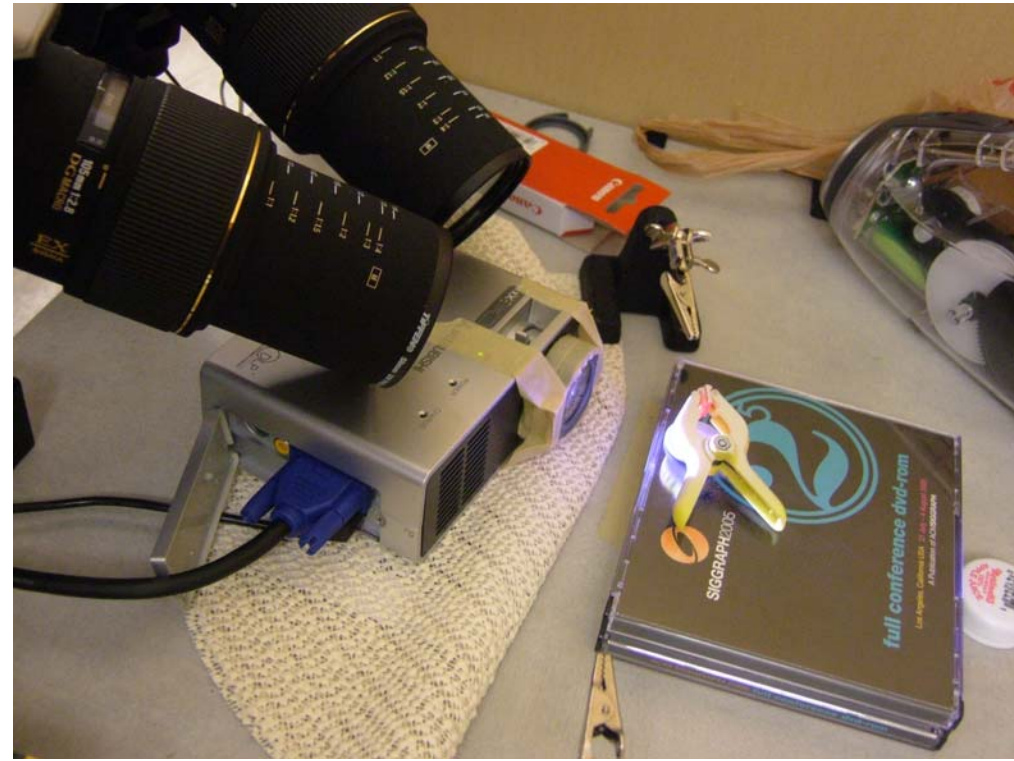


TINY SCANNER

