

Formex Algebra Adaptation into Parametric Design Tools: Dome Structures

Authors : Réka Sárközi, Péter Iványi, Attila B. Széll

Abstract : The aim of this paper is to present the adaptation of the dome construction tool for formex algebra to the parametric design software Grasshopper. Formex algebra is a mathematical system, primarily used for planning structural systems such like truss-grid domes and vaults, together with the programming language Formian. The goal of the research is to allow architects to plan truss-grid structures easily with parametric design tools based on the versatile formex algebra mathematical system. To produce regular structures, coordinate system transformations are used and the dome structures are defined in spherical coordinate system. Owing to the abilities of the parametric design software, it is possible to apply further modifications on the structures and gain special forms. The paper covers the basic dome types, and also additional dome-based structures using special coordinate-system solutions based on spherical coordinate systems. It also contains additional structural possibilities like making double layer grids in all geometry forms. The adaptation of formex algebra and the parametric workflow of Grasshopper together give the possibility of quick and easy design and optimization of special truss-grid domes.

Keywords : parametric design, structural morphology, space structures, spherical coordinate system

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