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Structural Geometric Forms in
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Structural Geometric Forms in Architecture

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Abstract: In the application of architectural technology, on the one hand, he is responsible for his cultural patterns and on the other hand, he is responsible for the patterns of science and technology, but in expressing and explaining the form, he is allowed to express his concepts and personality. Geometry is a shaping idea in architecture that is used to determine the plan and three-dimensional shape of a building. In this case, networks expand from the repetition of simple geometric shapes through reproduction, composition, division, and displacement. Geometry has been used as a design tool since ancient times in the history of architecture. Geometry is the most common source or coordinate in a building and can be used in a wide range of surfaces, forms or spaces. Includes complex forms. The realm of geometry as the creator of the architectural form is related to its measurement and quantification. Geometry is the basic science of forms and the order in them. Geometric shapes, forms and deformations form the main body of architectural design. In the history of architecture, geometric rules based on theories of proportionality and symmetry have formed certain tools for architectural design. The purpose of this study is to present an exercise in this paper that aims to stimulate the creativity of architect students, increase awareness of formal possibilities based on geometric shapes, and show how theoretical knowledge can be practically applied in a particular architectural program. Be. As basic information for this exercise, the types and characteristics of the main structural geometric shapes are considered, while the students' work in a particular case shows their use.

Keywords: Form, Geometry, Structure, Architecture, Concept.

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1- Introduction

It can be said that the basic science of forms and the geometric order in them has entered the process of construction and architectural design. The construction of an architectural work begins with the elements and the connections between them. Geometry can influence this process by interacting with geometric forms and shapes as the main elements in this process, as well as proportions, angles and deformations as existing connections between the proposed elements. Structures and structures form the basis of the construction process. Structures are, in fact, general regulatory systems that follow a variety of scientific principles. The structure is derived from the Latin word "structura" meaning regular sets (URL-1). Mathematics can be considered as the scientific basis of structures and structures. Mathematics considers systems and elements and their functions. This concept, for example, is the basis of the creative approach that Richard Buckminster Fuller uses in his work (Figure 1). "In general, mathematics is a science of structure and modeling.

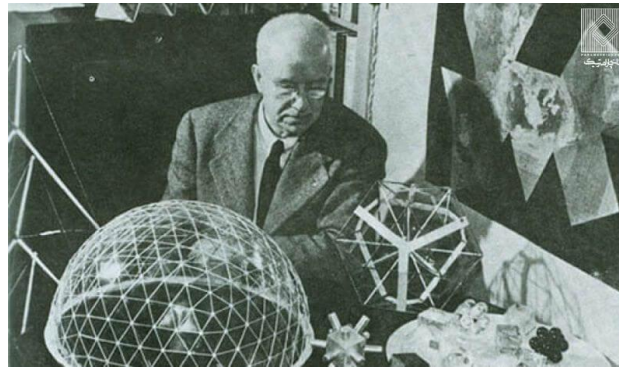


Figure 1. Richard Buckminster Fuller and Models Built, 1949. Source: (URL-1)

For example, in his research he introduced a systematic method for dividing the surface of a sphere. With his structural thinking and Platonic volumes, he came up with the idea of geodesic networks, which eventually led to the construction of geodesic domes. Geometry can be considered as a science that explains how structures work (URL-1). Max Bell worked artistically on geometric structures as usable instructions. For example, to make a change in a particular subject, that is, the process of turning a triangle into an octagon. By being able to create a variety of options, he was able to clearly articulate the methods he used to produce works of art (Figure 2).



Figure 2. Max Bell, 1938-1935, The process of deformation from triangle to octagon. Source: (URL-1)

Max Bell thought about the connection between structures and art. According to his theory, rhythmic order as a factor for creativity can be used by the architect to produce a work of art. A work that begins with a general structure. In the history of geometry and the application of geometric shapes in architecture, geometric laws have been formed that form the basis for the construction of architectural works (URL-1).

By definition, the term "form" describes the shape and structure of an object. In architecture, from a formal point of view, the shape of the designed objects can be identified on the one hand, a single shape with precise or precise geometric features, and on the other hand, it can be the result of a spatial combination of different shapes (Mousavi; 1397).

For an architecture student, the study of form and how he deals with it should be done in the early years of formation to increase awareness of formal possibilities and stimulate creativity (Mousavi; 1397). Due to the infinite number of forms, a limited range of forms are presented to the student, which are often used in the field of architecture. Therefore, the starting point of the study is to analyze each of the categories, underlining the constituent elements and the relationship between them, the classification criteria and some of the methods of using them in architectural practice. This section contains basic theoretical information that will be used in a practical exercise called "Structural Forms" in the second year of the bachelor's program at the Timisoara School of Architecture. During this exercise, the student observes and filters the images he or she sees, establishes visual communication, and can cover a variety of shapes. He will try to solve the structural problems in each category of shapes and also will try not to control the form to fit the ideal structure and function, and will try to find the free plastic expression of architecture (Mousavi; 1397).

In this article, after geometry and network, geometry in architecture and application of geometric forms, then structural geometric forms and their subsets and practice of structural forms and student work and recommendations are discussed.

2- Conclusion and Suggestion

By recalling the historical connections between geometry and architectural design, we will not only help preserve our cultural background, but also be able to understand the benefits of combining geometric thinking and architectural design. By incorporating the tests and experiences that geometric structures have used in design into the architecture curriculum, we should reflect on these historical connections and try to provide new contexts for design based on geometric laws in architecture.

The success of this proposed exercise can be assessed in two stages: first, at the end of the exercise when the result is presented, and second, during his practice as an architect. Architect students acquire various skills when dealing with this exercise:

Ease of working with architectural design components: form - function - structure;

Awareness of the possibility of compatibility of architectural forms with the structural specifications stated above;

- Increase three-dimensional understanding of shapes obtained when working on scale models.

- Acquire a basic technical language that will facilitate future collaboration with structural engineers.

The examples presented show the various methods of application of geometry and geometric shapes in architecture at the present time. There seems to be a useful and effective connection between geometry and architecture in the past and present, although sometimes the role of geometry has been considered only as an old and historical category. Although architecture surpassed mathematics in the Renaissance, it would still take time for new advances in geometry to enter architecture. However, this process begins now with finding the relationship between the mathematical concepts of transitional geometry, pictorial geometry, non-Euclidean geometry, or nineteenth-century topology with architecture. In this case, a new and strong connection may be formed between geometry and architectural design, and the issue of using geometric shapes in architecture may be properly considered.

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