Real-Time 3D Model Acquisition

Szymon Rusinkiewicz  Olaf Hall-Holt  Marc Levoy
Princeton University  Stanford University

Abstract

The digitization of the 3D shape of real objects is a rapidly expanding field, with applications in entertainment, design, and archaeology. We propose a new 3D model acquisition system that permits the user to rotate an object by hand and see a continuously-updated model as the object is scanned. This tight feedback loop allows the user to find and fill holes in the model in real time, and determine when the object has been completely covered. Our system is based on a 60 Hz. structured-light rangefinder, a real-time variant of ICP (iterative closest points) for alignment, and point-based merging and rendering algorithms. We demonstrate the ability of our prototype to scan objects faster and with greater ease than conventional model acquisition pipelines.

Figure 1: Our real-time 3D model acquisition system was used to scan a small turtle figurine. The total scanning time was 4 minutes and the final model, at 0.5 mm. resolution, contains approximately 200,000 polygons. (c) through (e) are rendered using splats, and (f) is rendered as a polygon mesh.