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Applying Evolutionary Architecture Theories in Creating Mutated Interior Spaces Using Digital Simulation Strategies

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ملخص الرسالة باللغة الانجليزية

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This study examined the philosophy of evolution in architecture and interior design through several concepts of evolution of ecosystems in nature and others and how to benefit from them. The process of growth and evolution of nature and the permanent ability to change, switch and respond to natural and functional variables was a key factor to develop designer's thought process. **Evolutionary architecture** is an applied philosophy based on the deep study of nature's processes, organisms, compositions and materials in the multilevel of atomic molecules to all environmental relationships.

Since this approach is based on the theory of evolution and the science associated with it, everything in nature evolves and changes from one stage to another. The change may be more sophisticated than its predecessor or less, according to experience with the ocean and its impacts, this knowledge is then applied in the fields of design and architecture by meeting these human needs and natural determinants such as climatic conditions. These natural needs and determinants are dynamic and constantly changing over time and therefore architecture must respond to this by being alive and evolvable.

"**Evolutionary architecture**" offers solutions to possible possibilities for the development of building shapes and performance. It also emphasizes changing the concept of space design so that it is mobile and evolvable

through iterative shifts that allow design flexibility. Architectural concepts are expressed as generative rules so that their creation, development and growth are accelerated and tested using computer digital modelling.

Chapter I discusses the definition of basic principles in design computing processes as well as concepts used and their benefits in the design process. Similar types of architecture were also introduced during the chapter in order to identify the principles that constitute the features and concepts of the evolutionary architecture under study. Evolutionary architecture is a philosophical concept based on the study of the patterns and idea of evolution in both organisms and their genetic evolution, as well as evolution in molecular structures and materials, and finally evolution in natural ecosystems.

Through the first chapter, evolutionary architecture and the growth laws used were defined to later create designs that follow the same evolutionary design approach, through the integration of the study of architecture and interior architecture with the study of basic science and biology. Some previous studies on this style of architecture have also been reviewed.

At the end of the first chapter, the stages of the design process of evolutionary spaces, the designer's relationship and the instruments of algorithms and the end of the production and implementation process were discussed.

In chapter II, the study discusses the design process of internal spaces based on evolutionary thought. During this chapter of the study, the stages

of the process of nature-simulated twin design and its design systems, which are summarized in the following points, are discussed:

1. Identifine stage
2. Generate Stage
3. Explore phase

At the end of chapter II, principles of twin design are recognized through systems based on algorithmic computational solutions through the study of algorithmology and genetic algorithms engineering models, graphic programmes and engineering generative components, Finally, formulaic systems that rely on a specific formatting system, such as Lindenmayer systems, cellular automation, fracture systems and rule-of-form systems.

These systems are based on computational equations and contribute to innovative parenting solutions based on predetermined data, thus being the core component of any other subsequent parenting system.

In chapter III, the design process is identified using digital technology technologies and their applications in the field of evolutionary architecture. The types and sources of inspiration for digital forms are addressed until the conclusion of the formation of ideas.

The term virtual reality also appears strongly in the design process where the interior architecture designer helps increase the ability to imagine and perceive the vacuum surrounding it. It also examined changes made using

evolution algorithms through the computer power of digital tools and the extent to which they affect the internal space to be applied to them.

This led to the emergence of two types of spaces:

1. Interior designs that contradict the shape of the architectural structure (contradictory design)
2. Interior designs compatible with architectural structure shape (compatible design)

Digital tools contribute to the designer's identification of the interior space and help him to access the best solutions he can benefit from in the following ways:

- Visual Expression
- Digital Simulation
- Optimize results to optimize solutions
- Production of elements and alternatives
- Virtual Reality

At the end of chapter III, some of the software used to build the digital model was recognized as well as how the designer benefits from each program in terms of analysis, configuration and simulation.

In chapter IV, sources of inspiration from nature and the concept of simulation of nature based on evolutionary thought were identified. Simulation is divided into four main sections:

- Direct Simulation College

- Partial Direct Simulation
- Modifying
- Self-vision

The simulation of nature is divided into three basic formulas:

- Similarity to the original model and not conformity
- Re-installation and drafting of the original source of inspiration
- A pivotal relationship between origin and image

Through Chapter IV, natural simulation sources were reviewed as well as their patterns and stages and the impact of growth on the formal body of designs resulting from the principle of simulation from nature.

At the end of chapter IV, the means of finding the shape were created by logarithms and its impact on the interior design of the spaces and how to utilize nature in choosing natural patterns and methods in architecture and interior architecture. And also, theories of generating and creating shape. Some models and ideas used through inspiration from nature were also presented in evolutionary interior spaces.

Chapter V focuses on the application of evolution theories in internal spaces and the identification of many important points. Evolutionary thought contributes to linking the multiple uses of internal spaces in terms of the formation of space and linking its own usage through techniques used in digital simulation methods of shape and integrating them with internal space to meet space needs in a manner commensurate with the methodology of evolution thinking.

Theories have been applied to the proposed project. It is a multi-purpose converted hall within one of the administrative headquarters of Al-Marefa City in the New Administrative Capital. It is an administrative headquarters of one of the Innovation Hub Innovation Hub centres that serves the activities of this administrative headquarters from a non-permanent exhibition and museum and places of brainstorming and other interactive spaces. Four design proposals have been made commensurate with each of the Hall's activities, such as:

1. The first proposal is a social communication Space.
2. The second proposal is an Exhibition.
3. The third proposal is a workshop space (workshops)
4. The fourth proposal is a meeting space

At the end of Chapter V, these spaces were discussed and how to design them and take into account the different needs of the activities to be exploited from these spaces, all of which link the use of evolution thinking and design in creating mutated spaces adapted to the various activities in the space.