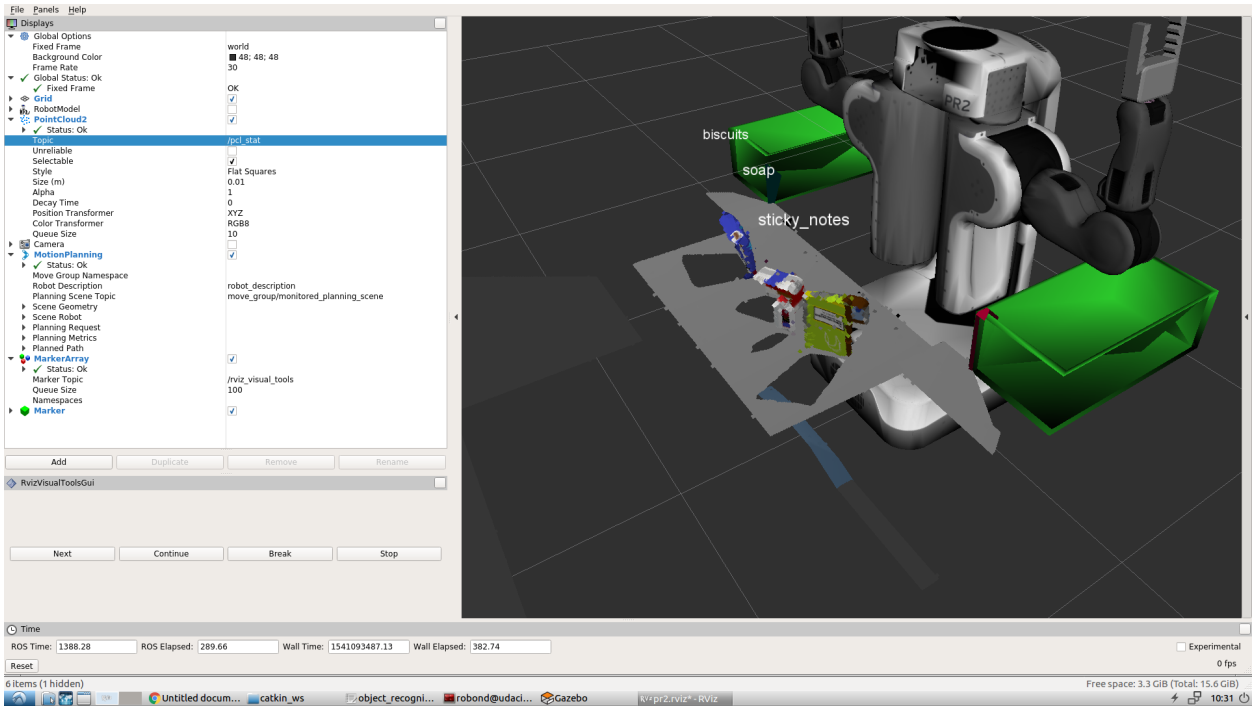
Perception pipeline

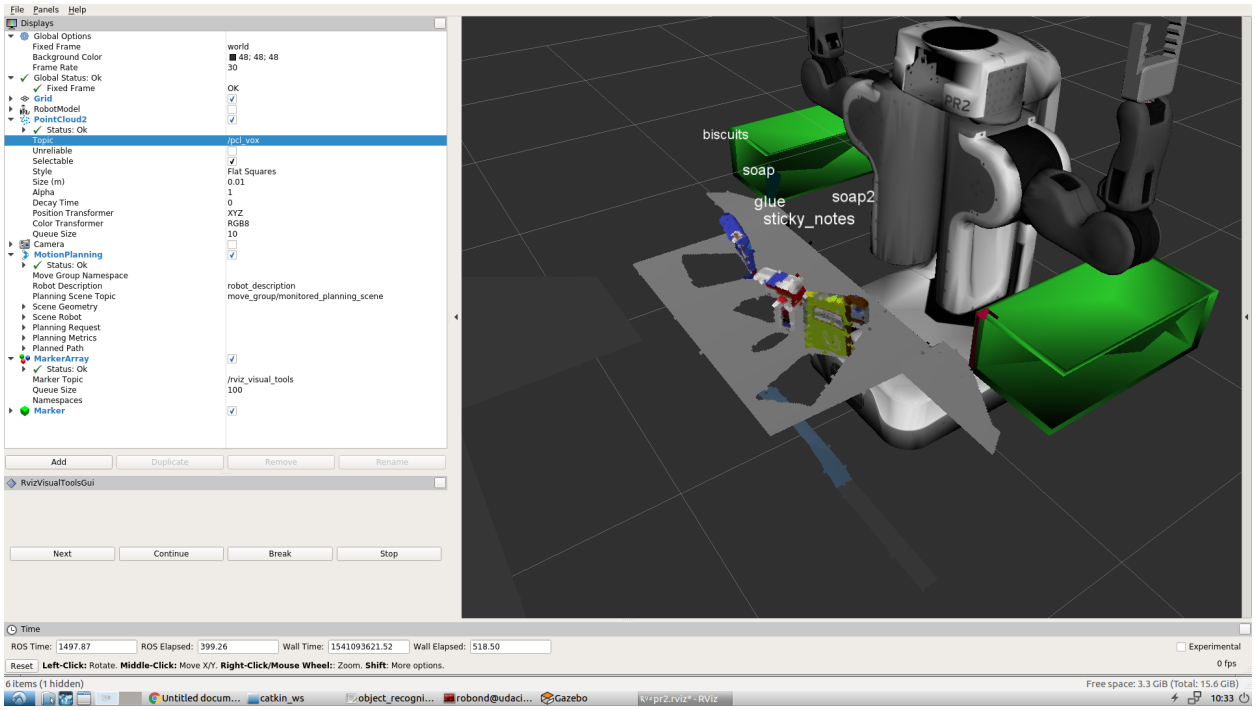
In this project I am using pr2 robot to identify different objects and classify them into different groups for packaging by building a perception pipeline.

