Sunrobotics Technologies

Summer internship at…

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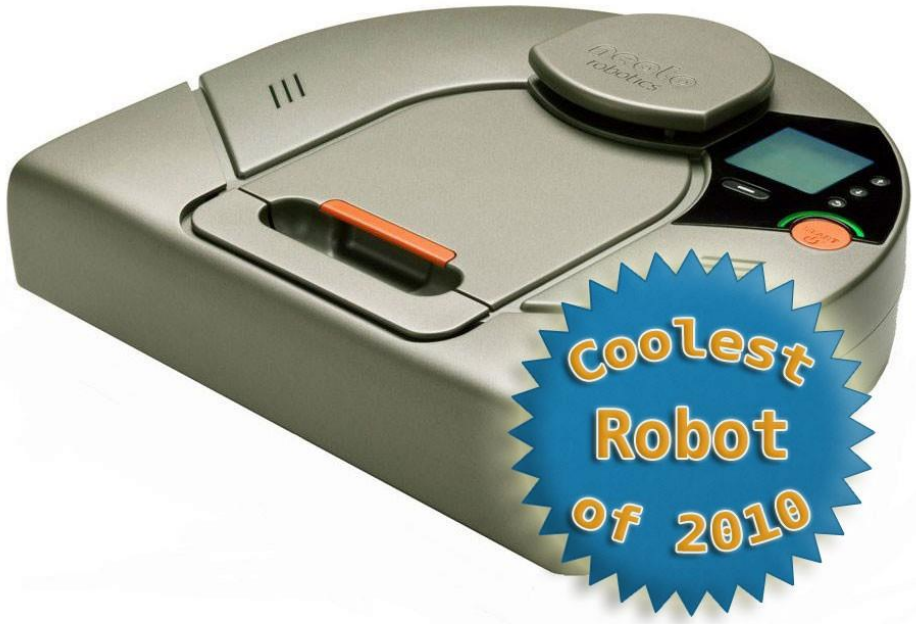
Nirma University, Ahmedabad

SUNROBOTICS

About SunRobotics

- Established in 2010
- Embedded and Robotics solution for hobbyist, students, learners and developers.
- Hobby kits (Bluetooth/Rc car kits, Arduino and RaspberryPi development kits, robot arms, diy 3d printers, etc.)
- Client specific projects (Customised drones, Robots, Boards, etc.)

Robot scenario



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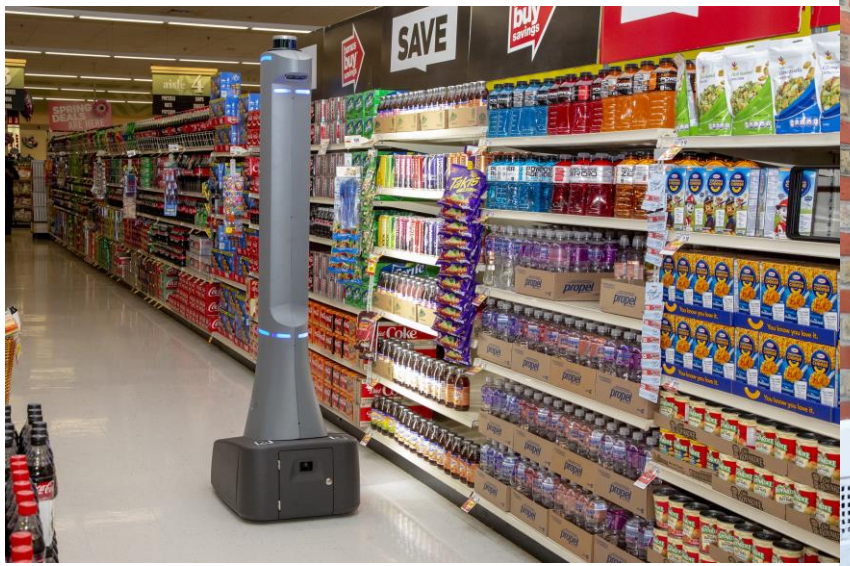
Robot scenario



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Design Brief

To design a versatile robot build that will allow students or those interested in field to learn about different robotic operations, and help them build their own robot projects.

“We live in a society exquisitely dependent on science and technology, yet have cleverly arranged things so that almost no one understands anything about science and technology” – Carl Sagan

To design a versatile robot build that allows students or those interested, to learn and grow in robotics, and help them build their own robot projects.

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Project Description

Key Points that I focused on:

- Robotics
- Learning
- Wide range of possibilities
- ML and AI

- To provide platform for students at university level
- The robot chassis has provisions for various components that will allow a multitude of outcome in the area of mobility (motors, actuators), perception (sensors), and manipulation.
- **Stackability** - Chassis can be scaled up or down by stacking according to the number of components to be used
- **Modularity** - Provisions for multiple types of components
- **Ease of manufacturing** – Has to be manufactured by either laser cutting or 3D printing, both of which were available in house.
- **Components** – Combination of components that were already a part of company's catalogue
- Robot can be programed using ROS as it is one of the best framework available which is also opensource

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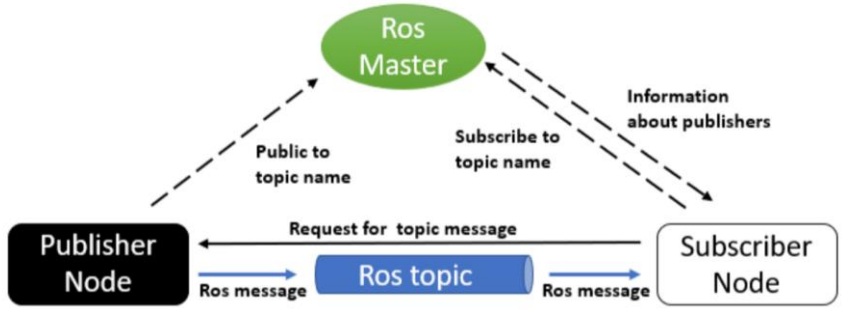
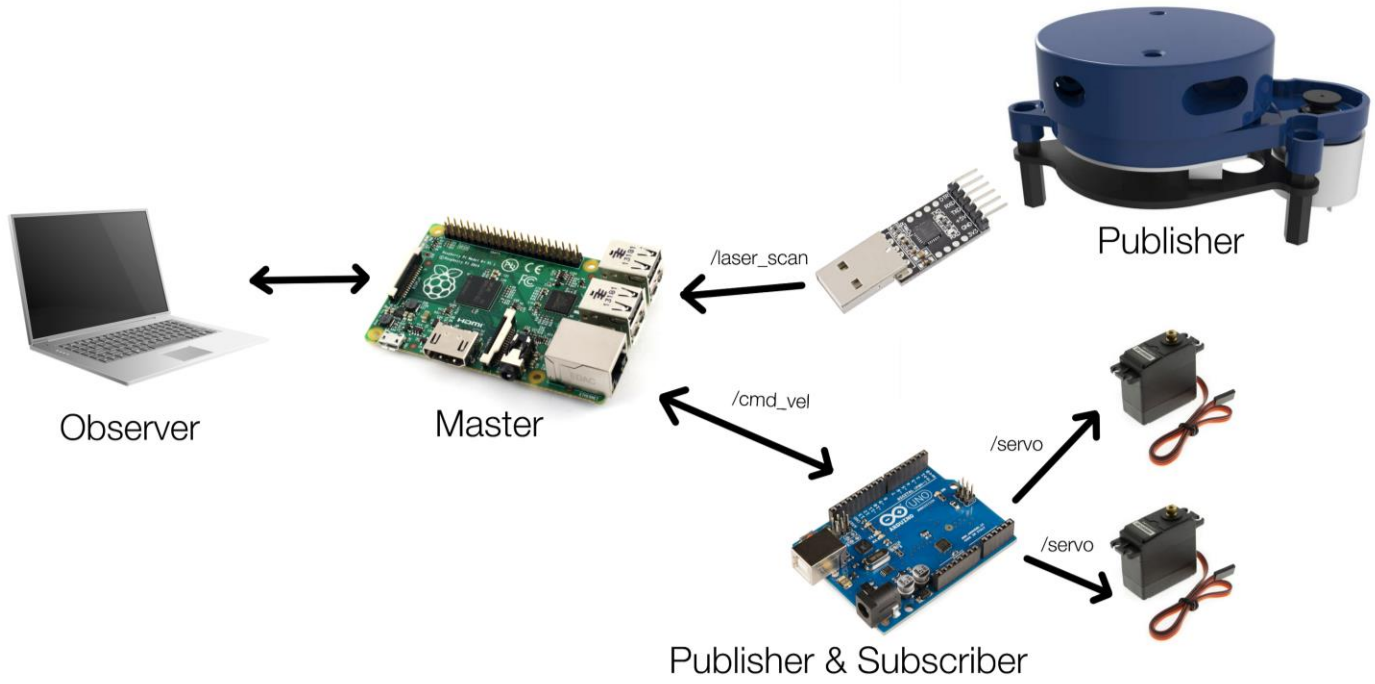
Technology

