Perception Project

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Summary

In this project we filtered and segmented RGBD point cloud data. Then we used models to train a Support Vector Machine to identify the objects in our field-of-view. Finally, we fed the position of these objects into a .yaml file which can be used by the pr2 robot to perform an ordered pick and place operation.

Pipeline Steps

1. **Downsampling** to decrease computational load. I chose a cubic centimeter as the voxel size as per the initial exercises.
2. **Outlier Filtering** with x=0.1 worked to get my noise down to a qualitatively low level
3. **Passthrough Filtering** along the z axis to remove the table's stand as well as along the x axis to remove the bins in the lower portion of the robot's field-of-view. Had to cut it really close with the table as the overhand was being recognized as an object
4. **RANSAC plane segmentation** with a max distance of 1cm did the trick
5. **Euclidean clustering** with a tolerance of 0.02 and a minimum cluster size of 75. Smaller tolerance resulted in edges being found across cans due to lighting.
6. **SVM based object recognition** using a dataset of 20 images per model, HSV coloring, and an rbf kernel

Confusion matrix, without normalization
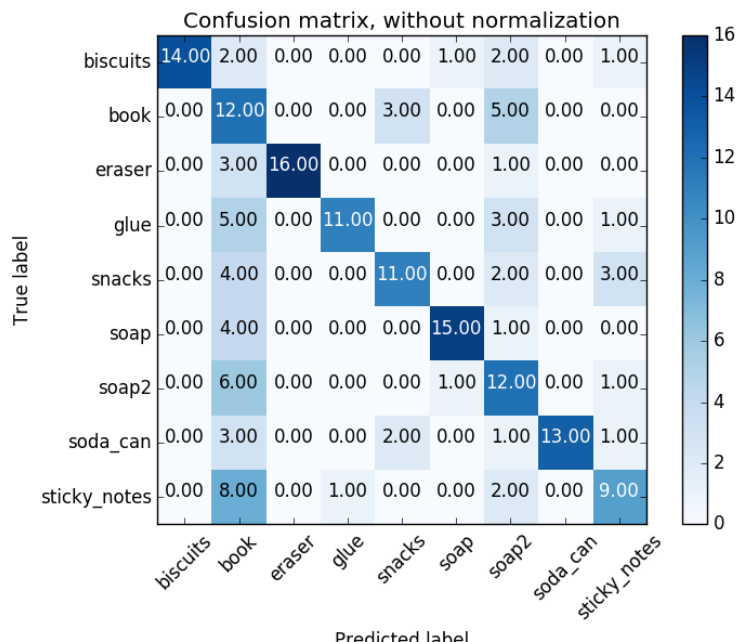
Results on pipeline
Pick list 1: 3/3
Pick list 2: 4/5 – glue misclassified as book. In a future algorithm I could add another metric to address the book model specifically.
Pick list 3: 6/6