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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 of Museum buildings. 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 syntax theory, 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 achieve proper 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 message which is required to be revealed to the visitors. In addition, the designer has to be concerned with the different characteristics 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.

Table of Contents

Abstract.....	I
Summary.....	II
Table of contents.....	IV
Table of Figures.....	VII
Table of Tables.....	XII
Introduction.....	XIII
Chapter 1: Introduction to Museum Building	1
1.1. Introduction.....	3
1.2. The Emergence of Museums.....	3
1.3. Historical Evolution of Museums Architecture.....	4
1.3.1. Museums from the Ancient times to 17th century.....	4
1.3.2. Museums from the end of 17th century to 19th century.....	7
1.3.3. Museums from 20th century to present and the future of museums...	13
1.4. The Role of Museum in The Socieity.....	22
1.4.1. Cultural and Social Role	22
1.4.2. Educational Role	22
1.4.3. Touristic and Economic Role	22
1.5. Types of Museums.....	23
1.5.1. According to the Time of Manufacture.....	23
1.5.2. According to the Museum Size.....	24
1.5.3. According to the Targeted Group of Visitors.....	24
1.5.4. According to the Exhibition Technique.....	25
1.5.5. According to the Targeted Visitor's Reactions	25
1.5.6. According to the Displayed Branch of Knowledge.....	25
1.6. Conclusion.....	29
Chapter 2: Museum Exhibition Hall Design.....	31
2.1. Introduction.....	33
2.2. Museums and visitor's Experience.....	33
2.3. Planning a Museum.....	35
2.3.1. Zoning.....	35
2.3.2. Entrances.....	37
2.3.3. Circulation routes.....	37
2.4. Exhibition Hall design.....	38
2.4.1. Exhibition hall cluster.....	38

2.4.2. Exhibition process and display strategies.....	41
2.5. The Museum visitors.....	44
2.5.1. Visitor's characteristics.....	44
2.5.2. Visitor's movement styles.....	47
2.5.3. Visitor's behavior.....	48
2.5.4. Visitor's traffic flow.....	50
2.6. Conclusion.....	52

Chapter 3: Design by Algorithms.....54

3.1. Introduction.....	55
3.2. Brief history of Algorithms.....	56
3.3. Algorithms Definitions& Characteristics.....	57
3.4. Expressing Algorithms	58
3.4.1. Natural language.....	59
3.4.2. Pseudo code.....	59
3.4.3. Flowchart.....	59
3.4.4. Programing language.....	59
3.5. Types of Algorithms applied in the Architecture field.....	62
3.5.1. The commonly applied algorithms.....	62
3.5.2. Analytical methods based on Algorithms (Space Syntax).....	74
3.5.3. Algorithms written for certain purposes.....	79
3.6. Architectural design by Algorithms.....	82
3.6.1. Generationapplication.....	83
3.6.2. Permutation application	87
3.6.3. Optimization application	88
3.6.4. Simulation application.....	91
3.6.5. Transformation application	93
3.7. Conclusion.....	96

Chapter 4: Architectural design of Museums using Algorithms.....98

4.1. Introduction.....	99
4.2. Designing Museums by Algorithms.....	99
4.2.1. Generation stage.....	100
4.2.2. Permutation stage.....	102
4.2.3. Optimization stage.....	102
4.2.4. Simulation stage.....	103
4.2.5. Transformation stage.....	103
4.3. Case Studies for Museum designed by Algorithm.....	104
4.3.1. The Grand Egyptian Museum (GEM), Cairo, Egypt.....	104
4.3.2. The British Museum, London, UK.....	112
4.3.3. Victoria & Albert Museum, The Spiral Extension, London, UK.....	116
4.4. Conclusion.....	118

Chapter 5: Exhibition Hall Arrangement using Algorithms.....	120
5.1. Introduction.....	121
5.2. Exhibition Hall Design.....	121
5.3. Algorithmic Design process.....	124
5.3.1. Design Methodology.....	124
5.3.2. Application.....	129
Conclusion.....	137
Recommendations.....	147
References.....	151

List of Figures

Chapter 1: Introduction to Museum Building.

Figure (1.1):-The Triumphal Quadriga.....	5
Figure (1.2):-Dresden palace –Germany.....	6
Figure (1.3):-Plan of the ground floor of the west wing of Dresden Castle with handwritten notes by Augustus the Strong in connection with the expansion of the Green Vault.....	7
Figure (1.4):-Hall of treasures in the Green Vault 1904.....	7
Figure (1.5):-Hall of treasures in the Green Vault now.....	7
Figure (1.6):-The Ashmolean Museum.....	8
Figure (1.7):-Michelangelo's design for Capitoline Hill, now home to the Capitoline Museums 1568.....	9
Figure (1.8):-The Palazzo dei Conservatori is one of the three main buildings of the Capitoline Museums.....	9
Figure (1.9):-The Louvre palace.....	9
Figure (1.10):-The Entrance to the British Museum in London, England.....	10
Figure (1.11):-The Charleston museum.....	10
Figure (1.12):-Becoming Americans and the low country history halls.....	10
Figure (1.13):-The Metropolitan Museum.....	11
Figure (1.14):-American natural history Museum.....	11
Figure (1.15):-The Egyptian museum, Cairo, in 1896.....	12
Figure (1.16):-The state Hermitage Museum, The Winter Palace, St. Petersburg, Russia.....	15
Figure (1.17):-The central armed force museum, Moscow.....	15
Figure (1.18):-The Deutsches museum, Munich.....	15
Figure (1.19):-The Museum of unlimited Growth in 1939.....	16
Figure (1.20):-The National Museum of Western Art, Tokyo.....	16
Figure (1.21):-The Guggenheim museum, Manhattan, New York City.....	16
Figure (1.22):-Guggenheim Bilbao Museum, Spain.....	17
Figure (1.23):-Guggenheim Abu Dhabi, UAE.....	17
Figure (1.24):-Jewish Museum, Berlin.....	17
Figure (1.25):-Imperial War Museum North, Manchester, England.....	18
Figure (1.26):-Denver Museum of Modern Art, USA.....	18
Figure (1.27):-MAXXI, National Museum of the 21st Century Arts, Rome.....	18
Figure (1.28):-Riverside Museum or the Glasgow Museum of Transport, Glasgow...	19
Figure (1.29):-Vilnius Guggenheim Hermitage Museum, Vilnius.....	19
Figure (1.30):-Towards a conceptual framework - comparison of Turing-based model with Oxman's classification.....	19
Figure (1.31):-Chengdu Museum, Sichuan, China.....	20
Figure (1.32):- Porsche museum, Stuttgart.....	20
Figure (1.33):- Classical Museum on Saadiyat Island museum, Louvre Dubai.....	20
Figure (1.34):- Dynamic museum, Dubai.....	21
Figure (1.35):- Grand Egyptian museum, Egypt.....	21
Figure (1.36):- Egyptian Museum and Papyrus Collection, Berlin	23