

Frontiers in 3D Photography: Reflectance and Motion

Steve Seitz

Abstract

The last decade has seen great progress in 3D shape capture technology, both in terms of research advances and successful commercial systems. So why don't most people own 3D cameras? Aside from such issues as expense and size, there remain fundamental technical problems that restrict the applicability of the current state of the art.

One of these problems is modeling realistic materials. If you look around, you'll notice that most objects are shiny and have specular highlights. However, virtually all shape recovery methods perform poorly for such surfaces. For this reason, it is common to paint an object white before scanning with a laser scanner. This limitation seems unnecessary, given that the human visual system appears to have no such problem—in fact, highlights should give us more information for shape inference.

Another major limitation is that the 3D capture process is currently slow and laborious. In particular, very few techniques exist that can capture moving scenes. Obtaining accurate and complete models of moving scenes is challenging, due to the limited measurements that can be obtained at each instant in time.

In this talk, I will describe new work from my research group that seeks to address these two problems—modeling shiny scenes and moving scenes from photographs. We have recently developed shape capture methods that produce laser-scanner-quality results but for scenes with general reflective properties, including shiny surfaces and even anisotropic materials like brushed fur. I will also describe motion-scanning techniques that yield dense shape reconstructions of moving scenes.
