## Overview

This report summarizes the results of completing the last assignment for CS583, implementing structure from motion, in particular generating 3d models from multiple images. Below I note my findings, what was difficult, what was interesting and possible future expansions for this project.

## Findings

This project was deffinitly easier to implement than the other 2 projects for this course. The most difficult part of the project was taking images and selecting points in those images to produce useful 3d models. I ran 4 different tests, with varying geometries. Test number 2 included images of my desk, this test did not include the surface of the desk, and so produced a somewhat skewed view of the open laptop. Other tests included various geometries of couches and kitchen counters.

My initial tests (not included) were of hallways. These tests were difficult to find planes to be used in generating a 3d model. I then decided to trash those tests and try new ones with convex shapes and concave surroundings.

Overall, the algorithms presented in class lectures and the supporting PDF on generating the Q matrix provided enough detail to help implement the various matrix multiplications and run time of implemented algorithm was near-real time (after manually selecting points and describing geometries).

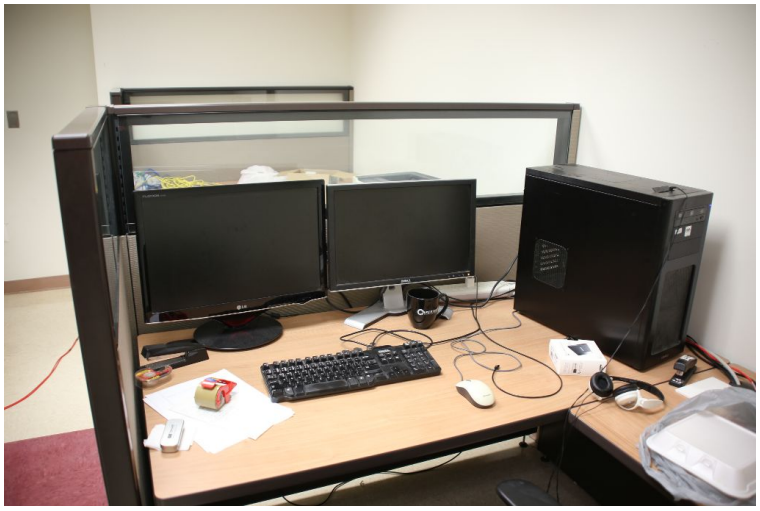
When debugging the reprojected image coordinates, there was some slight offsets when compared to the originally manually selected points. This may be due to rounding errors, or issues with the rotation matrix. This would require further investigation to determine if these variations can be minimized.

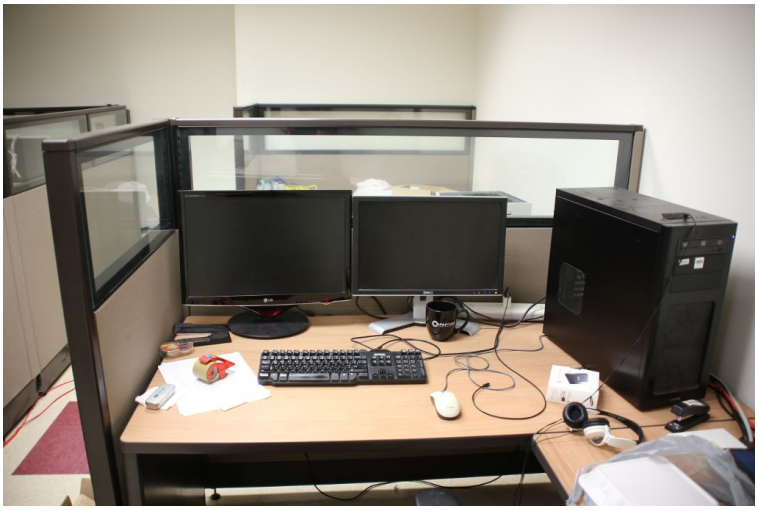
One future expansion of this project would be to allow selection of full planes in the track-points wrapper, rather than just points (this would help to ensure full planes were selected, and that the corners matched the geometries in the image. The other expansion of this project would be to implement full feature detection and description to eliminate the manual process of point tracking, however more research into this would be needed.

## Experiments / Results

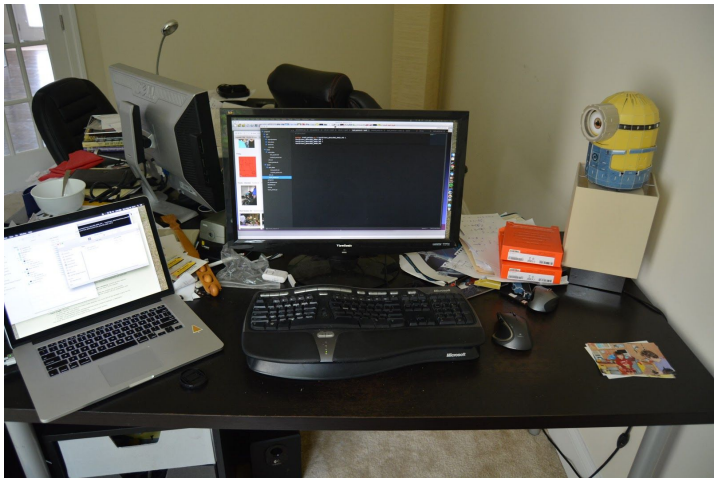
On the following pages are 2 sample images from each test and 2 snapshots of the generated models.
One oddity that I was unable to determine, using some of the images I produced, the 3d model appears to be flipped around the vertical axis. This was not the case with the provided test images / points.

