0.1 Online reconstruction of regular and free-form geometry from point streams

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Hand-held laser scanners are commonly used in industry for reverse engineering and quality measurements. It is difficult for the human operator to scan the target object completely and uniformly. Therefore, an interactive reconstruction of the scanned points can assist the operator in this task.

In our previous work [Article 1, Article 2], we developed a method to compute a triangulation of the point stream generated by the laser scanner online, i.e., the data points are added to the triangulation as they are received from the scanner. To guide the operator the resulting triangulation is rendered with a visualization of its uncertainty, see Figure 0.1.

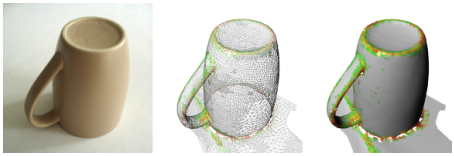

Figure 0.1: A scanned coffee mug. Original object (left), wire-frame mesh (center), triangulation with uncertainty visualization (right).

CAD applications typically do not use meshes to represent objects. Instead free-form surfaces and parametrized regular geometry is used to construct and modify objects in CAD software. In reverse engineering this object data is reconstructed manually in a separate step after scanning the object.

We are working on an automatic or semi-automatic online reconstruction of these object representations during the scanning process. This integrated scanning and reconstruction process will be more efficient, because only data required for the reconstruction needs to be scanned. Problematic regions can be improved by interactively adding additional scan data where necessary.

Bibliography

[Article 1] K. Denker, B. Lehner, and G. Umlauf. *Online triangulation of laser-scan data.* Proceedings of the 17th International Meshing Roundtable, 2008.

[Article 2] K. Denker, B. Lehner, and G. Umlauf. *Real-time triangulation of point streams.* Engineering with Computers, 27(1):67-80, 2011.