ROS

Original author(s)	Willow Garage Stanford Artificial Intelligence Laboratory Open Robotics
Initial release	2007; 14 years ago
Stable release	Galactic Geochelone (ROS 2) / 23 May 2021; 2 months ago
Preview release	Rolling Ridley (ROS 2)
Repository	•github.com/ros
Written in	C++, Python, or Lisp
Operating system	Linux, MacOS (experimental), Windows 10 (experimental)
Type	Robotics suite, OS, library





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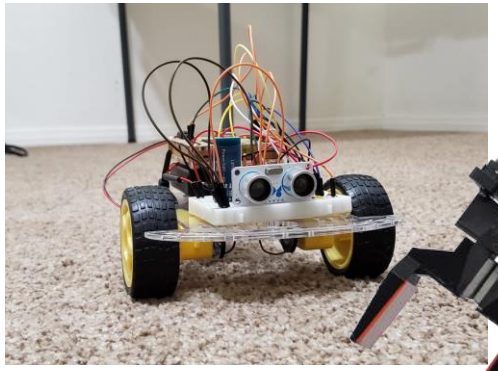
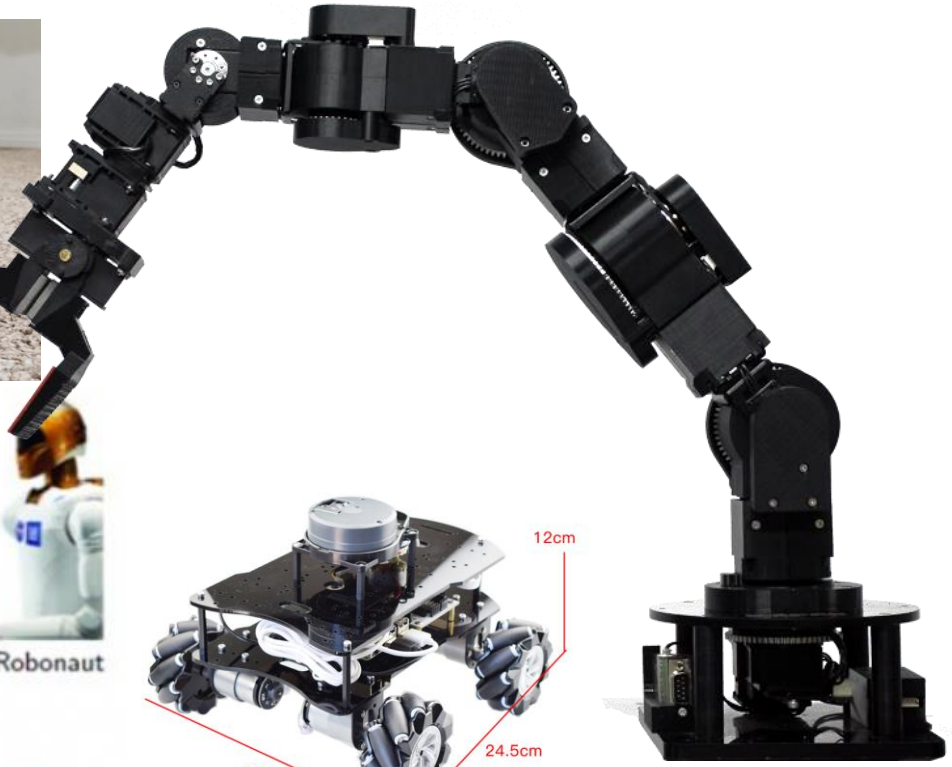
Examples, competitors, etc.






Nao


Willowgarage PR2


Baxter


Care-o-Bot


Toyota Helper


Gostai Jazz

Robonaut


Peoplebot


Kuka YouBot


Guardian


Husky A200


Summit


Turtlebot


Erratic


Qbo


AR.Drone

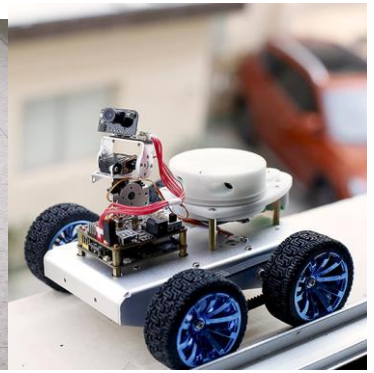

Miabot


AscTec


Lego NXT


Pioneer


SIA 10D



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SLAM

WHY?

Automation

Navigation

Wide range of capabilities

Autonomous driving

HOW?

