Structuring Realities: How Laser Scanning and Reality Capture Are Remaking the World

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Abstract:
A tsunami of digital 3D models of real objects has entered the worlds of entertainment, simulation, museums, and historic preservation. This paper focuses on their entry into the museum, and provides an overview of several of the Smithsonian Institution's recent projects involving 3D scanning of museum objects, including a case study of the Apollo 11 Command Module. As 3D scanning and "reality capture" tools and techniques for creating digital reproductions of artifacts and environments are adopted by practitioners in historic preservation, museums, and the entertainment industry, they can bump up against curators' traditional understandings of artifacts and their histories.

Techniques developed in the 1980s for 3D scanning physical objects, using lasers and structured light devices, are being extensively used by the entertainment industry to create characters, phenomena, and environments. The tools have become more affordable and accessible, and converting physical surfaces of all sorts of objects into data has become easier, though the process is still far from seamless. Museums, including the Smithsonian, have embraced entertainment industry techniques and tools, and are testing methods of converting objects in their collections into 3D models. At the Smithsonian, a growing collection of digital museum

objects is being displayed in a virtual online gallery, accompanied by curators' notes and commentaries. The notion of virtual collections, which can expand access to museum artifacts and present them to new audiences is intriguing, and the objects themselves are beguiling. But many important questions remain unexplored.

The growing number of detailed 3D models of artifacts and entire archaeological sites being created is allowing scientists to contemplate and study these objects in new ways, including to virtually revisit an object or place at any time. What impact does this new ability to, in effect, move backward and forward in time and place have on our relationship to the original or authentic object or event, or to the idea of authenticity itself? Transforming objects and places into data points is appealing for precise scientific studies, but how is the data collected from 3D objects verified and secured? Who in an organization does this? In addition, organizations

engaging in object digitization projects must decide how to archive, preserve, and migrate object data from one operating system or computing platform to another over time, in perpetuity.

Other important questions touch on creating naming conventions, file format standards, and guidelines for resolution and granularity of data. Finally, what kinds of experiences can a digital 3D object provide that a physical 3D object cannot and vice versa? How believable are digital objects, and what kinds of mental processes are at work when interacting with them? Are there any caveats, such as those that apply to simulations? As Professor Sherry Turkle, of the Massachusetts Institute of Technology has noted, beautiful, compelling simulations can be dangerously easy to love, and difficult to doubt. As 3D models become powerful, persuasive tools for understanding the world, developing an understanding of their limitations, and encoded misperceptions and biases becomes critical. This paper presents a preliminary framework for thinking about reality capture techniques, digital objects, and their impact on organizations such as museums.