

Quantifying Automation in the Architectural Design Process via a Framework Based on Task Breakdown Systems and Recursive Analysis: An Exploratory Study

Authors : D. M. Samartsev, A. G. Copping

Abstract : As with all industries, architects are using increasing amounts of automation within practice, with approaches such as generative design and use of AI becoming more commonplace. However, the discourse on the rate at which the architectural design process is being automated is often personal and lacking in objective figures and measurements. This results in confusion between people and barriers to effective discourse on the subject, in turn limiting the ability of architects, policy makers, and members of the public in making informed decisions in the area of design automation. This paper proposes the use of a framework to quantify the progress of automation within the design process. The use of a reductionist analysis of the design process allows it to be quantified in a manner that enables direct comparison across different times, as well as locations and projects. The methodology is informed by the design of this framework - taking on the aspects of a systematic review but compressed in time to allow for an initial set of data to verify the validity of the framework. The use of such a framework of quantification enables various practical uses such as predicting the future of the architectural industry with regards to which tasks will be automated, as well as making more informed decisions on the subject of automation on multiple levels ranging from individual decisions to policy making from governing bodies such as the RIBA. This is achieved by analyzing the design process as a generic task that needs to be performed, then using principles of work breakdown systems to split the task of designing an entire building into smaller tasks, which can then be recursively split further as required. Each task is then assigned a series of milestones that allow for the objective analysis of its automation progress. By combining these two approaches it is possible to create a data structure that describes how much various parts of the architectural design process are automated. The data gathered in the paper serves the dual purposes of providing the framework with validation, as well as giving insights into the current situation of automation within the architectural design process. The framework can be interrogated in many ways and preliminary analysis shows that almost 40% of the architectural design process has been automated in some practical fashion at the time of writing, with the rate at which progress is made slowly increasing over the years, with the majority of tasks in the design process reaching a new milestone in automation in less than 6 years. Additionally, a further 15% of the design process is currently being automated in some way, with various products in development but not yet released to the industry. Lastly, various limitations of the framework are examined in this paper as well as further areas of study.

Keywords : analysis, architecture, automation, design process, technology

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