Progress Presentation-II

e-Yantra Summer Internship-2018

A System for Solving Jigsaw Puzzle using Multiple Robots

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June 22, 2018

Overview of Project

- Project Name: A System for Solving Jigsaw Puzzle using Multiple Robots
- Objective:
  - To develop an autonomous system that can solve any Jigsaw Puzzle given its image using multiple robots
- Deliverables:
  1. Go-to-Goal controller for robot in a given frame
  2. Autonomous solving of any Jigsaw Puzzle given just its image
  3. Proper documentation and report on solution of the system

Overview of Task

Task No.	Task	Status
1	Python, OpenCV, Firebird V Intro, XBee Communication	Done
2	Pose and orientation calculation of 2 Firebird robots using color/Aruco markers	Done
3	Programming the Go-To-Goal Controller for single Firebird V robot. Tuning the PID values to perfection	Done
4	Implementing path planning with Firebird V where obstacles have been placed in arena	Done
5	Detection of jigsaw puzzle blocks using Template Matching	Done
6	Pick and place of blocks - gripper mechanism building	Ongoing
7	Implementing the entire solution for a given jigsaw puzzle	Ongoing
8	Documentation and reporting results	Pending

Task Accomplished

- Template matching
  - without rotation
  - with rotation

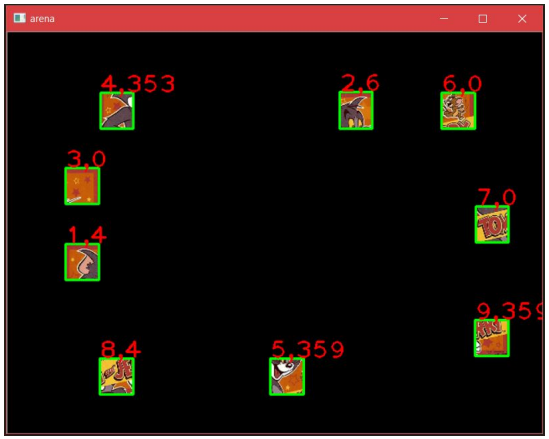

Figure 1: Puzzle block identified with orientation

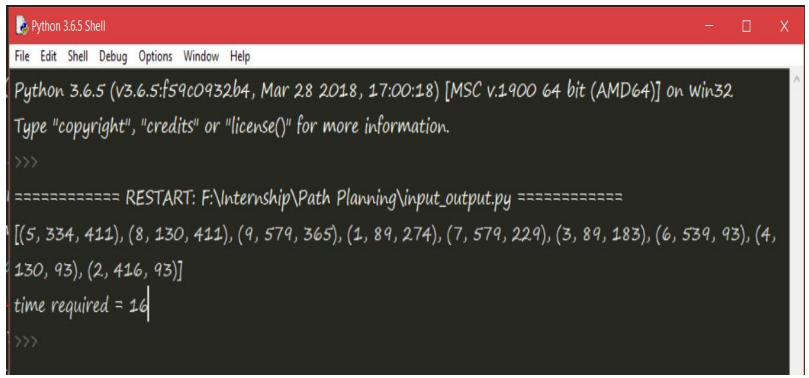

Figure 2: Puzzle blocks with their center

- Introduction to CAD software
  - Fusion360
  - OpenSCAD
- Gripper Mechanism
- Path Planning with collision avoidance between Robots

First 3D design

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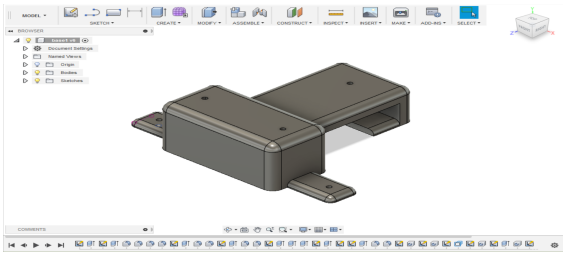

