

Progress Presentation-I

e-Yantra Summer Internship-2017

Robotic Arm

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IIT Bombay

June 6, 2017

Overview of Project

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Overview of
Project

Overview of
Task

Motion
Planning

Mechanical
Design

3D Vision

Thank You

Robotic Arm

- Objective:

Real time planning of Robotic Arm's movement using kinect sensor and ROS

Designing a 3D printed Robotic Arm from scratch using Autodesk Fusion 360.

- Deliverables:

Robotic Arm capable of collision avoidance

Tutorials on Moveit! and Arm Design

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- Build and 3D print Kinect Mount for object and obstacle detection.
 - Familiarizing with Fusion 360 ,Cura and 3D Printing.
- Understanding MoveIt! package in ROS
- Creating URDF of the arm and testing in RViz
- Creating moveit package using MoveIt! Setup Assistant
- Path planning of arm in Gazebo simulator
- Object Detection and Recognition using Kinect.

Task Accomplished

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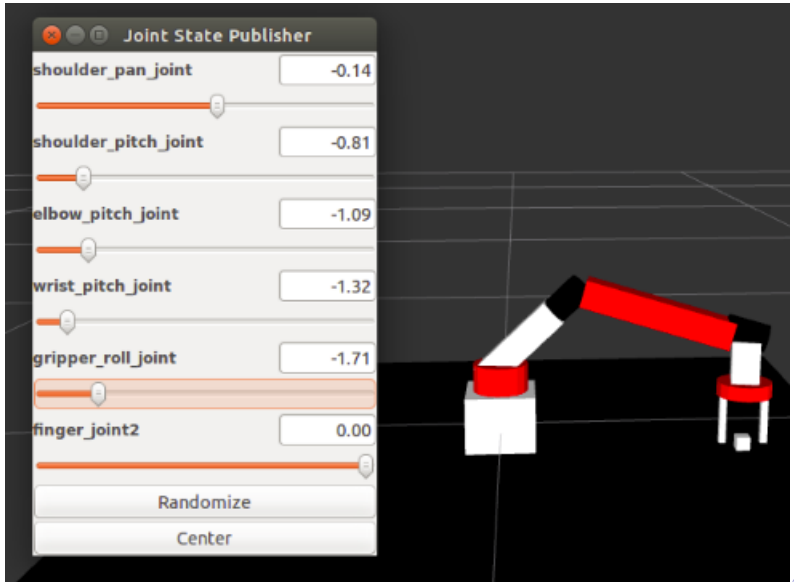
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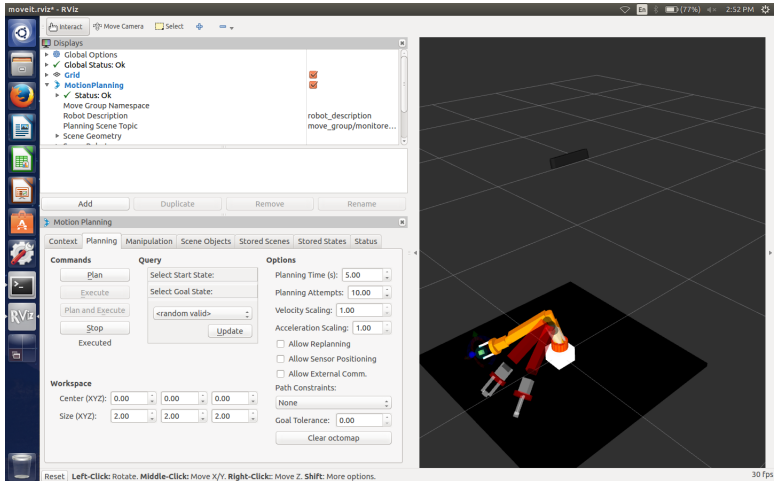
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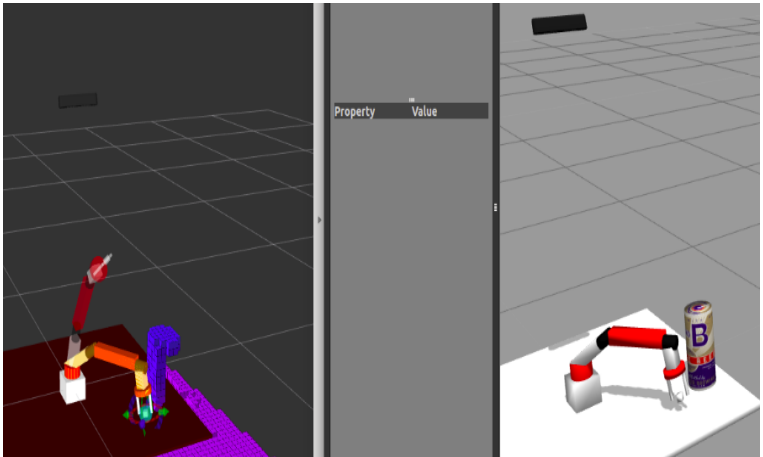
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Challenges Faced

