

## 1001 Acquisition Viewpoints Efficient and Versatile View-Dependent Modeling of Real-World Scenes

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Three dimensional modeling is a severe bottleneck for computer graphics applications. Manual modeling is time consuming and, even so, the resulting models fail to capture the true complexity of real world scenes. Automated modeling based on acquiring color and depth data is a promising alternative. The conventional approach is to sample the scene densely from a sparse set of acquisition viewpoints. Unfortunately, even with careful view planning, a sparse set of acquisition viewpoints does not and cannot ensure adequate coverage for complex scenes. Moreover, the approach is inefficient due to the considerable data redundancy between neighboring acquisition viewpoints: acquisition from an additional viewpoint has the same cost while it contributes fewer and fewer new samples.

We propose an automated modeling approach based on sampling the scene sparsely from a dense set of acquisition viewpoints. We show that the sparse data quickly accumulates to generate models with good scene coverage. The sparse depth is acquired efficiently and robustly, which enables an interactive, operator-in-the-loop acquisition pipeline. We describe a modeling system that implements this approach. The system acquires scenes with complex geometry and complex reflective properties from thousands of viewpoints in minutes. The resulting model has a compact memory footprint and it supports photorealistic rendering at interactive rates. The system is robust, yet it does not require displacing scene objects or altering scene lighting conditions.