First i converted ros message to pcl then i implemented different filter technique.

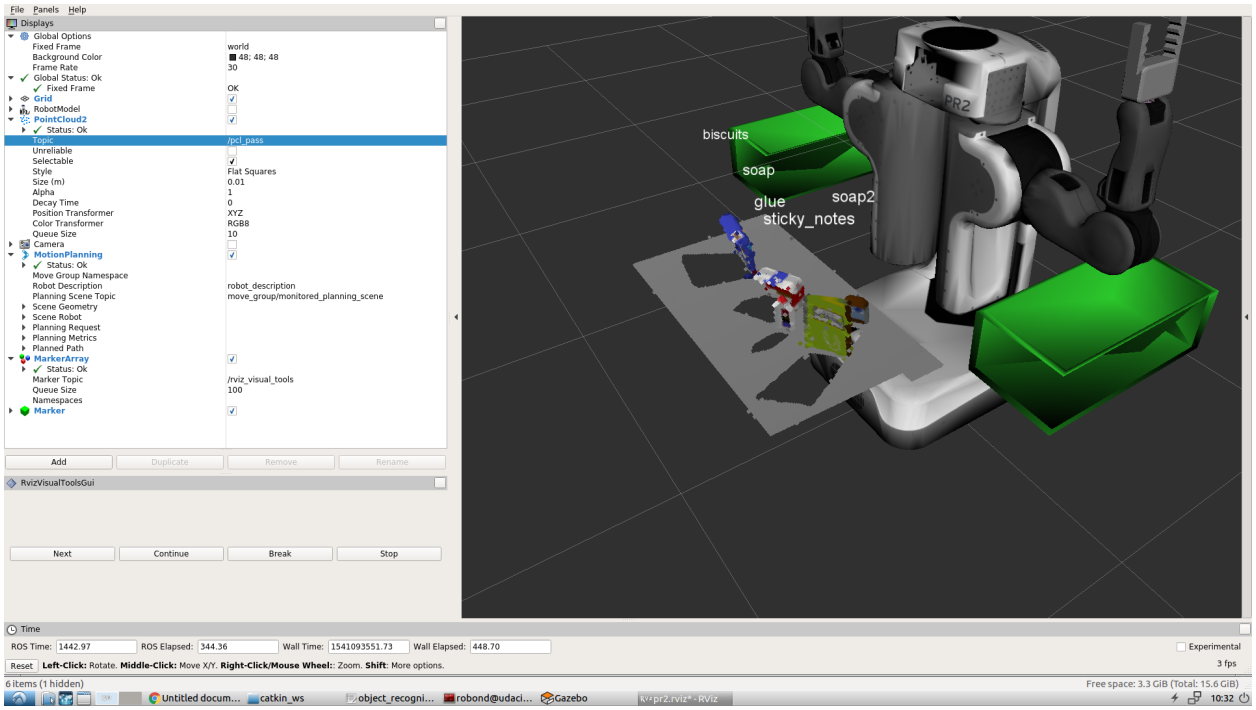
- Statistical outlier filter to reduce the noise and have a clean image.