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- Understanding MoveIt!
- Interfacing MoveIt! with Gazebo

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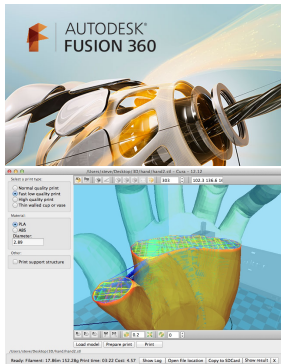
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Fusion 360

Sketch Based Modeling
Parametric Modeling
Surface Modeling

Cura

Slicing Software for 3D Printing
Understanding Support, Infill, etc.



Fracktal Works: Julia

Working with 3D printers, and getting
practical advices.

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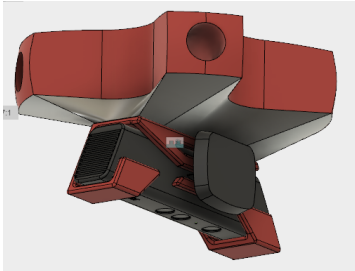
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Task (Week 1): Design a Kinect Mount



First Prototype

"Overkill Model"

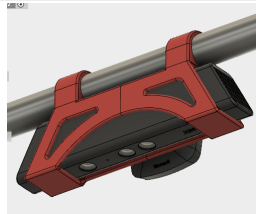
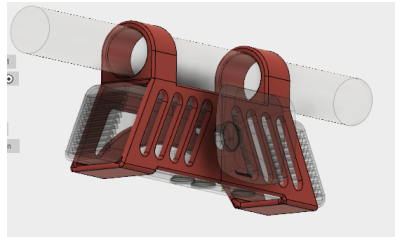
Excess Material usage

Many overhanging parts

Difficult to print

Complex Design

(7mm Thickness)



Final Prototype

Challenges Faced

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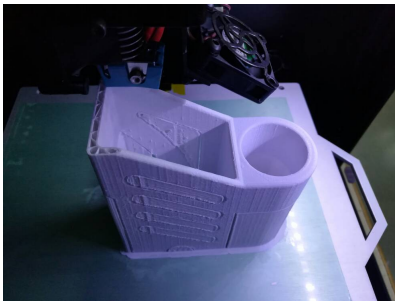
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- Practical 3D Printing challenges like:
 - Dimensions of model greater than 3D Printer
 - Excessive support in first print.
Resulting in poor surface finish.

Task Accomplished

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Task 2:

Familiarize with ROS Indigo,
Interface Kinect with ROS

And Implement Object Detection and Recognition.



Kinect
RGB and Depth



freennect launch
based on OpenNI



ROS

Task in Progress...

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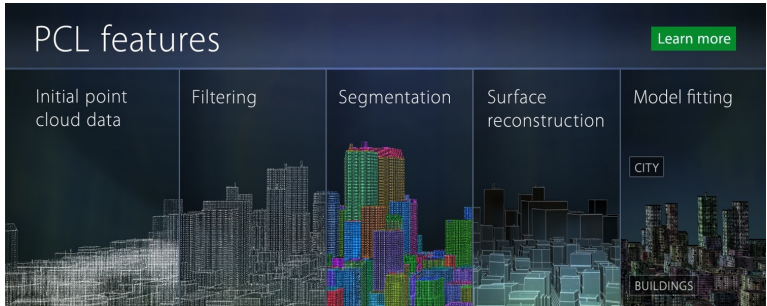
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pointcloudlibrary



OpenCV is to Computer Vision
PCL is to 3D Vision

Task In Progress...

