To Predict ▶ To Design ▶ To Perform

College of Engineering
Department of Mechanical & Industrial Engineering

ME, ECE, BE Capstone Design Programs

3D Mapping with Microsoft Kinect

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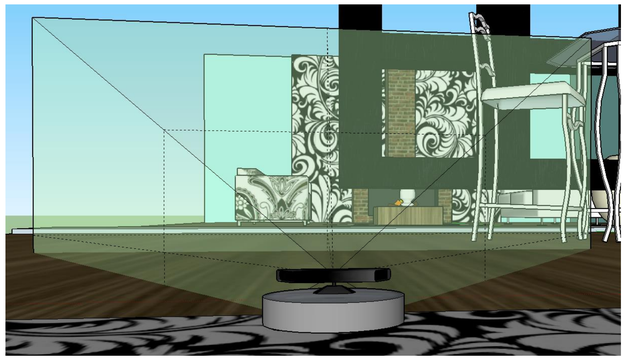
Introduction

This project seeks to create a robotic system capable of reconstructing an arbitrary indoor environment in 3D. This system will use the Microsoft Kinect as the depth and color sensor and the iRobot Create as the vehicle to transport the Kinect sensor.



Hardware

Software Pipeline

This project is software intensive, therefore we divided the coding into 5 distinct processes:

1. Capture data with the Kinect

First the depth and rgb data is captured from the Kinect sensor onto the laptop atop the robot.

2. Pull data over network

Next the raw depth and rgb data is sent to a local computer through a connected wireless router.

3. Process to jpeg images

Third, raw Kinect data is converted to jpeg format

4. Process to xyzrgb

Next, the raw depth data and rgb images are converted into the xyzrgb format for SLAM

5. Run SLAM

Finally SLAM (Simultaneous Localization and Mapping) algorithm is run to stitch together adjacent frames for the final 3D model

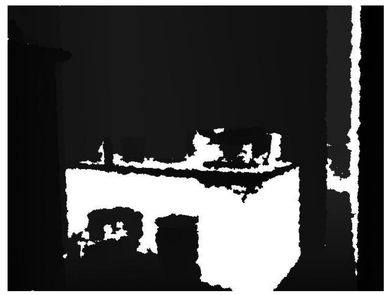
6. Visualization Program

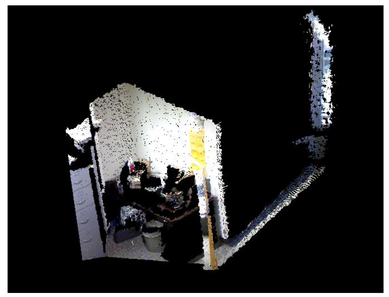
Open result using the visualization application to easily visualize the 3D rgbxyz point clouds

Testing

- Robot Movement Accuracy
  - ± 5.35 cm
- Point Cloud Accuracy
  - Accurate within ± 2.5 cm
- Minimum operating voltage for Kinect Sensor
  - 10.3 V
- Voltage Dropout Range Test
  - 11.7 V to 9.5 V
- Operating Voltage
  - 11.5V

Results





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