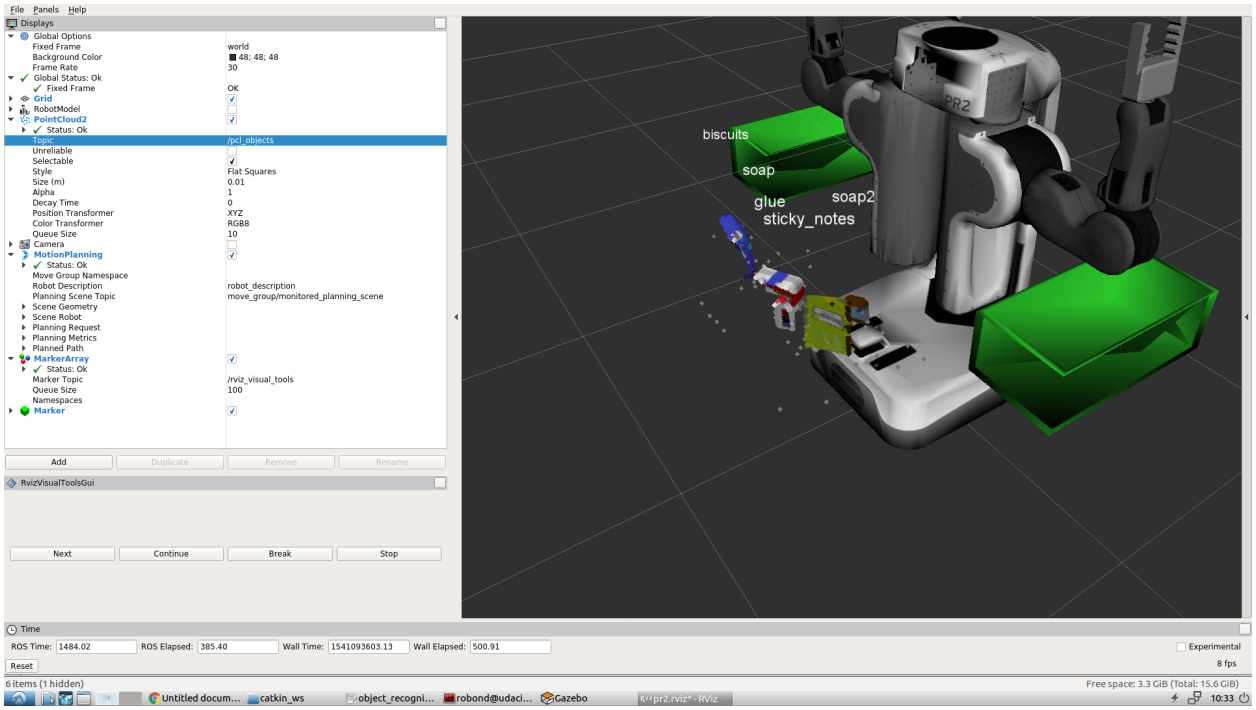
- Voxel grid filter to downsample the image and have faster processing.