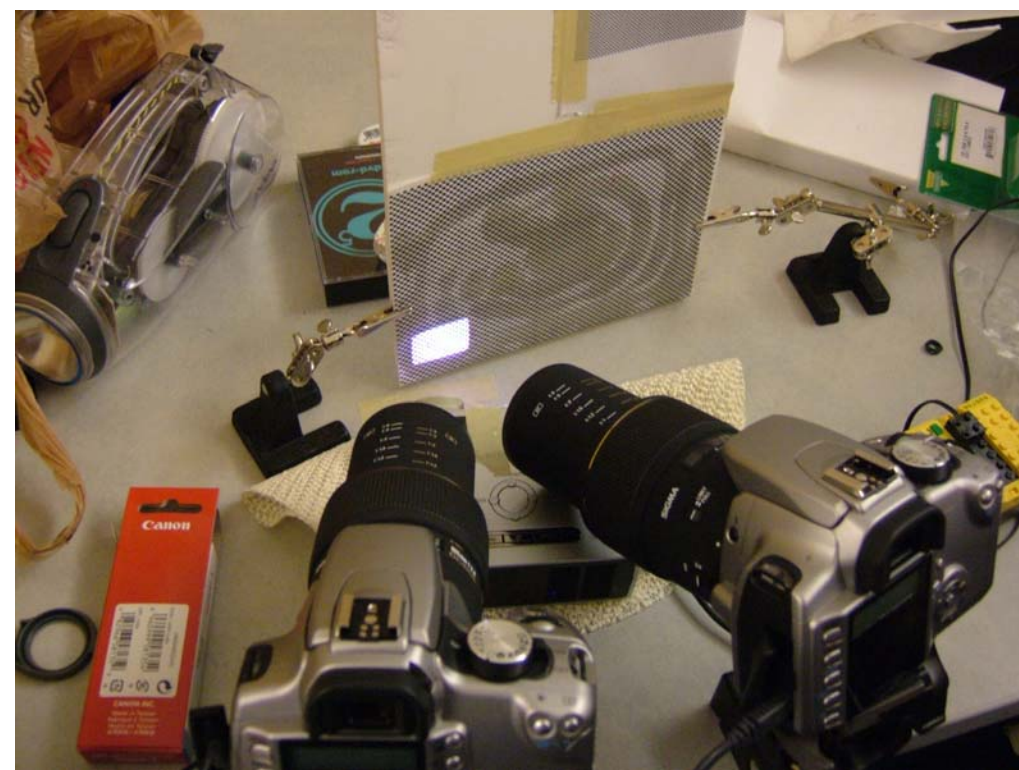
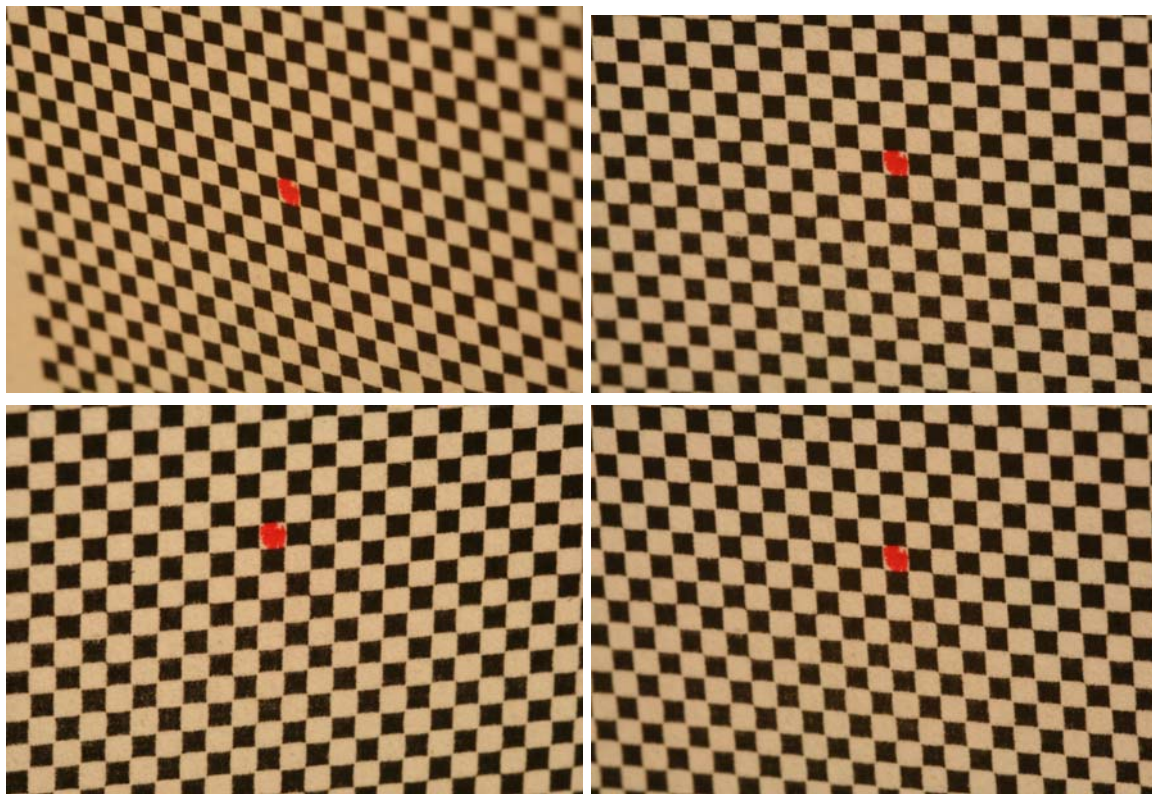
The Setup



