Properties and applications of polygonal blending splines

Tatiana Kravetc

Department of Computer Science and Computational Engineering,
Faculty of Engineering Science and Technology,
UiT – The Arctic University of Norway
tatiana.kravetc@uit.no

In this talk we consider the evaluation of blending type splines on a polygon grid. One promising application of the blending spline surfaces is for isogeometric analysis. Polygon grids provide great flexibility for constructing a wide range of computational domain geometries. The blending spline basis functions possess the following properties: strict locality, C^d-smoothness over the polygon grid, and linear independence. The combined expo-rational functions that form the basis for blending splines are evaluated as a combination of the underlying basis functions defined on each polygonal element and multivariate Bernstein polynomials.

We present the main steps of the isogeometric analysis approach in terms of polygonal blending splines: polygon mesh generation, evaluation of the combined expo-rational basis on the parametric domain, approximation of the curvilinear computational domain, constructing and solving the linear matrix equation that represents a model problem. The talk mainly focuses on the isogeometric concept of the proposed method, i.e. the use of the special type of basis functions both in the domain construction and in the analysis. In addition, we discuss the properties of the combined expo-rational basis functions over the polygon grid and provide a numerical comparison of several refinement schemes.