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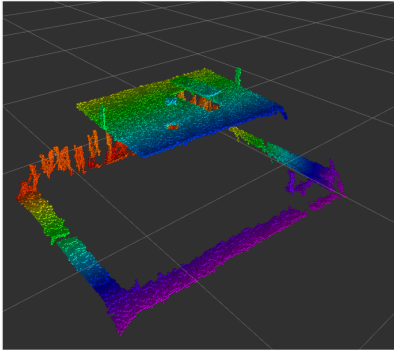
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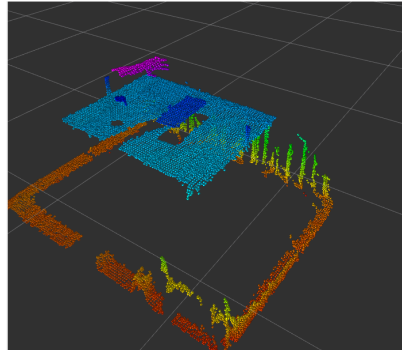
3D Vision

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Preprocessing



Initial Point Cloud
”\depth\cloud\points”



Downsample Cloud
pcl::VoxelGrid<pcl::PointXYZ>

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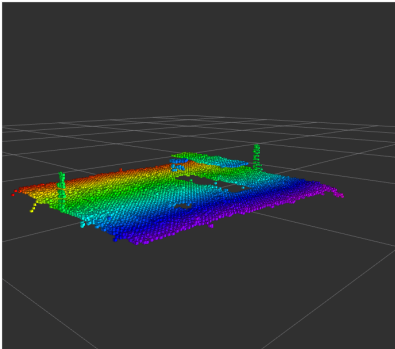
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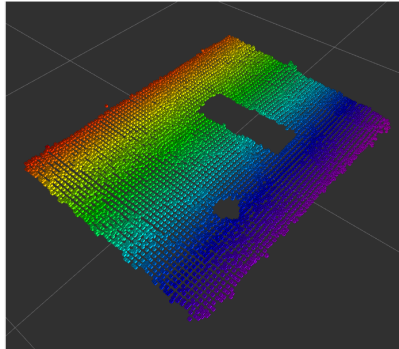
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Preprocessing



Conditional Removal
pcl::ConditionAnd,
pcl::FieldComparison and
pcl::ConditionalRemoval



**Random Sample Consensus
RANSAC**
Iterative method to estimate
parameters of the plane

Task In Progress...

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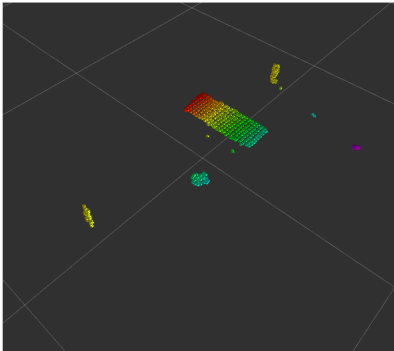
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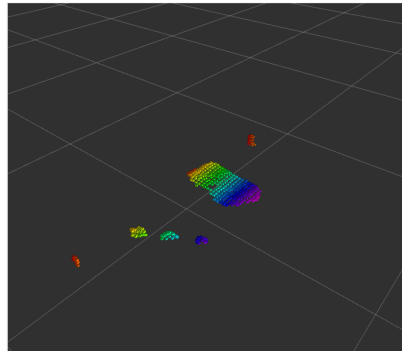
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Preprocessing



Extract Outliers
`pcl::ExtractIndices`



Noise Removal- In Progress
`pcl::StatisticalOutlierRemoval`

Challenges Faced

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- Difficult to find resources to PCL with ROS.
- ORK(Object Recognition Kitchen) requires a model to train it.

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THANK YOU !!!