Introduction

- Depth sensing is a useful tool to estimate object pose
- We tested three depth sensors:
  - Kinect 1
  - Kinect 2
  - Structure.io Sensor
- While these sensors are similar, small differences can have a significant impact on object pose estimation

Sensor Components

- Kinect 1 consists of a RGB camera, an infra-red camera, and an infra-red projector
- Kinect 2 consists of a RGB camera and an infra-red camera
- Structure.io Sensor has an infra-red camera and an infra-red projector
- This project’s goal was to figure out which of these three sensors is the most accurate, and how robust it is to different materials and viewing angles

Calibration

- To calibrate the Kinect 1 and the Kinect 2 (intrinsic and extrinsic parameters) we used a checkerboard since it is easy for sensors to recognize its pattern.
- For the Structure.io we used the default calibration since it is good enough for our goal.

Results

- To get data we used a plane made of different materials (metal, wood, plastic and paper) attached to a linear stage and moved it to three different distances
- We also created some angles between the camera and the plane to verify the angle range of each sensor.

Using RANSAC to Compare the Data

- To compare the data we used the Random Sample Consensus to fit a plane from the point clouds
- After fitting a plane we calculated the centroid of the second point cloud then calculated the distance between plane and point.

Using a Linear Stage to Run Tests

- Based on the graph and on the tables one can assume that Structure.io Sensor is the best choice since it is stable and has good accuracy
- Kinect 2 is more unstable than the others two sensors
- Kinect 1 also is stable but its accuracy is worse than the structure sensor

Future Work

- Improving calibration using the method presented in the paper "Joint Depth and Color Camera Calibration with Distortion Correction." by Herrera, Kannala and Heikkila

References