Ain Shams University
Faculty of Engineering
Department of Architecture

Utilizing Algorithms in Designing Museums

By

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بسم الله الرحمن الرحيم

" و قل رب زدني علماً "

صدق الله العظيم

To

Mom, Dad, and Brother

For all your Support and Unconditional love

My friends

And

My colleagues of

FEDA 2010

Statement

This thesis is submitted to Ain Shams University for the degree of Master in Architecture. The work included in this thesis was accomplished by the author at the Department of Architecture, Faculty of Engineering; Ain shams University from 2011 to 2014. None of this thesis parts has been submitted for a degree or a qualification at any other university or institute.

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Abstract

This study aims to highlight the effect of utilizing the Algorithmic design methodology in the Architectural design ofMuseumbuildings.The changes happened to visitors' behavior, as a result of the modifications introduced to the exhibition hall arrangement, are observed and analyzed using computer application programs, such as Rhinoceros program and Grasshopper plug-in. These programs depend on applying the common algorithms used in the Architectural design including (Cellular Automata, Swarm Intelligence) for the arrangement of artifacts in the exhibition halls, in addition to the Space syntaxtheory,which is also based on algorithms, for analyzing the visitor's movement. By using this computer application from the beginning of the design process, designers may achieveproper solutions for exhibition in museum spaces, thus revealing the cultural message of the museum.

Keywords: *Museums – Culture Message – Visitor's Experience – Exhibition Hall – Algorithms.*

Summary

The design process imposes that the designer should deal with many constraints, in addition to studying the different elements that affect the design, in order to reach the best design solution, by using advanced tools. As there is a rapid development in the methods of architectural design, by using computer application programs, the architect has to deal with these programs using different methodologies, which differ according to the required application. Accordingly, these methodologies should be improved to suit the required design. This has made the design process depend mainly on an advanced methodology, which aims to obtain a number of solutions, and select between them, to reach an appropriate solution.

Based on that, the design process has been developed for many types of buildings, to depend partially or sometimes totally on application of different methodologies, to reach an integrated architectural product. Museum buildings are of these buildings, which depends on a manual design methodologies that make the development in its design methodologies became a need in this digital age.

This research is concerned with how to reach a design concept, which emphasizes the content and the objectives of the museum. The ability of the visitor to perceive the cultural and scientific content of the museum is illustrated, which is considered the main goal of any museum. According to that, the responsibility falls on the designer to study the type of the museum, and the types of its exhibits, presenting a certain cultural messege which is required to be revealed to the visitors. In addition, the designer has to be concered with the different charactaristics of the visitors and their behavior inside such type spaces, which affects the whole design.

The research also addresses one of the advanced techniques of digital design using algorithms, and its effect on the architectural design of museums. The research concentrates on the possibility of reaching a new methodology of designing museum exhibition halls, and the way to comply with the museum message. This in addition to studying the way of arranging exhibits digitally, and its relation to the visitors' behaviour, which shall be shown in details through a digital design methodology and an application in designing the exhibition hall using algorithms.

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