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Using T-Splines to Model Point Clouds from Terrestrial Laser Scanner

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Abstract : Spline surfaces are a major representation of freeform surfaces in the computer-aided graphic industry and were recently introduced in the field of geodesy for processing point clouds from terrestrial laser scanner (TLS). The surface fitting consists of approximating a trustworthy mathematical surface to a large numbered 3D point cloud. The standard B-spline surfaces lack of local refinement due to the tensor-product construction. The consequences are oscillating geometry, particularly in the transition from low-to-high curvature parts for scattered point clouds with missing data. More economic alternatives in terms of parameters on how to handle point clouds with a huge amount of observations are the recently introduced T-splines. As long as the partition of unity is guaranteed, their computational complexity is low, and they are flexible. T-splines are implemented in a commercial package called Rhino, a 3D modeler which is widely used in computer aided design to create and animate NURBS objects. We have applied T-splines surface fitting to terrestrial laser scanner point clouds from a bridge under load and a sheet pile wall with noisy observations. We will highlight their potential for modelling details with high trustworthiness, paving the way for further applications in terms of deformation analysis.

Keywords : deformation analysis, surface modelling, terrestrial laser scanner, T-splines
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