Chicken & Egg problem

Based on computational geometry and computer vision

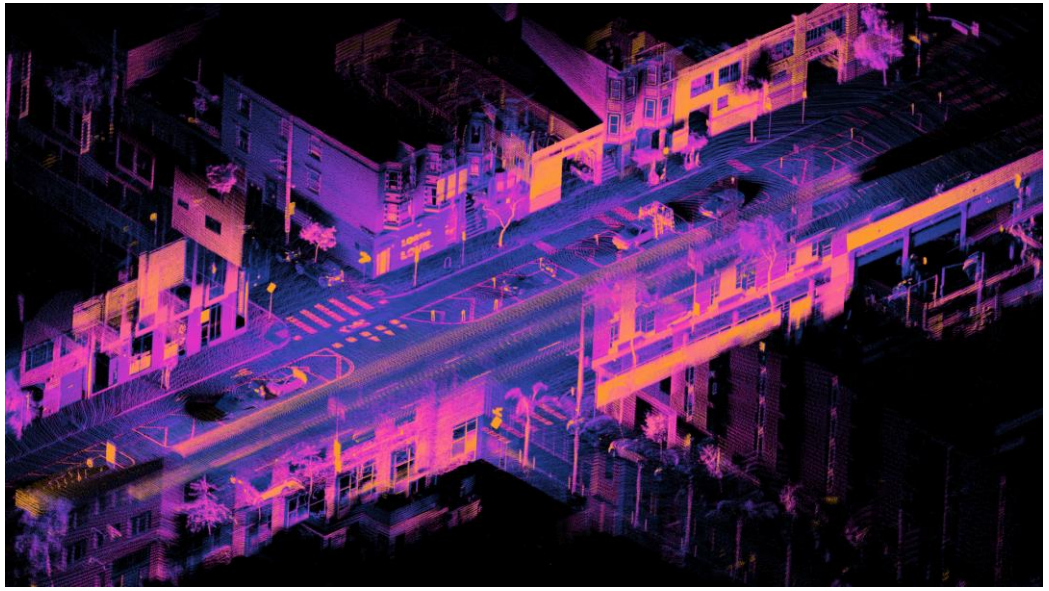
Different Methods

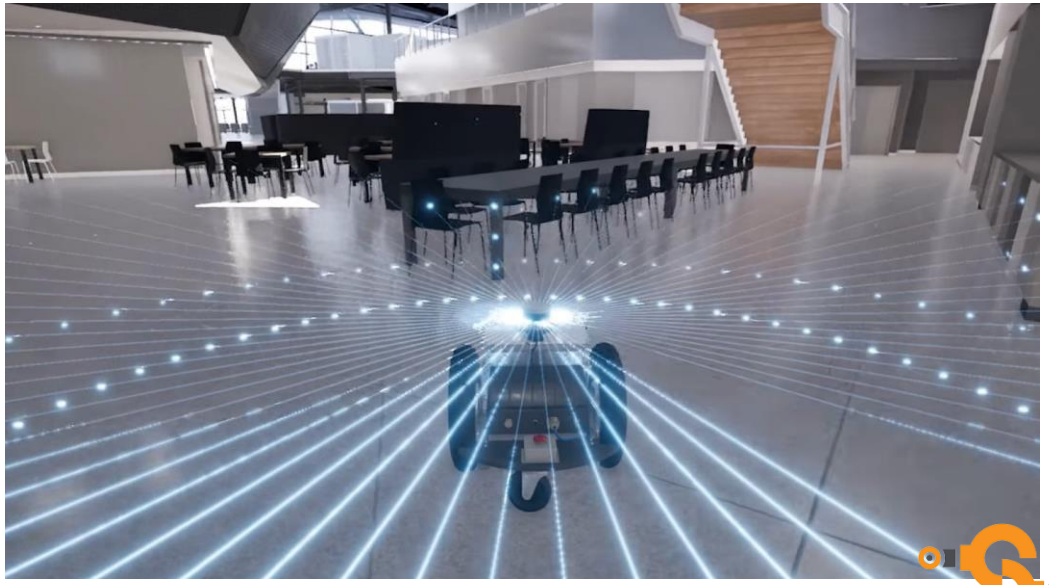
WHAT?

Localization
Mapping
Perception
Hector SLAM

WHERE?

Navigation
Robotic Mapping
Odometry for VR and AR





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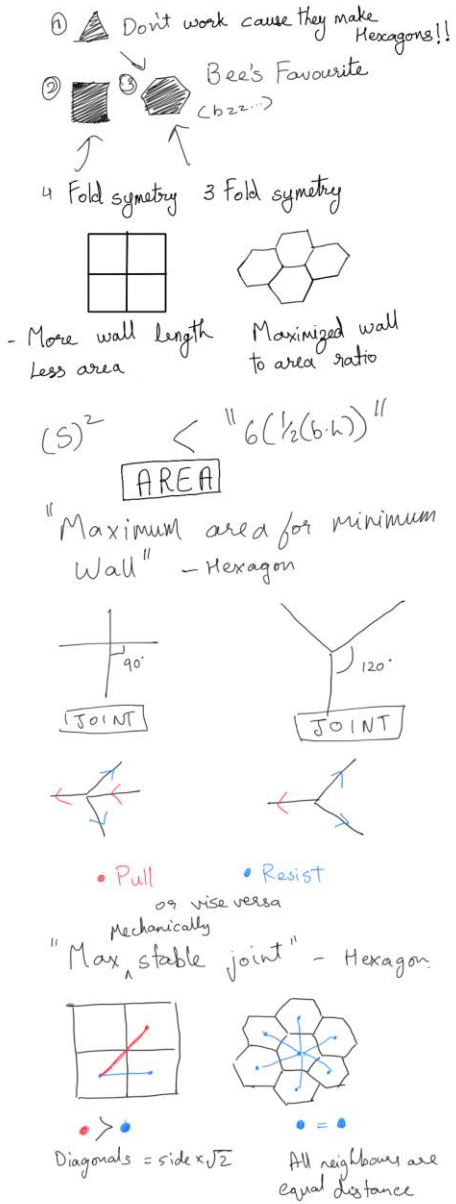
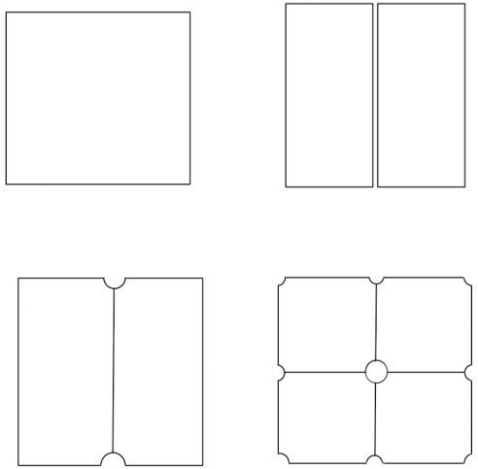
Exploration Phase

- Sketches
- Exploring different solutions
- Mockups
- Refining/ modifying design
- finalizing

