APPLICATION NOTE

This device has been successfully administered on an ASUS VivoBook, Intel Core i7. Some of the programs used are OS dependant and version specific, which may not work for specific users. Note Open3D currently only works with Python 3.6-3.9.

INSTRUCTIONS

1. Download all Required software:

   a. Python (must be version 3.6-3.9) can be downloaded from https://www.python.org/downloads/ . You may optionally download an additional IDE to edit and run the files, or you may use the default IDLE included with python. The application example uses the IDLE.

   b. After python has been installed, Open3D and PySerial can be downloaded using the command prompt. Open the command prompt as administrator, and use the following commands to install: "pip install open3d" and "pip install pyserial"

   c. Install Keil IDE for the MSP432E401Y code. This can be installed here: https://developer.arm.com/Tools%20and%20Software/Keil%20MDK

2. Decide what is going to be measured, and what is required for a functional program:

   a. How many scans/iterations are required? Perform (360 / # of scans) to get the motor angle.

   b. Will there be any x-displacement? If yes, note down that amount of displacement in millimeters.

   c. How many full 360deg scans are desired? Note this down.

   d. What is your PC's UART port? This can be checked by opening Device Manager → Ports (Com & LPT) → XDS110 Class Application/User UART (COM___)

3. Once these specifications have been identified, we can start filling in parameters on the provided code files.

4. Open the Keil Project File provided. The C code file named Project.c is what will be modified. Enter the number of iterations on Line 201. Enter the number of steps on Line 202. Steps can be determined by doing (2048/iterations).

5. Open the Data_Collect_Visualize.py file. In this file enter the correct COM port on Line 11. Next enter your desired total scan number on Line 22. Then enter total iterations desired on Line 26. Enter desired degree on Line 28. Finally, enter Desired x-displacement on Line 24.

6. Once these settings have been configured the software components are ready.

7. Wire up all components according to the Circuit Schematic.

8. Connect the PC to your MSP432E401Y and translate, build, then load the Project.c file. Reset the Micro.

9. Run the Data_Collect_Visualize.py file in an IDE of choice. Now the program should be ready to use. The messages will indicate when the port has been opened, which is your queue to start data collection. This can be done by pressing the push button. Pressing the push button will allow for one 360-degree scan. Pushing the button again after the original scan is complete will prompt another scan. The program will automatically stop and visualize the data when the predefined number of scans are reached.

EXPECTED OUTPUT

An example of this application can be found below. This example showcases a 11.25-degree stepper angle, 32 scans per displacement, for a total of 21 displacements. The final data is a 3D representation of a hallway. One can see the results below:
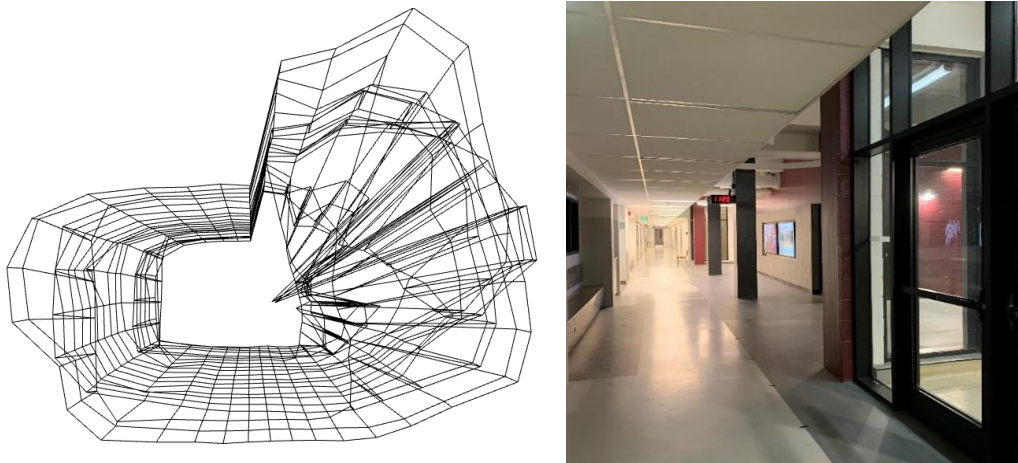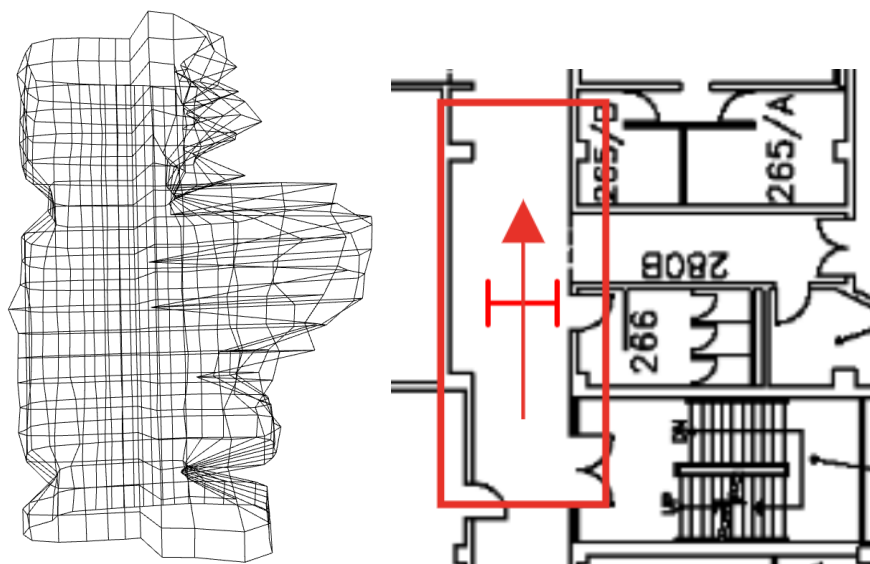

Figure 1 Final Scan of Hallway Side by Side Comparison

Figure 2 Top View of Hallway Scanned