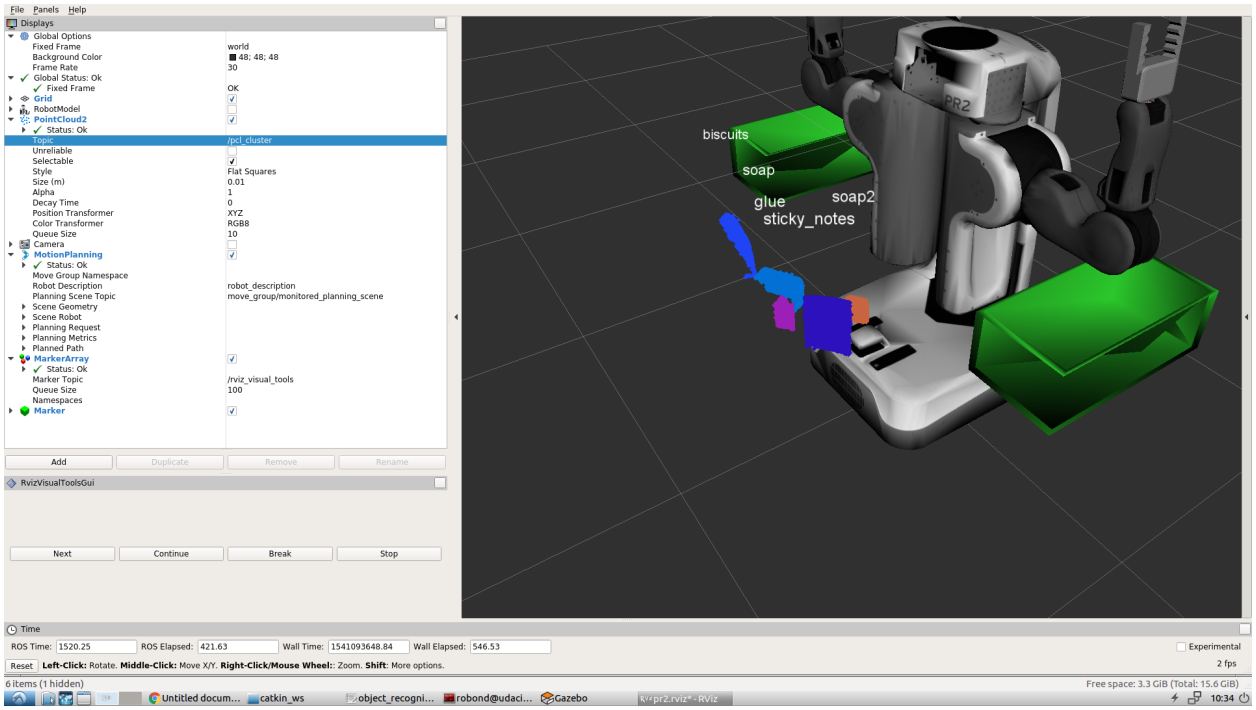
- PassThrough filter to crop the image from the z-axis to locate the table only, x-axis to decrease the table width as other tables was identified as objects and y-axis to decrease the table length.



- RANSAC to identify the table without objects (inliers) and from it we can extract the objects only from the image (outliers).



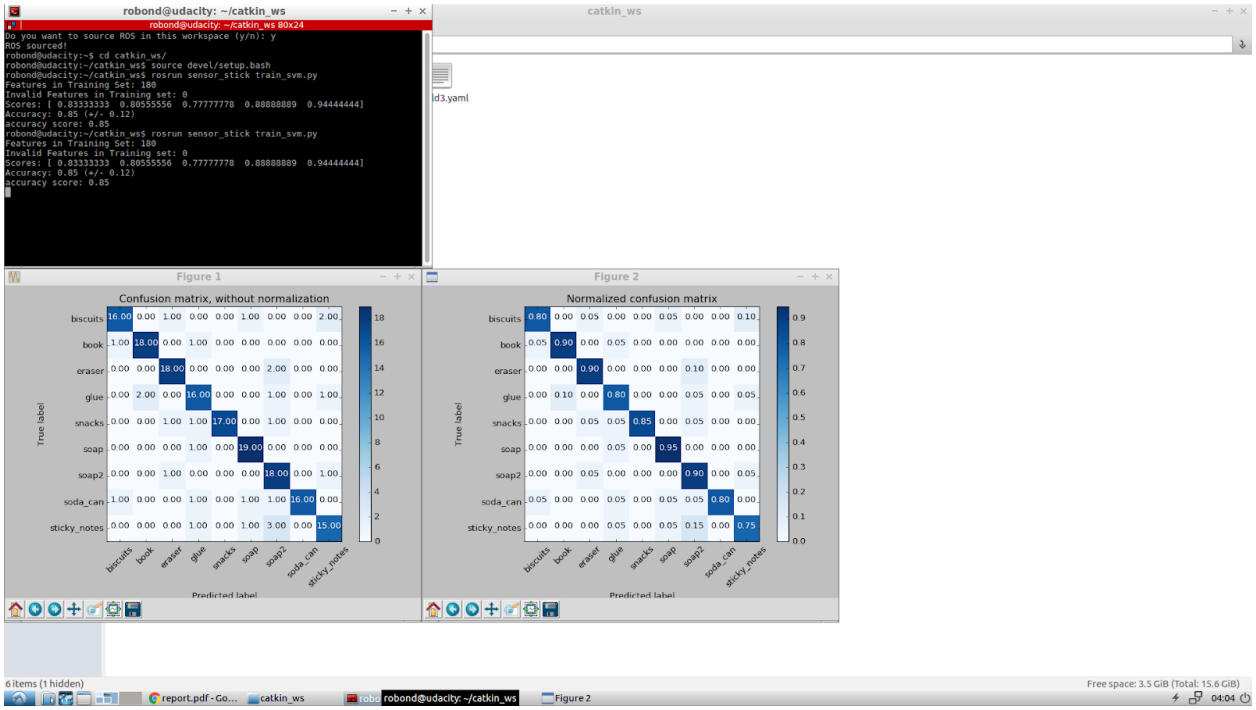
- Euclidean Clustering to create clusters of the objects and the minCluster was set to 50 as noticed less than that the glue in the 3rd object set was identified as two objects because it was covered by another object in the image, After identifying the clusters it was applied to the image.



