Novel Approach to Parametric Knowledge Modelling applied to Viaducts

Maria GKIOKA[*], Jeroen COENDERS[a], Rob NIJSSE[b], Sander van NEDERVEEN[c], Sander PASTERKAMP[d], Arend RUTGERS[e]

*White Lioness technologies
Van Diemenstraat 118, Amsterdam, Netherlands
mariagkioka@white-lioness.com

[a] White Lioness technologies
[b,c,d] Delft University of Technology
[e] A&E Architecten

Abstract

This paper presents a novel approach to modelling and documenting design knowledge: to use parametric technology to explicitly store knowledge which exists in a group of people (such as a company), so that it can be reused over many projects and grow over time when more projects are designed. This approach has been applied and tested on a test case of common concrete viaducts. The outcome constitutes the first iteration of the development of a parametric viaduct design platform, aimed for architects and structural engineers. The motivation was to counter the fragmentation of the Architecture, Engineering & Construction (AEC) industry, where each discipline encapsulates different knowledge areas. This results in miscommunication and the loss of valuable information and time. While Building Information Modelling (BIM) technology [1] aimed at resolving these issues, BIM technologies are often characterised by a limited design flexibility, which discourages the design team from adopting an integrated design approach from the early design stages. The suggested methodology aims at combining the BIM principles with the concepts of parametric and associative design, as well as visual programming [2]. Such a platform ensures that both disciplines are working on the same design and merges their different knowledge areas into one model. The generic geometry of the viaduct components, as well as their interaction are considered in the definition of the design parameters. These parameters are divided in 3 categories, according to the level to which the designer can influence their value. The knowledge model evolves from a top-down UML diagram into a user-friendly, parametric platform for viaduct design on Dynamo [3]. Moreover, an instant structural analysis of the concrete deck of the viaduct is conducted to facilitate the assessment of the design by the structural engineer and 3d renders are generated to facilitate the aesthetic evaluation by the architect. The authors would like to acknowledge the support of BAM A&E where this research project was conducted.

References

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