We used two Canon Digital Rebel XTs (8 MP digital SLR) with two Sigma Macro 105mm F2.8 EX DG camera lenses to take the pictures. This combination allows us to get a 1:1 image ratio, therefore have 3264 pixels in 2/3 of an inch over the horizontal axis (about 0.067mm per pixel).

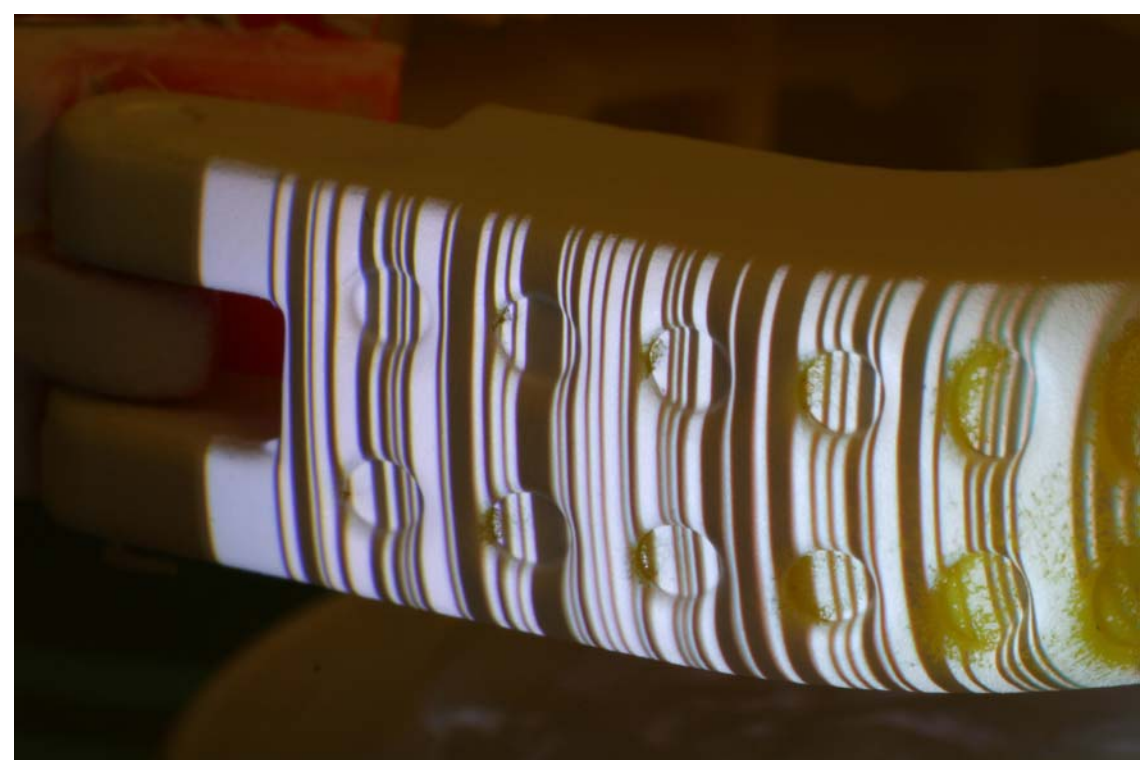
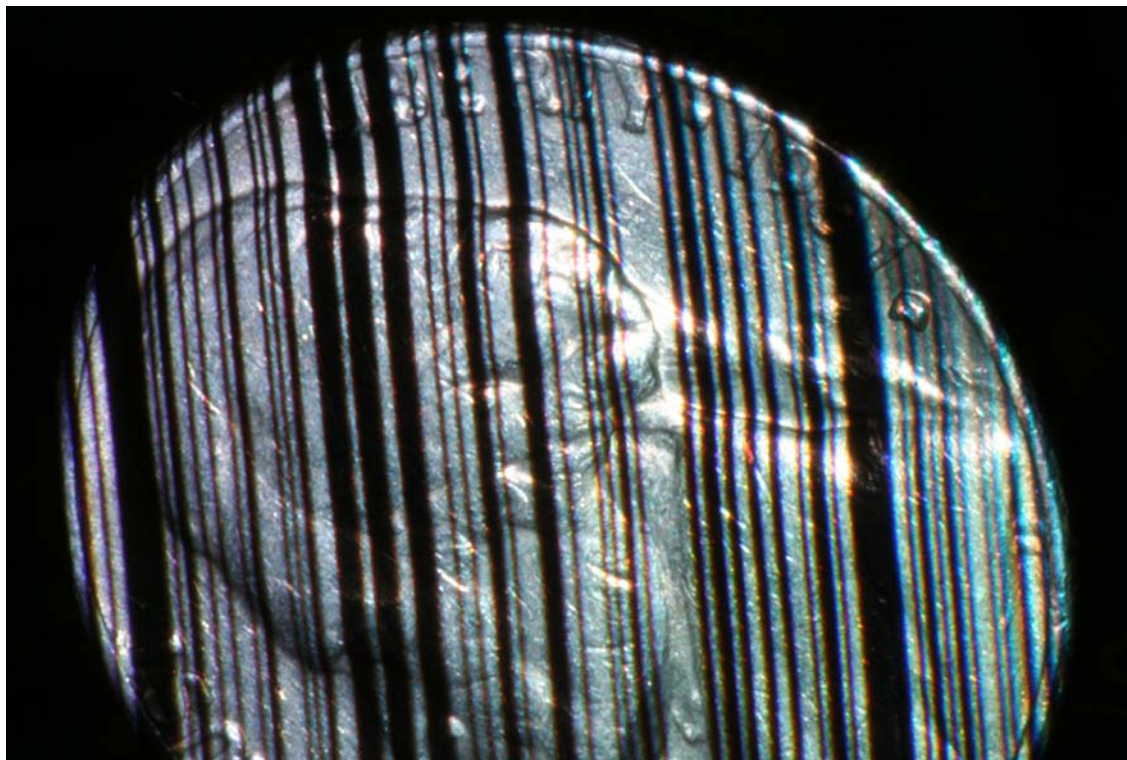
Magnification lenses have been added in front of the projector optics to make it focus closer and have a smaller projected image. It now creates an image of 800x600 pixels over an area of a little bit more than an inch squared.

Calibration



Before scanning, the system must be calibrated. A checkerboard is positioned at various angles and pictures are taken with both cameras. The images are then run through a MATLAB script where grids of squares are defined and it then outputs a data file with all the information needed.

Scanning



Stripes are projected on the surface of the object through a LED projector. The pattern varies from image to image, and 50 shots are taken per camera. The software then recognized the position of each stripe and the distortion due to the surface of the object, and can reconstruct a virtual 3D image of it.

Problems

Even if, with this setup, we are able to focus on the object, project stripes on it and take pictures, we ran into several problems. At first the MATLAB script would not accept our set of calibration images, then the computer we were using stopped recognizing one of the Canon cameras (therefore not allowing us to take pictures from the PC through a USB cable, but forcing us to save them on compactflash and then copy them on the hard drive) and finally, after more than 70 calibration pictures taken, when it finally seemed to accept a set of them, the script would output an “out of memory” error at a later stage. We never managed to get the system calibrated, and therefore never got a 3D reconstruction, even if we have everything needed.