Notice every single filter was converted to ros message and sent to rviz as it helped a lot in debugging.

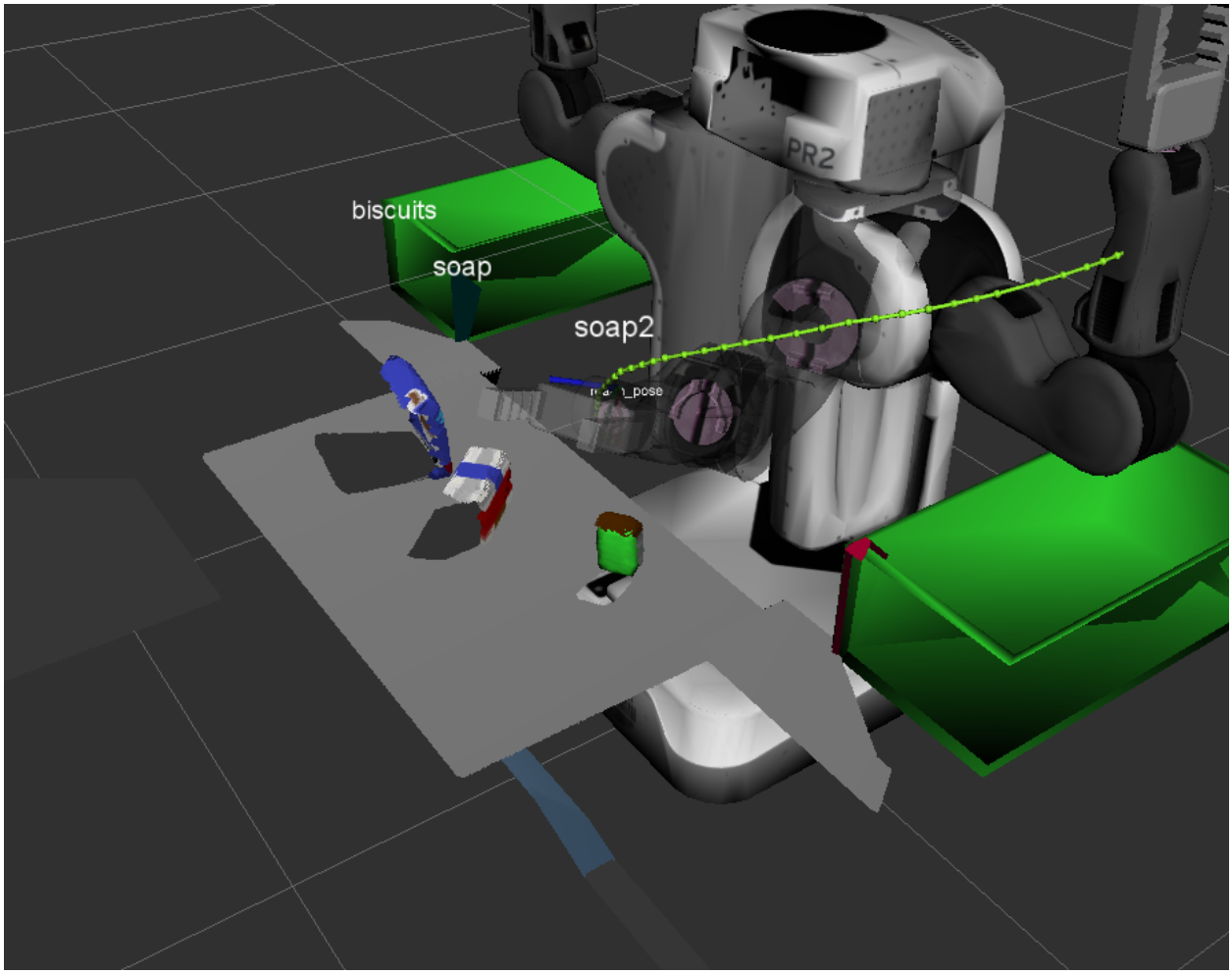
Secondly, I trained a model by loading every object in gazebo with a different 100 orientation and converted the