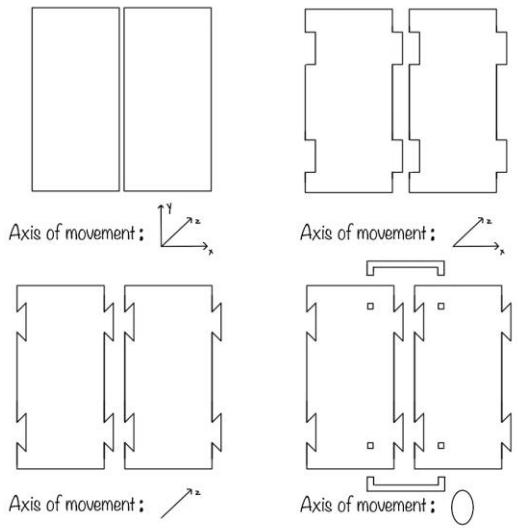
Tiling without space

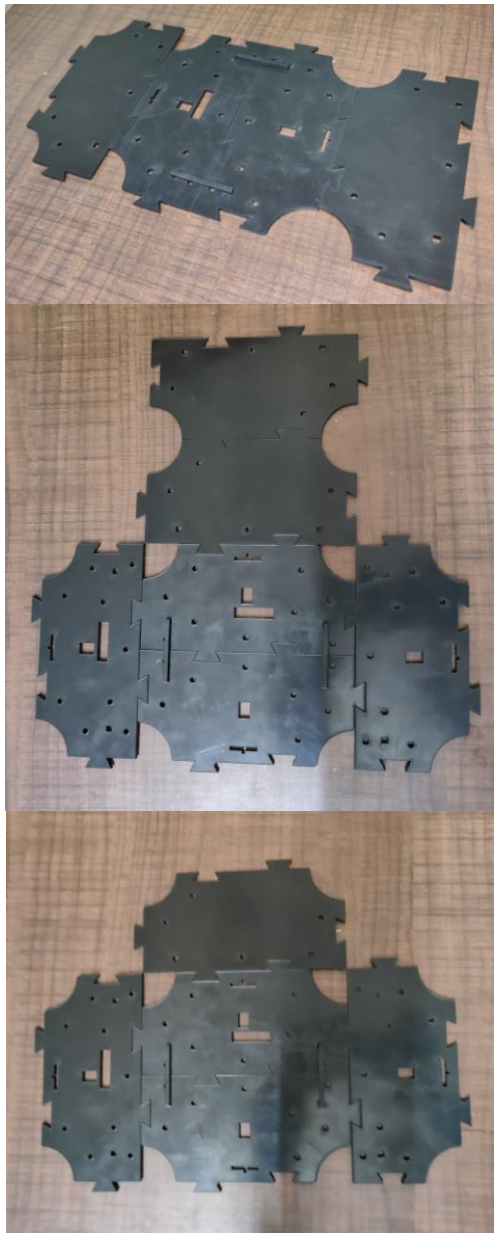


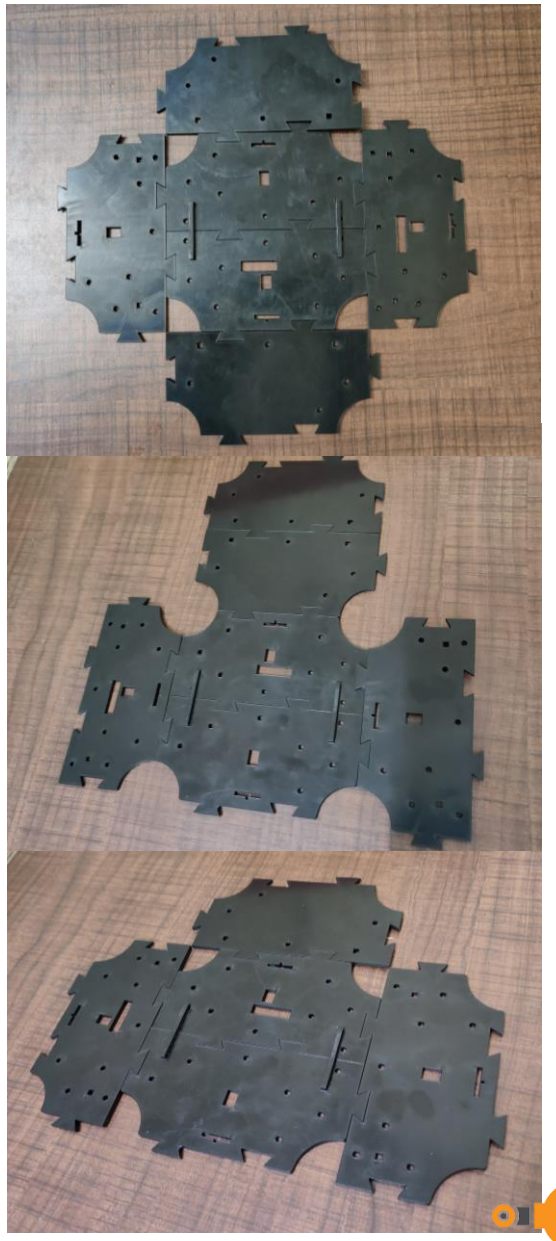
Plates



Joining the plates







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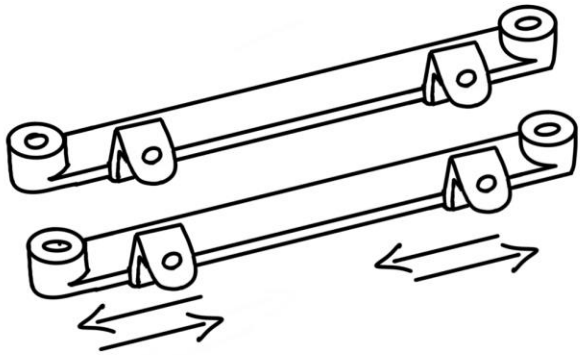
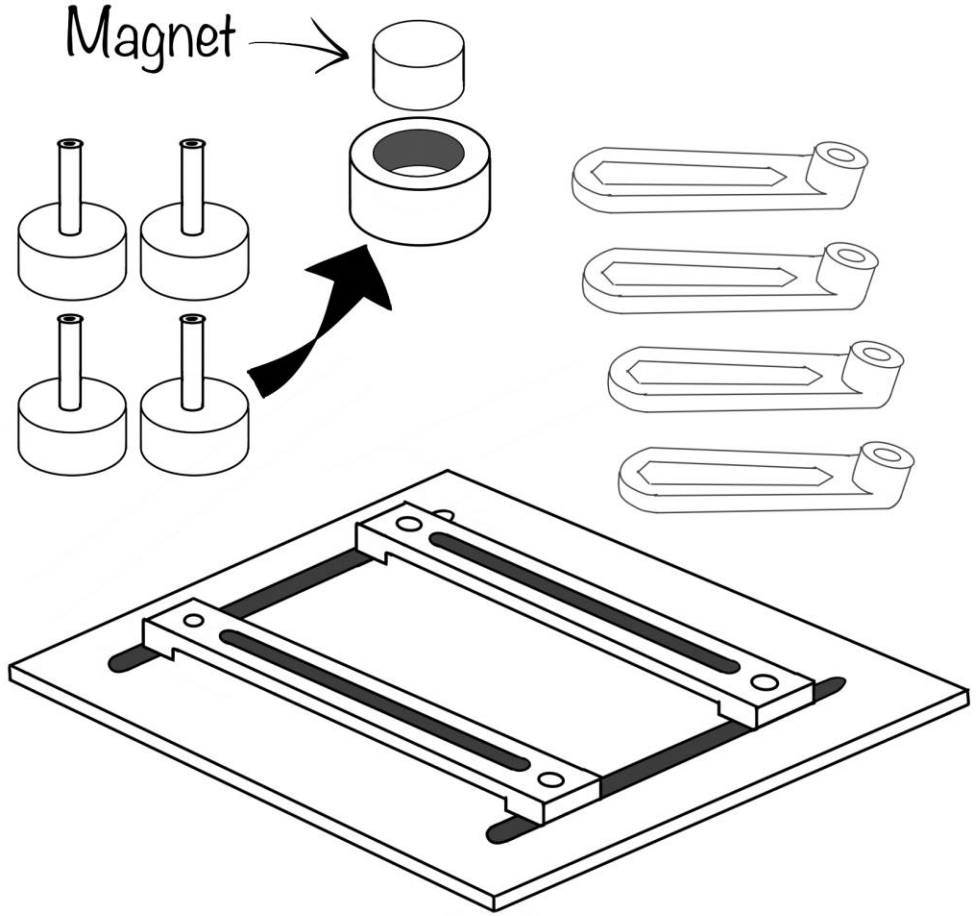
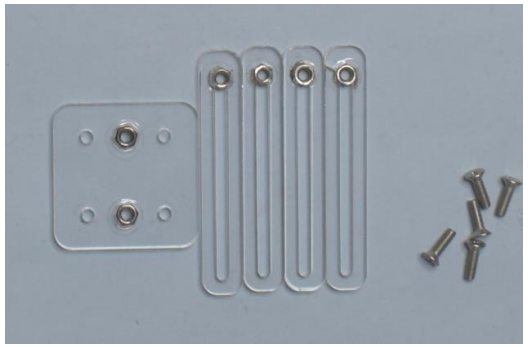
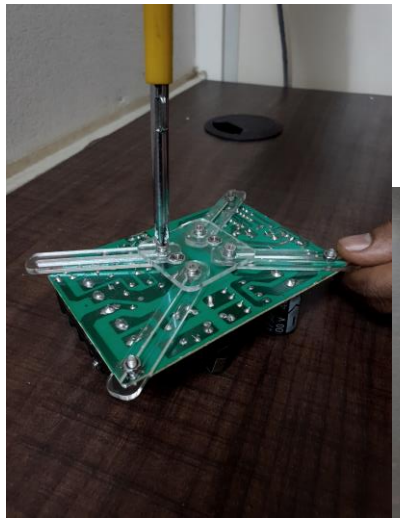
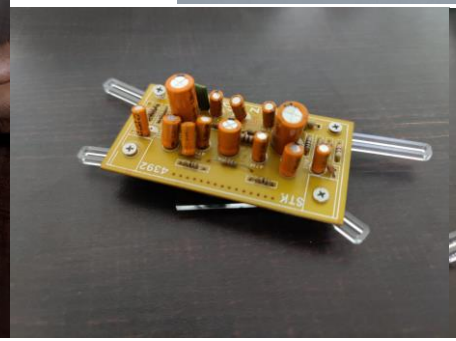
PCB Mount