Figure 3: Base

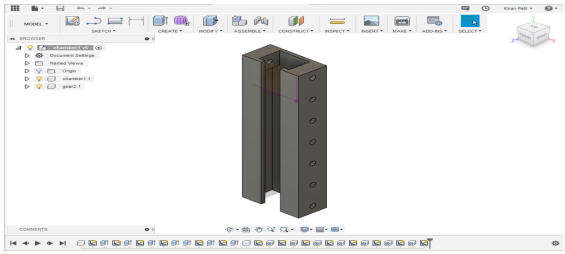

Figure 4: Chamber

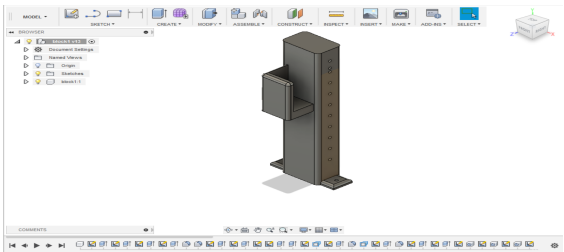

Figure 5: Column

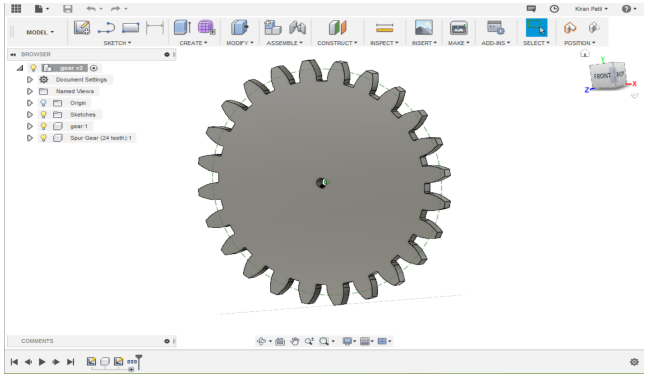

Figure 6: Gear

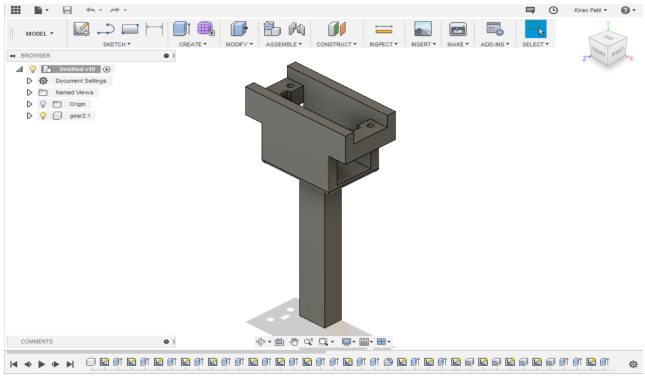

Figure 7: Rack with Servo slot

Second 3D design

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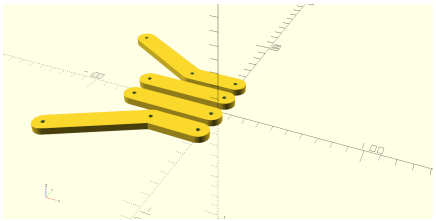

Figure 8: Arms

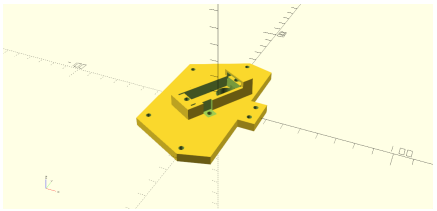

Figure 9: BottomPlate

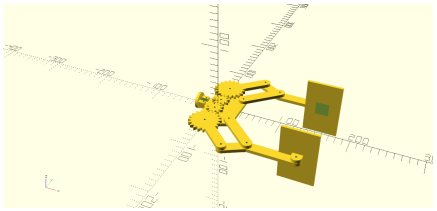

Figure 10: Claw

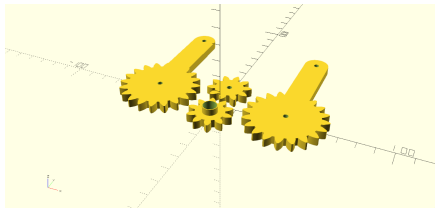

Figure 11: Gears

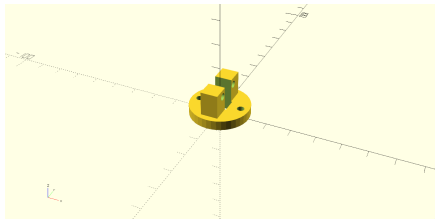

Figure 12: ServoMount

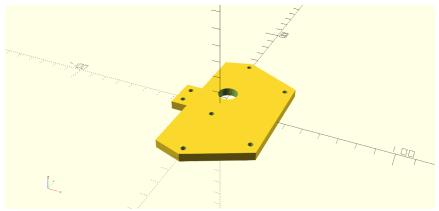

Figure 13: TopPlate

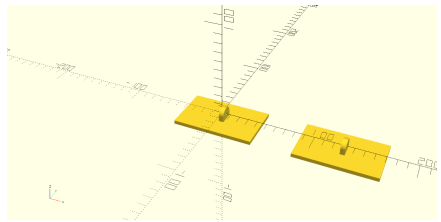

Figure 14: GripperPlate

Latest Design

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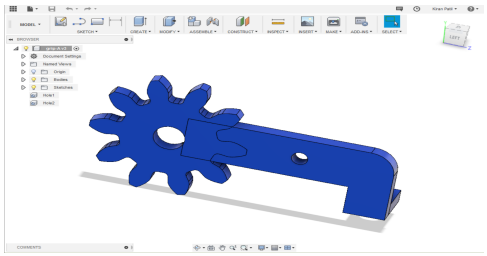

Figure 15: Right Gear

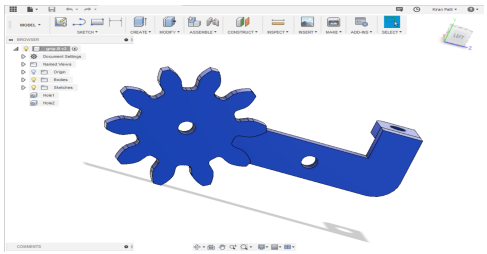

Figure 16: Left Gear

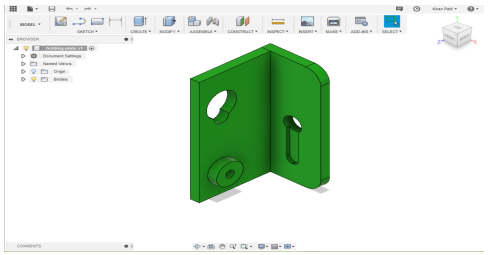

Figure 17: Servo Mount

Challenges Faced

- Right gripper mechanism for the problem
- Block size and arm height(with 3 DOF)
- The size of arena captured from the camera

Future Plans

- Implementation of whole of the solution to solve a puzzle
- Documentation

Thank You

THANK YOU !!!