Computational Design Potentials Promoting Regional Arab Architecture

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Abstract
Computational design was the phase that revolutionized the role of computer in the architectural design process. Generative, Bio morphogenetic, Parametric, and algorithmic design are all synonyms and sub-Disciplines for computational design, aiming to use "Artificial Intelligence" and advanced mathematics to generate and control far futuristic, complex organic forms. Besides, Digital fabrication techniques made it possible to build these forms at astonishing accuracy and time management. Furthermore, computational design has a number of concrete applications in environmental simulations, as well as building modeling and documentation. Unfortunately, these computational design methods were imported to the Arab world not as tools but as copies of the western application to this technology, aggravating the identity crisis and local sustainability, as seen in Dubai, Doha, Abu Dhabi and others. Regional Architecture identity was neglected although it is richness with ritual, religious, sustainable and geometric values, leading to cities with no Identities, non-sustainable buildings and non-efficient spaces. This paper explores the applications of computational design tools for preserving the architectural heritage within the Arab world. Firstly, a historical approach to the role of mathematics in Islamic architecture will be reviewed, discussing how mathematics played a major role in the sophistication of Muslim buildings. Secondly, the unique Islamic patterns will be studied, according to types, features, and computational nature. Finally, a set of case studies will be reviewed for computational design tools used to promote the local identity of contemporary regional architecture in the Arab world. The cases will show various applications in different aspects including form finding, historical buildings restoration, construction, and environmental simulation.

Keywords: computational design, Islamic patterns, regional Architecture, architectural identity, sustainability .

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