are asking for fundamentals for design processes, in order to escape from an arbitrary design and finding criteria for design processes.

When we look back in the history of architecture, we can find the background of geometric structures as important fundamentals for design, for example in symmetry concepts or using transformations like perspective transformations. There is a tradition of using structural thinking for design disciplines referring to a mathematical-geometric basis. Mathematics had been developed in the 1930s as a general structural science, based on the notions of set, relation, and transformation, whereby an universal applicability got possible, thus also for designing.

There had been efforts in the structuralism and cybernetic school of thought to follow rational methods also in design processes. It was the initial point of structural thinking to look for the relations between elements of a system not for the elements itself, to find out the rules of their combinations in a system. Later the technological developments influenced the structural science. The first computer experiments in art and designing in the 1960s had strong relationships to this rational mathematical background. Aesthetics with these characteristics become principles of order and tools for structuring the world, therefore a fundament for designing.

With our digital tools today we have appropriate possibilities for referring to a rule-based parametric design, finding the relations between the various parameters for the design and representing the developed structure by suitable codes. This way gives the chance to create a dynamic architectural design process, working with the formulated relations and interactions between geometry, material, construction, and other components, also social-cultural matters, in multidisciplinary interrelation with an integrative role for geometry. This theoretical background for architectural design processes will be illustrated by examples and appropriate approaches in geometric-architectural education shown with some experiments of our students.

Results of the international Summer Schools in frame of the Erasmus Intensive Programme “Structural Architectures - Geometry, Code and Design” 2011 and 2012 will provide insight into such architectural design processes in international and interdisciplinary projects.

Key words: design processes, structural thinking, geometry, parametric design, aesthetics

MSC 2010: 51A05, 51M10, 51M15

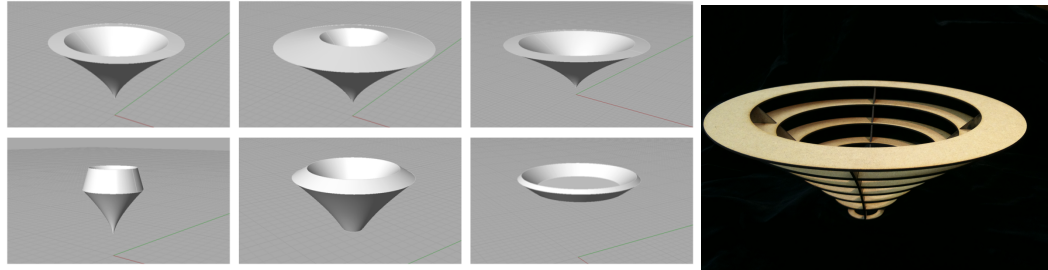


Figure 1: Variations of parameters for a rotation solid by the evolute of a parabola and physical model by student Hanno Katschinski, TU Kaiserslautern 2013.

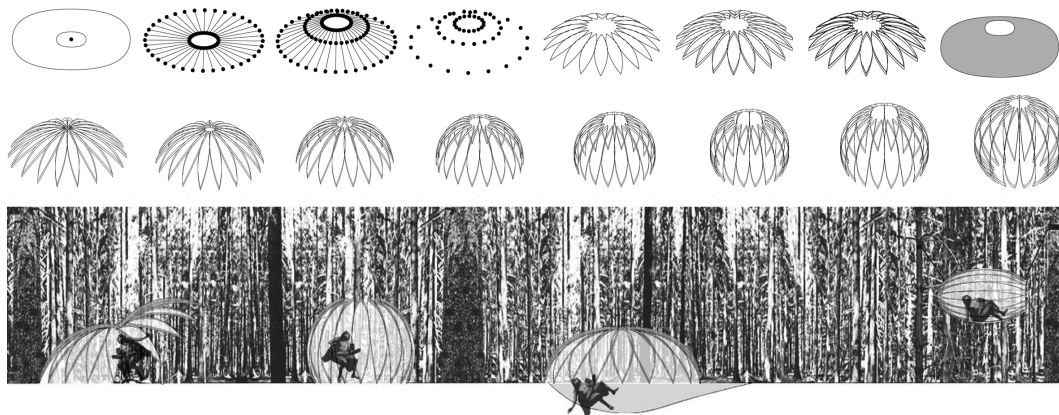


Figure 2: Erasmus Intensive Programme “Structural Architectures Geometry, Code and Design II”, Kaiserslautern 2012. A hermit’s cabin - design project example.

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