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Form-finding of thin shell structures

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ABSTRACT

The outstanding characteristics of structural efficiency, durability and aesthetic beauty make the thin shell structure a much more viable structural design solution as compared to the more traditional methods of design. However, the manifestation of these outstanding characteristics is directly related to the form of the structure. This makes the form of the structure a key factor in ensuring the success of the design.

The correct form of the structure is not known in advance and requires a process known as form-finding or shape-finding. Hence, the focus of this research is to enhance this form-finding process, through the development of a computer design tool that is capable of accurately predicting the form of a pure compression thin shell structure, quickly and easily, in a manner that ensures that the desired characteristics are obtained within the structure.

The analyses show that the computer model only corresponded to the shape of the physical chain model in two out of the six cases analyzed. The results suggest that the shapes produced by the computer model corresponded more closely to the shapes produced by the square slabs of yield-line analysis or the physical models developed using the hanging fabric modelling technique. In conclusion, the physical hanging chain models did not provide a correct representation of the shapes produced by the computer model.