Approximation of freeform surfaces with polyhedral patterns

Helmut Pottmann
KAUST, Saudi Arabia, and TU Wien, Austria
pottmann@geometrie.tuwien.ac.at

Polyhedral meshes, i.e. meshes with planar faces, recently received a lot of inter- est because of their potential applications in architecture and industrial design. Avoiding triangle meshes because of their high node complexity, research concen- trated mainly on polyhedral quad meshes. They possess an elegant treatment within discrete dierential geometry and are capable of approximating arbitrary shapes. However, they are strongly linked to the curvature behavior of the surfaces to be approximated and may not possess sucient exibility to satisfy the design intent. As an alternative, various types of patterns dierent from the quad grid have been investigated, both in real projects and in geometric computing. We report on our recent progress on polyhedral meshes which are combinatorially equivalent to well-known 2D patterns, analyze their exibility in approximating freeform shapes, discuss ways to handle the arising new forms of smoothness and suggest a computational framework suitable for interactive design and approximation.

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