Structural efficiency of segmental shells, depending on segment geometries and connection properties

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Abstract
Segmenting shell structures can simplify their fabrication and erection, as the segments are produced in a controlled workshop environment and only mounted on site. Various examples show, that it is possible to build such structures with simple connections – using suited segment geometries, even hinged connections are possible without the introduction of folds. The entities planning these structures usually studied different connection properties on their specific example. Anyhow, the few built examples are usually realised with connections, that are as stiff as possible, to improve the structure's overall robustness and stiffness.

In the following paper these considerations' impacts on overall stiffness and therefore material-efficiency of shell structures in a more general frame is to be studied. Two shell geometries, with positive and negative Gaussian Curvature, are to be evaluated and compared with various segmental versions of themselves. Different doubly curved, planarised and developable segment geometries, tessellations, grid rotations and connection properties are to be examined and ranked according to their impact on structural efficiency. For the purpose of examining these interconnected parameters, an approach based on an analysis of a large number of specimen via a multi-objective evolutionary algorithm, is to be used.

References

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