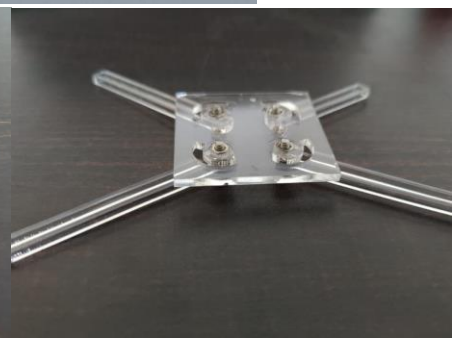


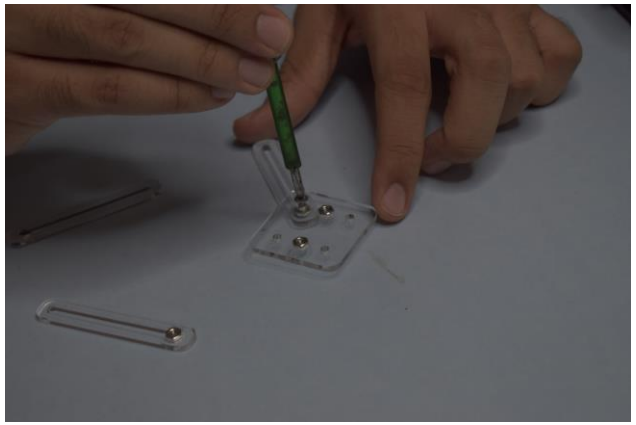


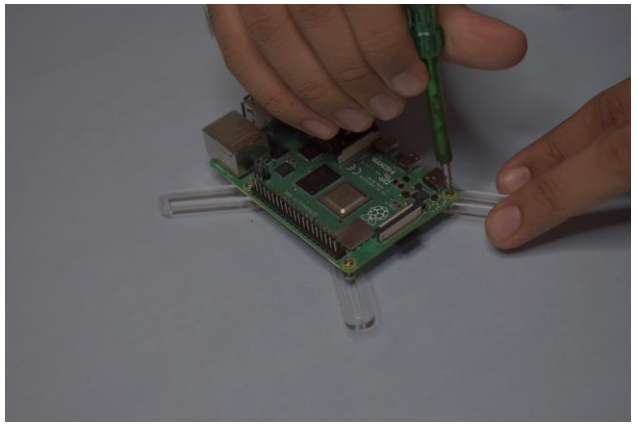












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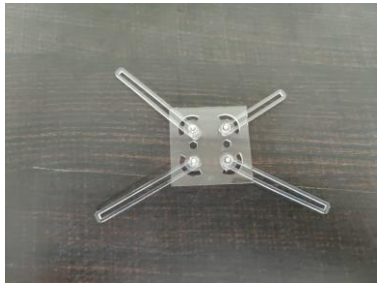
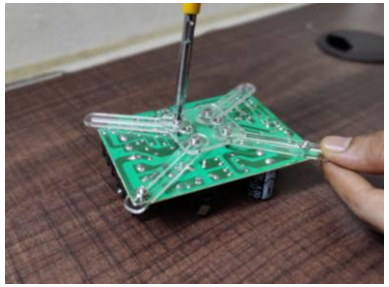
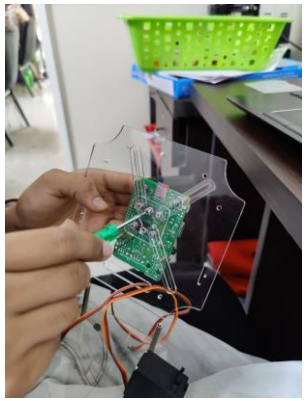
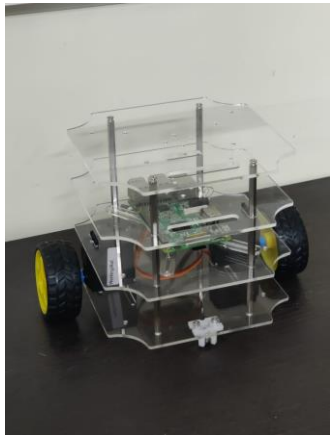
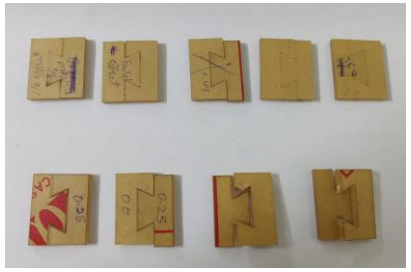
Refining/ modifying design

