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KSZTAŁTOWANIE GENERATYWNE W POSZUKIWANIU FORM STRUKTURALNYCH WSPÓŁCZESNYCH OBIEKTÓW PAWILONOWYCH

SUMMARY

The dissertation is an interdisciplinary work and its subject is the study of exhibition pavilions in the context of the relationship between their spatial form and a structure. The work particularly aims at the study of the influence of parametric shaping on the search for optimal structural forms on the example of a selected model object, with an exposed simplified structure. The dissertation contains eight chapters. The study part of the dissertation (chapters 1-4) presents the development of exhibition pavilions designed for World Exhibitions, summer temporary exhibitions, such as the Serpentine Galleries. Furthermore, some contemporary experimental pavilions are described. The changes taking place in the design of the pavilions over 150 years of the EXPO organization are described. The work presents buildings constructed since 1851. Due to the specificity of the nature of the objects, no location restriction was introduced. However, the undertaken research in this paper concerned mainly pavilions, where numerical analyses were applied to architectural design. The leading trends of parametric creation of load-bearing structures of free shape were given. The important parts were case studies of own research of curvilinear structures of open canopies (Chapter 5). The study analyzed the influence of the change in the open pavilion geometry, as well as the support arrangement and various divisions of rod structures. In terms of optimization, the results obtained from the divisions of triangular meshes built based on Delaunay triangulation were compared with quadrilateral as well as regular triangular divisions. Multivariate optimizations were carried out due to the criterion of minimum own structure weight.

Keywords: Architectural Design Optimisation, Structural forms, Generative design, parametric design, multivariate optimisation, EXPO pavilions, experimental pavilions, interdisciplinary designing



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