G\(^1\) SCATTERED DATA INTERPOLATION WITH MINIMIZED SUM OF SQUARES OF PRINCIPAL CURVATURES

Abstract:

One of the main focus of scattered data interpolation is fitting a smooth surface to a set of non-uniformly distributed data points which extends to all positions in a prescribed domain. In this paper, given a set of scattered data \( V = \{(x_i, y_i), i=1,\ldots,n\} \subseteq \mathbb{R}^2 \) over a polygonal domain and a corresponding set of real numbers \( \{Z_i\}_{i=1}^n \) we wish to construct a surface \( S \) which has continuous varying tangent plane everywhere (G\(^1\)) such that \( S(x_i, y_i) = z_i \). Specifically, the polynomial being considered belong to G\(^1\) quartic Bézier functions over a triangulated domain. In order to construct the surface, we need to construct the triangular mesh spanning over the unorganized set of points, \( V \) which will then have to be covered with Bézier patches with coefficients satisfying the G\(^1\) continuity between patches and the minimized sum of squares of principal curvatures. Examples are also presented to show the effectiveness of our proposed method.