Shaping Steel Grid Shells by Applying a Visual Programming Language

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ABSTRACT

The aim of the study is to develop an original, and practical approach to the early design stage of designing steel grid structures. The research consists in analysis of the several representative steel bar structures covering a square place. They were obtained as the result of the simulation transforming two-layer bar grids into curvilinear forms. The equilibrium geometries for the bar structures were determined in the interactive structural analysis processes. The starting point for each simulation was the creation of the block script describing the initial geometry and topology of the grid, the loads acting and the supporting system. As a result of the simulations carried out, different structures were obtained depending on the pre-assumed criteria. These structures were further analyzed considering both snow and wind loads and next optimized due to the minimum mass, assuming the worst load combination. The structural analysis showed that generated structures proved to be efficient in terms of load transfer.

The research not only enabled the development of novel procedures aimed at generating of effective bar structures but also allowed to obtain a wide variety of the interesting structural forms, which after further analysis or modification may constitute proposals of various types of building covering structures.

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