Quality Investigations of Different Modelling Approaches for Laser Scanning Point Clouds Representing Natural Surfaces

Corinna Harmening and Ramon Butzer (Germany)

Key words: Engineering survey; Laser scanning; Point cloud modelling, natural objects

SUMMARY

Terrestrial laser scanning has established as standard measurement technique for geodetic applications in recent years, as it enables the fast and high-resolution acquisition of entire objects and scenes. In addition to the acquisition of man-made objects such as bridges or dams, the acquisition and monitoring of natural surfaces such as landslide or soil erosion is playing an increasingly important role.

Regardless of the characteristics of the captured object, the first step of the evaluation usually consists of a point cloud modelling, aiming to reduce the measurement noise contained in the data. Compared to artificial objects, natural surfaces are characterised by an irregular structure that often also has a random component. These characteristics complicate the modelling of natural surfaces and require extensions to the methods classically used for modelling artificial objects.

The aim of this contribution is the investigation of different modelling approaches for point clouds representing natural surfaces. The simplest modelling approach used is the tensor product B-spline surface, the limiting global property of which is compensated by extending them in two ways: The first extension improves the pure functional modelling by using skinned B-spline surfaces which take local characteristics of the acquired scenes into account. The second extension complements the functional representations by a stochastic signal, which accounts for insufficient local functional modelling.

The developed approaches are compared on the basis of two case studies with regard to the resulting approximation quality.