



Creating parametric design workflows for rapid conceptual design and optioneering

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Abstract

Complex, large span structures including roofs and footbridges are functional structures and are often presented as works of art or sculpture to complement the surrounding landscape. The design process of architectural large span structures or footbridges require architects and engineers to collaborate closely to co-create visually appealing and structurally efficient forms that serve the aesthetic, functional and economical objectives. In the co-creation process, a rapid turnaround is often expected. However, a tool that links form exploration and engineering is lacking; a tool that allows exploration of parametric forms quickly with instantaneous engineering and physical feedback to assess feasibility of the concept.

This paper presents a journey of exploration in developing workflows and associated tools in the digital virtual space that allows collaboration, co-creation between architects and engineers so as to work seamlessly in creating structurally efficient, functional yet architectural pleasing structures.

Keywords: parametric design; digital workflow; optioneering; automation; concept exploration.

1 Background

The idea of conducting this research project originated from the first author's experience and observation of the engineering design industry of conceptual design of bridges. In the competitive construction and engineering consultancy market, especially in the Asian environment, very short timeframe is normally allowed for the development of conceptual design.

It was the first author's experience in working on an architectural footbridge located in the Middle East. The bridge was required to be a landmark

structure complementing the new development of the surrounding areas. This footbridge was required to have an elegant and slender architectural form.

1.1 Conventional Approach

During the development of the concept of the footbridge, the design team was given two weeks by the client to produce a concept and a reference design. A conventional linear design workflow shown in **Error! Reference source not found.** had been adopted to undertake the design. With this workflow, the architect independently develops