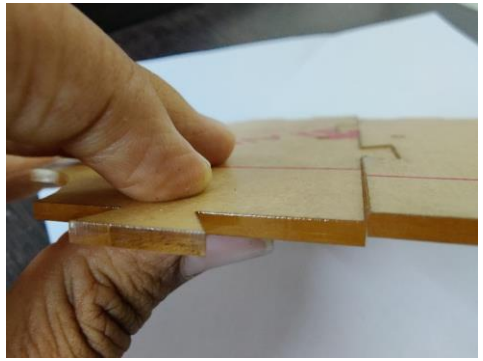


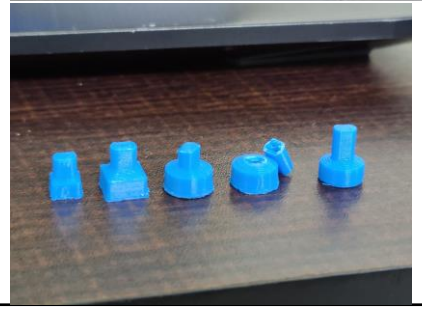


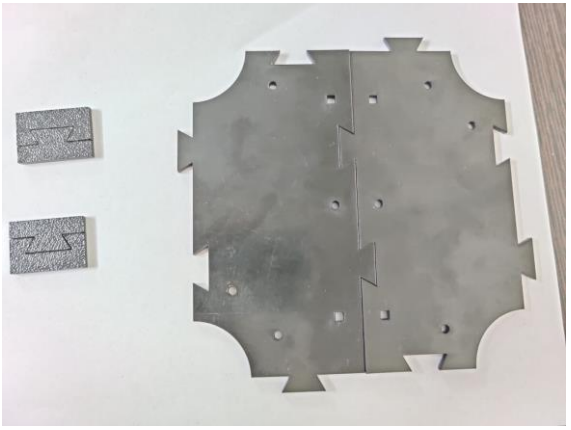












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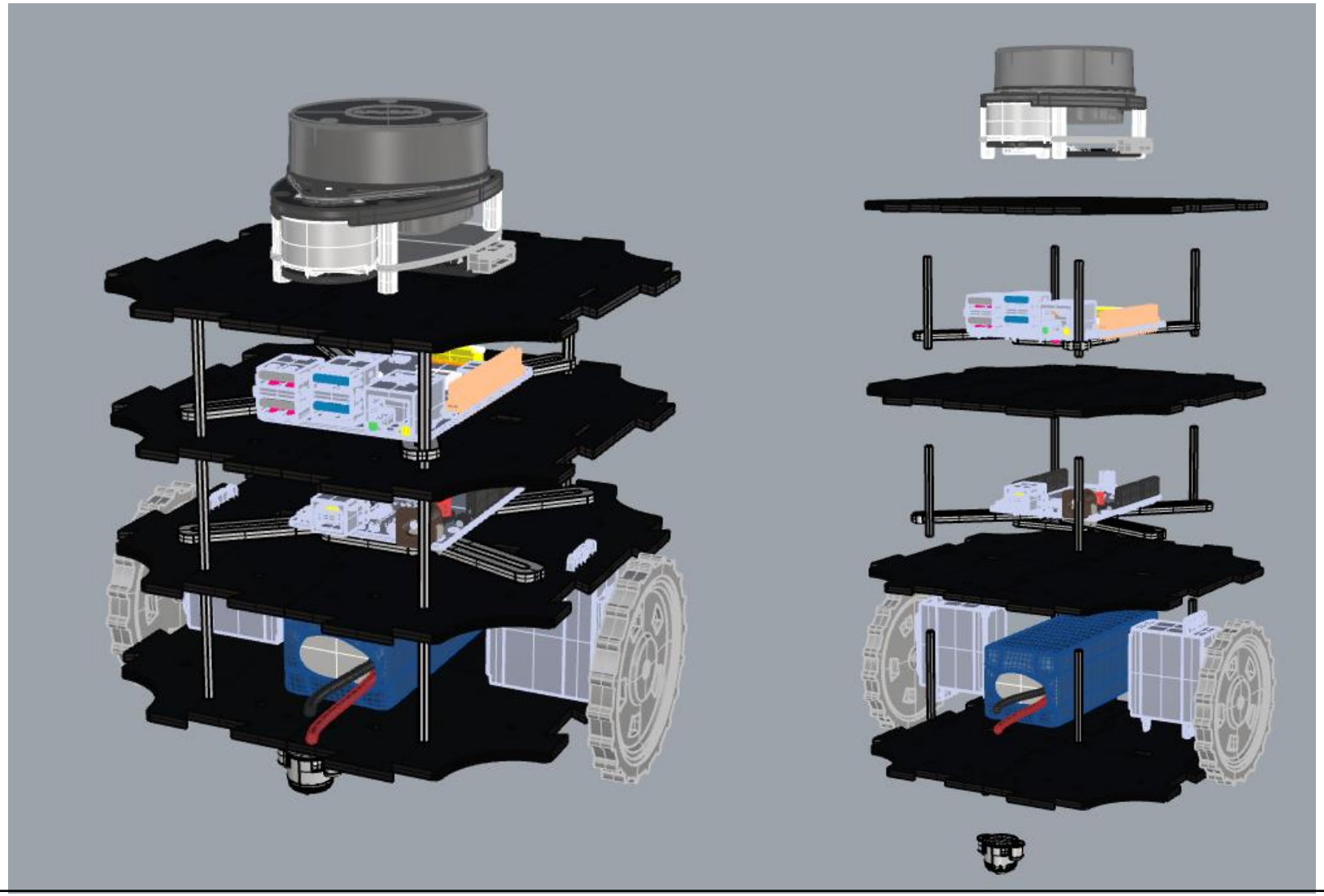
Finalizing design



- Yd Lidar & usb2uart
- RaspberryPi 4b
- Arduino uno
- 360 Servo motor
- High output PowerBank
- Wheels
- Castor wheels
- Hexagonal Standoffs
- M3 screws and nuts

