

Triangular spline quasi-interpolants and their application in terrain modelling

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Digital Elevation Models (DEMs for short) have a wide application in Hydrology, Geology, Environment and Civil Engineering, among other disciplines. Sometimes there exists more than one DEM from the same area. The difference among them may be due to the fact that they come from different producers, different methodologies to capture them or different cell sizes used in their production. Many applications require that all DEMs used have the same cell size to be interoperable [1, 2, 3], which implies a resampling of the original DEM. This resampling can influence the quality of the final product, so the resampling method used very important aspect to take into account.

In this work we propose the construction of a triangular spline quasi-interpolant over the type-1 triangulation of the partition into squares associated with the dataset to be approximated. The triangulation is endowed with a Powell-Sabin 6-split. Instead of expressing the quasi-interpolant in terms of a basis of B-spline-like functions, it is constructed by directly setting the coefficients of the Bernstein-Bézier representation of its restriction to each of the micro-triangles into which each macro-triangle is decomposed. Each coefficient will be determined from the values to be approximated at the points of a neighbourhood of the micro-triangle under consideration, making use of rules that will guarantee the required regularity and order of approximation.

This quasi-interpolating spline will provide a new resampling method that will allow to study its quality when going from a higher resolution to a lower resolution.

References

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