SE 491 WEEKLY REPORT 6

Date: 3/06/2017

Group Number:

Dec1704

Project Title:

Danfoss Visual Inspection System

Client &/ Advisor:

Radoslaw Kornicki and Professor Dogandzic

Team Members &/ Roles:

Joseph Elliott – Communications

Evan Woodring – Team Lead

Nicholas Gerleman – Key Concepts

Cory Itzen - Webmaster

Weekly Summary

This week, we focused on testing what we have built. As a focal point, we decided to start making 3D models and 3D printing these models. This will allow us to test a couple things:

1. How well the cameras work at scanning basic objects.
    a. How the Occipital camera differs from the RealSense camera
    b. If the two cameras can be used in unison for an even greater accuracy and precision.
2. How well the test bench works in comparing the scanned 3D objects to their CAD counterparts.
    a. How each different algorithm for comparing two point clouds works (accuracy, precision)

Furthermore, we continued on our own modules, working another step forward in making a prototype. Our overall goal is to have a prototype by the end of the semester, an ambitious, but reachable, goal. You can see our individual contributions below. As part of reaching this goal, we've noticed that we will need a few things. As such, we've decided to seek a budget in hopes of purchasing the tools we need for testing. Kornicki has graciously provided us with the tools we've needed for development, but it's time we provide some of the smaller things via the senior design budget.

Past Week Accomplishments

Name	Accomplishments
Joseph Elliott	Found the error in why the RealSense camera won't generate an output file. However, as we discussed in our meeting, we may not even need to generate this file. The test bench may integrate the code for this camera seamlessly to allow the mesh data to be directly transferred (as raw data) to the test bench. After writing this, I actually figured out the solution to the problem at hand. I can now generate files programmatically.
Evan Woodring	Began working with the Structure sensor from Occipital.
Nicholas Gerleman	Began 3D printing reference objects for testing. Started fleshing out Frontend interface for the test bench. Fixed several bugs with the backend of the test bench.
Cory Itzen	Finished first version of the website. Generated 2 point clouds with minor differences for testing. Began working on using KD-trees to map points on the scanned point cloud to their nearest neighbors on the actual point cloud

Pending Issues

Name	If Applicable
Joseph Elliott	n/a
Evan Woodring	Structure sensor is not designed for PC use, so there may be some hiccups (for example, the sample code does not work as is)
Nicholas Gerleman	n/a
Cory Itzen	Some small issues getting KD-trees to work. Should be resolved on Monday

Individual Contributions

NAME	INDIVIDUAL CONTRIBUTIONS	HOURS THIS WEEK	HOURS CUMULATIVE
Joseph Elliott	Revealed the error code the camera is generating. Finally was able to generate an OBJ or STL file from the camera programmatically.	5	30
Evan Woodring	Began research and testing the Structure sensor. Software is installed, and am in the process of debugging the sample code to get a read of an item.	5	24
Nicholas Gerleman	Reference objects will help us validate our approaches for alignment and error detection. The test bench is closer to being complete. Once these two are done we should be able to begin initial testing.	5	43
Cory Itzen	Finished first version of the website. Created point clouds for testing. Began mapping scanned vertices to actual vertices	6	26

Comments and Extended Discussion

n/a

Plan for Coming Week

Name	Accomplishments
Joseph Elliott	Conclude the process of scanning an object programmatically. If possible, migrate the code to the git repo. If not, then work on generating raw streams.
Evan Woodring	More work on (potentially finishing) evaluation of the Structure sensor so we know how to advance.
Nicholas Gerleman	Functionally finish the test bench. Start implementing alignment and tessellation algorithms on the test bench. Print more 3D objects as references.
Cory Itzen	Finish mapping vertices from the scanned point cloud to the actual point cloud using KD-trees. Determine the expected distance for all vertices and isolate clusters of vertices that exceed this distance.

Summary of Weekly Advisor Meeting

This week's meeting was a bit shorter than the previous weeks. We've reached a point in our development process where we are all working on sections that take a lot of time. Because of that, the content of our meeting was more or less "the same as last week, just working on more bugs". However, there are a few key things that we talked about.

First, we discussed what to do about keeping our client in contact more often. We noticed that on the sheet for our proposal that the Kornicki wished to meet once a week. However, due to scheduling conflicts and overall difficulties, we have been unable to meet this requirement thus far. We do plan on working on this, however.

Second, we talked about the differences between the two cameras (RealSense and Occipital). While much work on the Occipital camera is yet to be done, we have noted two key differences:

a. The Occipital camera uses two separate cameras and meshes their different angles together, while the RealSense camera uses infrared light.
b. The Occipital camera is a lot more difficult to get working because of restrictions on the SDK.

Third and lastly, we talked about how we plan on testing the cameras on real world objects. Nick has access to a 3D printer for cheap, so we are printing out a few objects (think cubes and cylinders) with some being defect-versions of said objects. This will allow us to test our camera much better than with random objects we find. Also, we can test the point-cloud comparison framework using the OBJ files generated from the creation of the 3D models.