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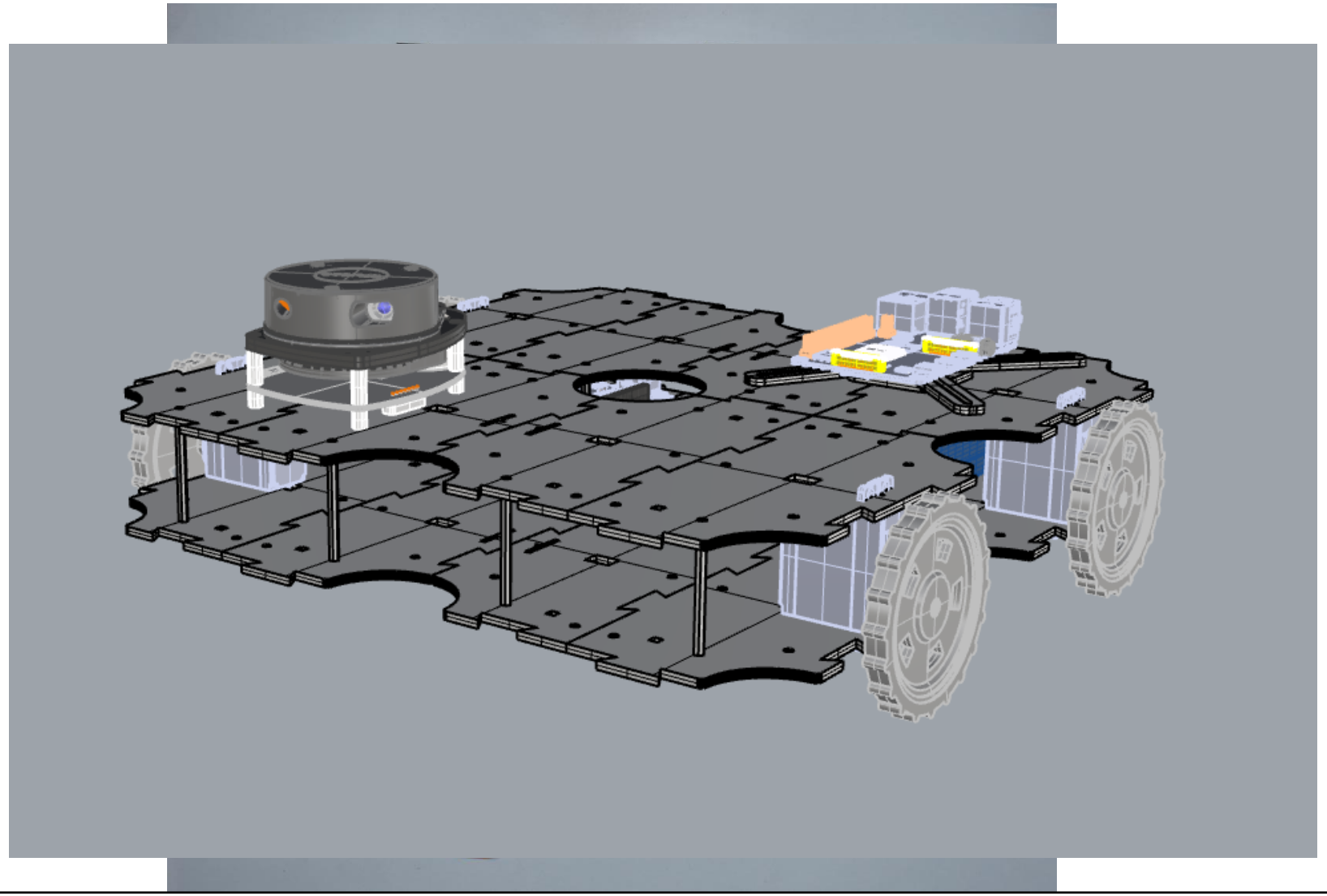
Finalizing design



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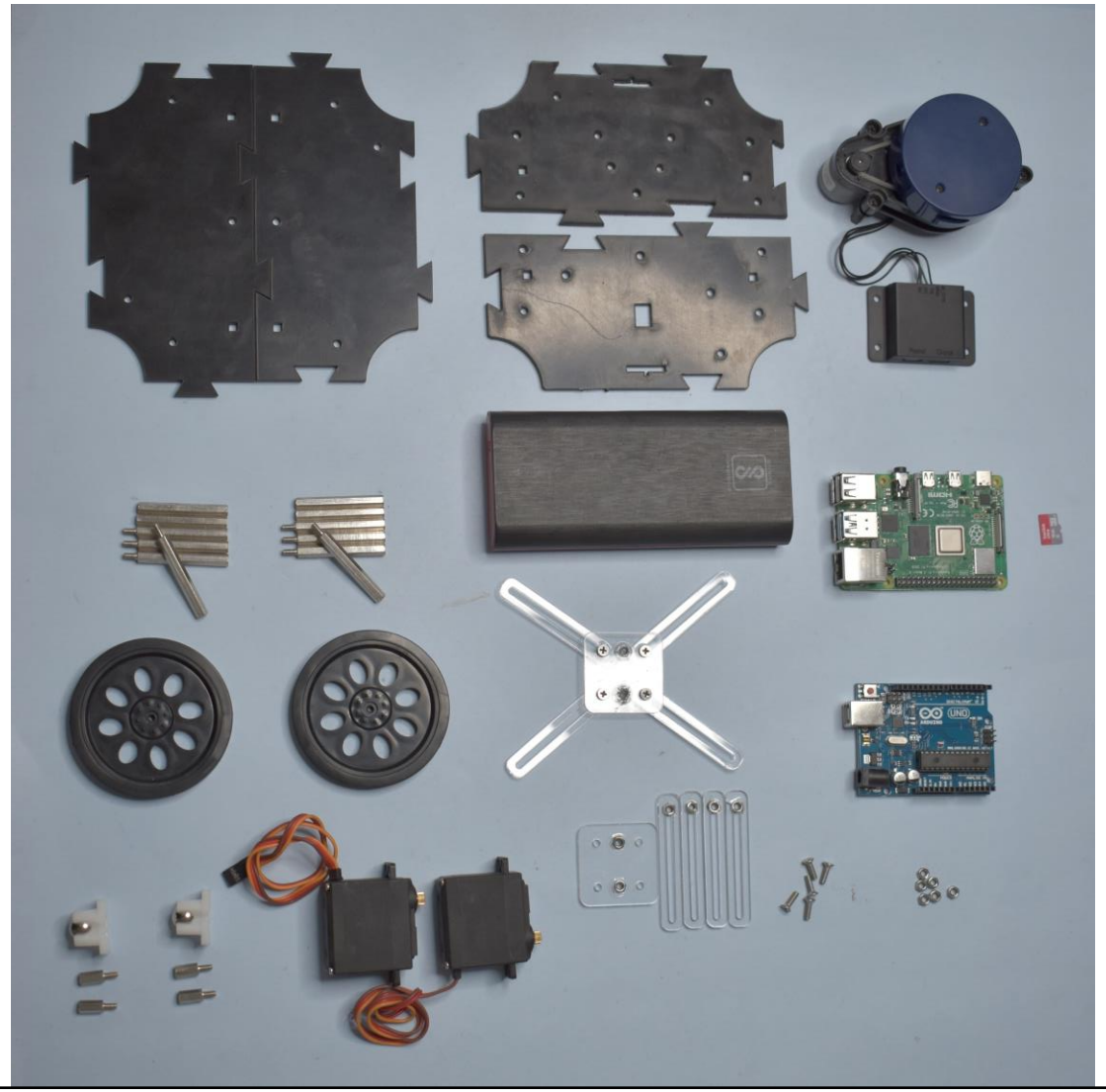