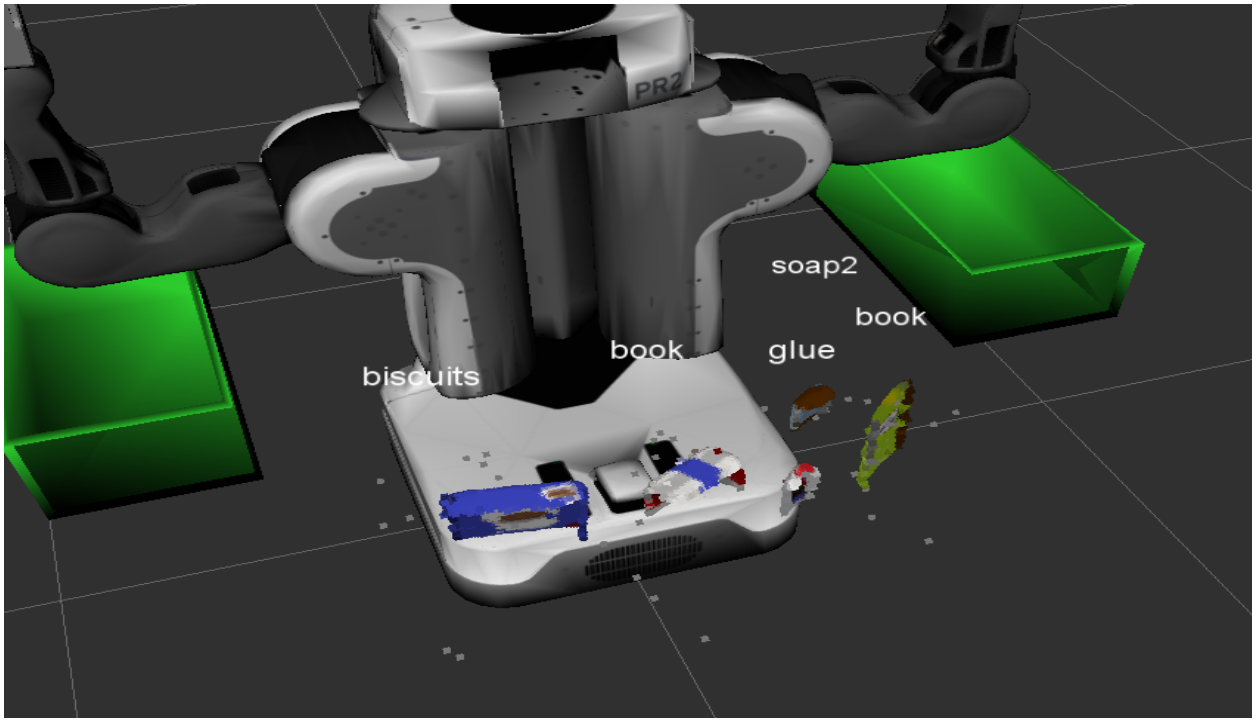
image into histogram using HSV technique for better accuracy.



At last i calculated every object center and orientation by calculating the centroid and from the pick list i could classify the objects into two groups green and red and choose which arm would pick that object and all this data was converted to yaml file.

I tested the program by the 3 world scenes and the accuracy was 3/3 100%, ⅘ 80% and 8/8 100%.


PR2
biscuits
soap
soap2


PR2
soap2
book
glue
book
biscuits


pr2.rviz - RViz
File Panels Help
PR2
snacks
biscuits
soap2
book
soap
sticky_notes
glue
eraser
Time
ROS Time: 1665.68
ROS Elapsed: 362.61
Wall Time: 1540926412.07
Wall Elapsed: 453.38
Experimental
Reset
0 fps