

Transparent and Reflective Scene Reconstruction

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We provide a state of the art report on reconstruction methods for transparent and reflective scenes. While the 3D acquisition of opaque surfaces with lambertian reflectance is a well-studied problem, transparent, refractive, reflective and potentially dynamic scenes pose challenging problems for acquisition systems. The proposed State of the Art report will review and categorize the important literature in this exciting field. Despite tremendous interest in object digitization, the acquisition of digital models of transparent or reflective objects is far from being a solved problem. On the other hand, real-world data is in high demand for applications like object modeling, preservation of historic artifacts and input to data driven modeling techniques, to name just a few.

This STAR aims at compiling the first comprehensive review of existing approaches for transparent and reflective object acquisition. The authors' goal is to describe the majority of acquisition approaches for different classes of objects. Transparent objects/phenomena that do not change the straight ray geometry can be found foremost in natural phenomena. Phenomena as diverse as fire, smoke, and planetary nebulae are found in this category. Refractive and reflective surfaces on the other hand change the straight rays into (usually) piecewise linear ray paths, adding additional complexity to the reconstruction problem. This STAR will cover state-of-the-art acquisition techniques for transparent, refractive, reflective and translucent objects. By collecting the available literature and categorizing the main approaches, the authors aim at providing a useful reference work for future research. The report will also be useful for identifying future research directions and stating the main problems that need to be resolved in order to solve this challenging problem.

The authors hope that this STAR will become a comprehensive guide to recent activity in the field, providing an overview and an accessible entry-point literature for future research on the subject.