Optimisation of Structural Design by Integrating Genetic Algorithms in the Building Information Modelling Environment

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Abstract : Structural design and analysis is an important and time-consuming process, particularly at the conceptual design stage. Decisions made at this stage can have an enormous effect on the entire project, as it becomes ever costlier and more difficult to alter the choices made early on in the construction process. Hence, optimisation of the early stages of structural design can provide important efficiencies in terms of cost and time. This paper suggests a structural design optimisation (SDO) framework in which Genetic Algorithms (GAs) may be used to semi-automate the production and optimisation of early structural design alternatives. This framework has the potential to leverage conceptual structural design innovation in Architecture, Engineering and Construction (AEC) projects. Moreover, this framework improves the collaboration between the architectural stage and the structural stage. It will be shown that this SDO framework can make this achievable by generating the structural model based on the extracted data from the architectural model. At the moment, the proposed SDO framework is in the process of validation, involving the distribution of an online questionnaire among structural engineers in the UK.
Keywords : building information, modelling, BIM,genetic algorithm, GA, architecture-engineering-construction, AEC, optimisation, structure, design, population, generation, selection, mutation, crossover, offspring

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