

‘Weaving the Mashrabiya Pavilion’: A Mashrabiya-Inspired Pavilion Design based on Barycentric Subdivision

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Abstract

This paper shares an experience of applying the barycentric subdivision method for designing and constructing a rope-made steel-framed pavilion structure for Dubai Design Week 2018. Barycentric subdivision subdivides a polygon into multiple triangles, and we used this geometric process iteratively with each cell of a triangular grid that eventually resulted in a complex pattern resembling the Islamic pattern “mashrabiya” that is frequently seen in the Arab region. This geometric outcome helped us to design the mashrabiya pavilion targeted for 2018’s Dubai Design Week event which mainly exhibits such designs that display contemporary expressions rooted or emerged from regional traditions. We applied our barycentric-subdivision-based mashrabiya-like pattern to a hyper (hyperbolic paraboloid) structure for making the proposed pavilion structure. We used ropes for weaving the mashrabiya-inspired web. We conducted structural analysis to ensure the structural feasibility and strength of the pavilion for the real-world installation. This paper outlines the structural analysis of the pavilion briefly. After a series of analysis, we constructed the pavilion at the University campus by the students as a part of their hands-on design workshop exercise, and finally moved and installed it at the main venue Dubai Design District for the exhibition. The whole workflow of the design and construction process was strategically designed so that students can acquire studio-based learning as well as off-studio hands-on construction experience targeting for a prestigious exhibition.

Keywords: Barycentric subdivision, hyper, IFS, weaving, pavilion, mashrabiya