Zenith Object Detector (ZOD): A multi-camera 3D body scanning platform

Dan Collins
Arizona State University
Tempe, AZ, USA
dan.collins@asu.edu

Josh Gigantino
Arizona State University
Tempe, AZ, USA
joshua.gigantino@asu.edu

Aubrey Wigner
Arizona State University
Tempe, AZ, USA
aubrey.wigner@asu.edu

1. Introduction

This project introduces a procedure for creating 3D full body scans utilizing a low-cost commodity-based infra-red(IR) sensor and multiple consumer grade cameras. The project, entitled *The Zenith Object Detector*, uses a home built series of concentric octagons to mount both *Asus Xtion* structured IR light sensors with color capture capacity, as well as the 16-28 digital cameras for instantaneous image capture. Subjects are scanned in via the Xtions by standing on a rotating platform while the octagons move up from the floor. Simultaneously, the cameras will capture the pose for later 3D reconstruction using 123D Catch, a free Autodesk service for turning images into 3D objects. The outputs will be sent to 3D printers to produce portrait pieces.

2. Background

2.1 Structured IR light-based depth sensor

IR depth sensors have been available on the consumer market for the past 4 years. The first cheap commercially available structured light IR sensor was the Microsoft Kinect, released in 2010 as an interface option for the Xbox 360 console. First generation sensors such as the *Kinect*, utilizing an on-board ASIC, were capable of generating an 11-bit 640x480 depth map at 30Hz. Current technology offered by *Asus* generates a slightly higher resolution depth map plus HD Color. These systems offer a low-cost alternative to expensive photogrammetry and laser-based systems. Primesense, an Israeli tech company founded in 2005 provided the hardware for both the Kinect as well as the Asus Xtion. Primesense was purchased by Apple in late 2013 and the open source community using them has been discontinued.

2.2 Multi-camera digital capture

Reconstructing 3D images from multiple camera views is no new technology. Previously however, stitching together large numbers of photographs required a great deal of computing power and expensive software. Often, calibrated camera rigging was needed for the software to adequately define the captured space. Freely available software like Autodesk's, 123D Catch, allows arbitrarily placed cameras to capture complex 3D forms, such as the human body, by uploading dozens of images to the cloud for processing.

2.3 Why We Created ZOD

There are a variety of solutions for scanning an object into a digital format, from multi-camera rigs to laser scanning. However, many of these solutions are prohibitively expensive for artists, designers, and educators. Through the use of low cost, commercially available scanners, this project introduces an accessible method for scanning objects and people.

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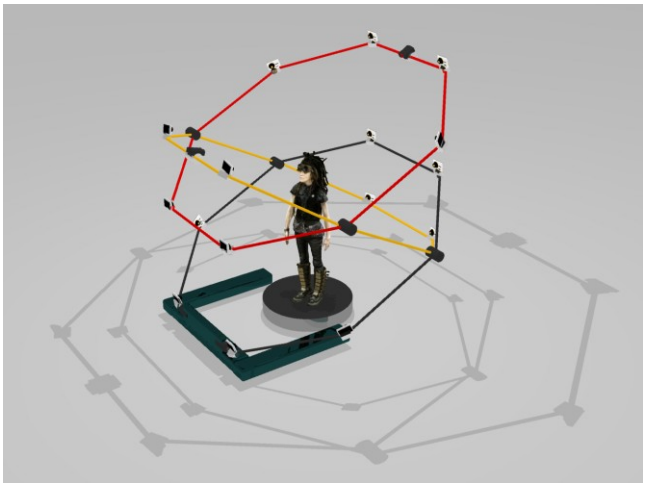

Figure 1. *A digital render of the ZOD scanning rig, currently in production. The scanned figure inside the rig is from the Würm Hole, which was displayed at the SIGGRAPH 2013 Studio*

3. Results

The *The Zenith Object Detector* demonstrates how creative use of cheap 3D depth scanners, used digital cameras, and a Do It Yourself camera rig, can be used to enhance the experience of digitizing subjects in a spontaneous and rapidly visualized manner. Furthermore, 3D printing is used to allow for the rapid turnaround of digitized subjects to sculptures.

4. Conclusions

A wide range of possibilities for 3D scanning are currently entering the market. The ZOD highlights an example of how two scanning technologies can be used to create an interactive experience for audience members to turn their own bodies into rapid prototype sculptures.

References

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