Statistical Evaluation of the B-Splines Approximation of 3D Point Clouds

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SUMMARY

Terrestrial laser scanning (TLS) has proved to be a suitable technique for geodetic monitoring of structures such as bridges as it allows determine object deformations rapidly with high precision as well as high temporal and high spatial resolution. In addition, this monitoring includes the evaluation of their life cycle, and the developing of concepts to increase their expected life time as well. In an interdisciplinary project, which being conducted with partners from industry and research, an historic masonry arch bridge over the river Aller near Verden (Lower Saxony, Germany) has been investigated. A terrestrial laser scanner was used (besides different other sensors) to measure the deflection of the bridge construction under different load scenarios. The resulting 3D point clouds have been spatially approximated using approaches of free-form curves and surfaces, B-Splines. The selection of degree of basis function and number of control points has a considerable and important effect on the estimating results of the B-Spline. To assess the statistical significance of the differences displayed by the estimates for different model choices, a non-nested model selection test as well as information criteria will be developed and applied.

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