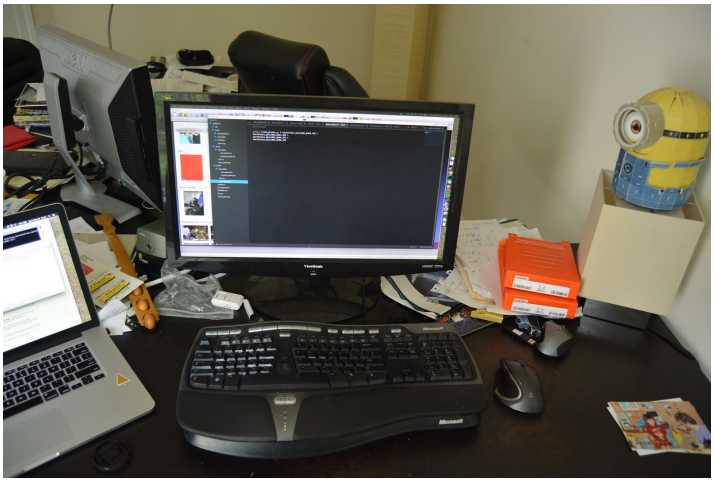
Test 1 - Given test data



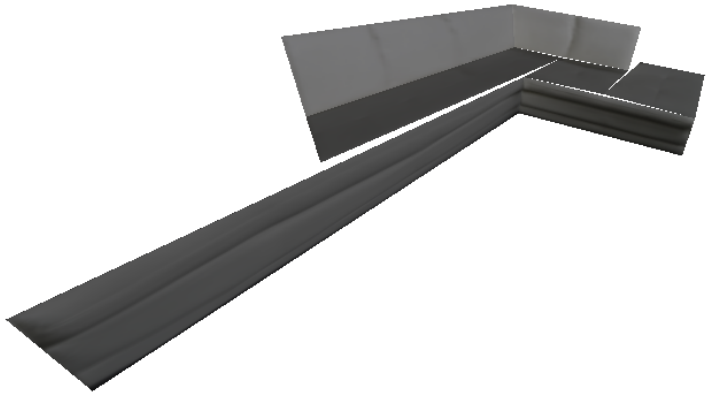


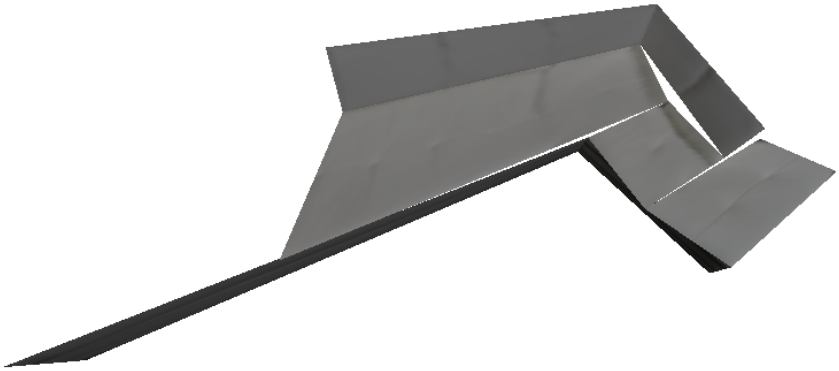
Test 2 - My Desk

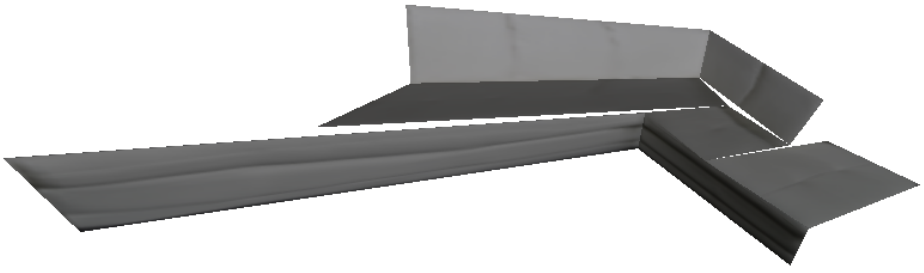




Test 3 - Couch







Test 4 - Kitchen Counter