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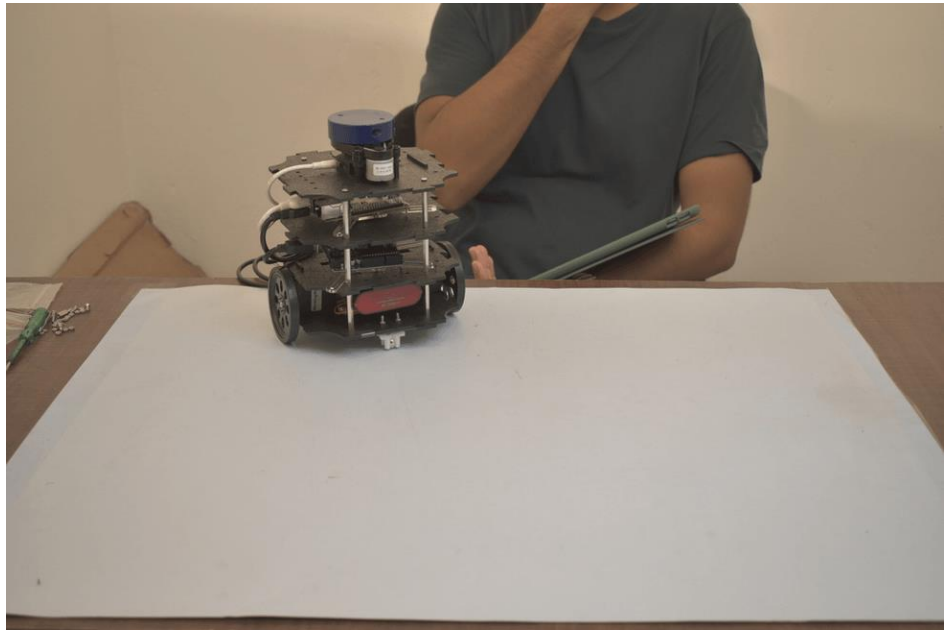
Outocome/ Solution Shots



- Lidar for mapping
- Wide range of connectivity
- High torque motors
- Wide range of PCB support
- Differential Drive

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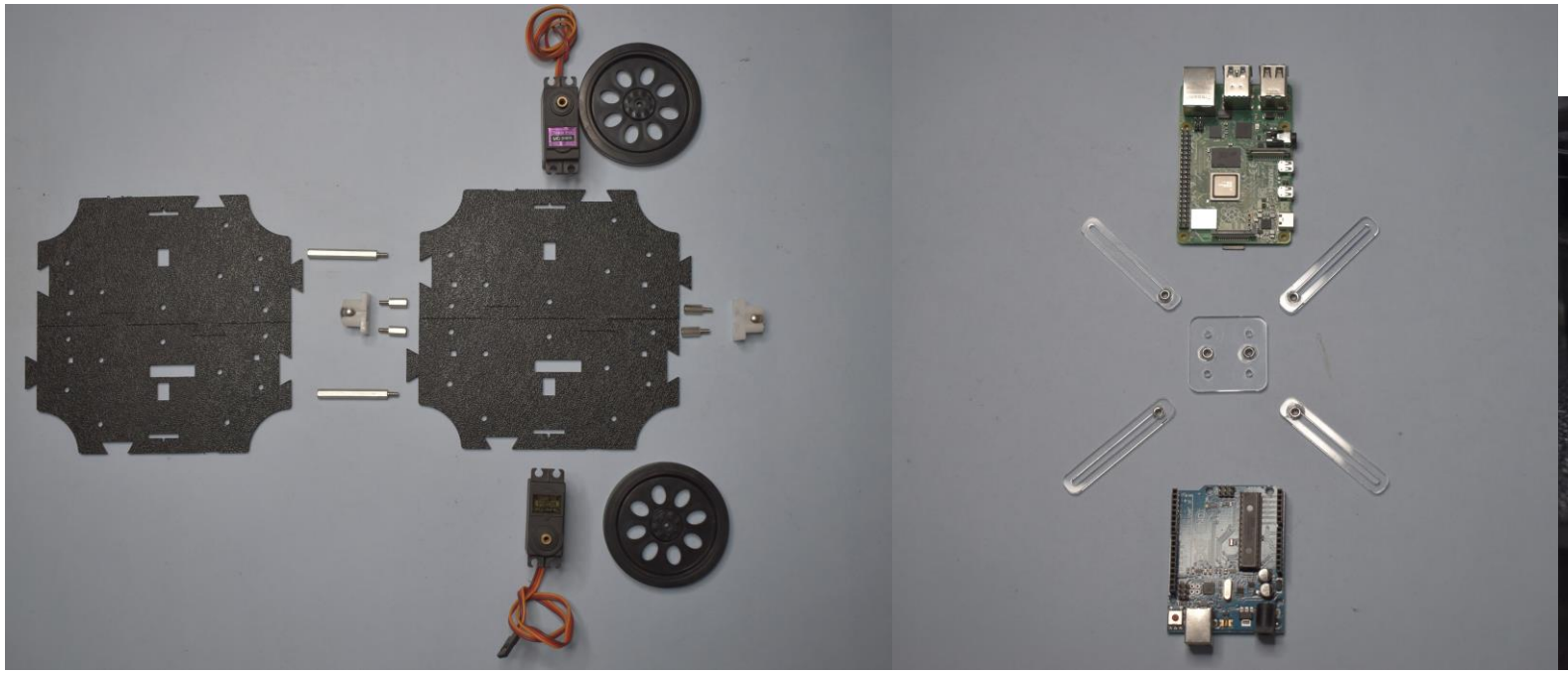
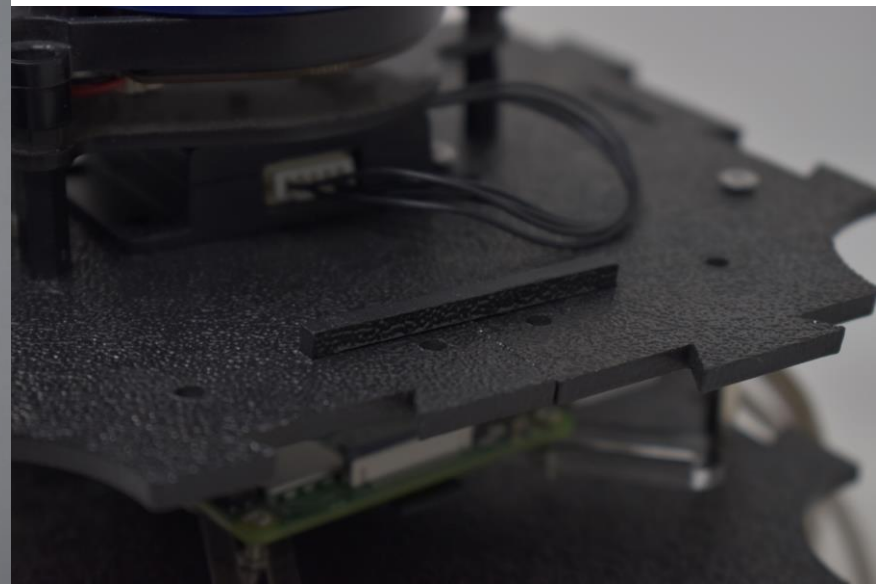
Solution Explanation





- Material, assembly and working

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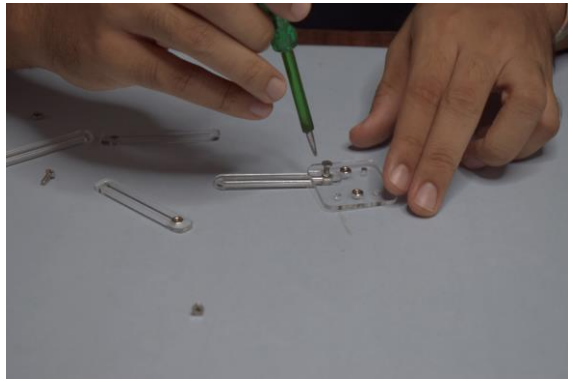
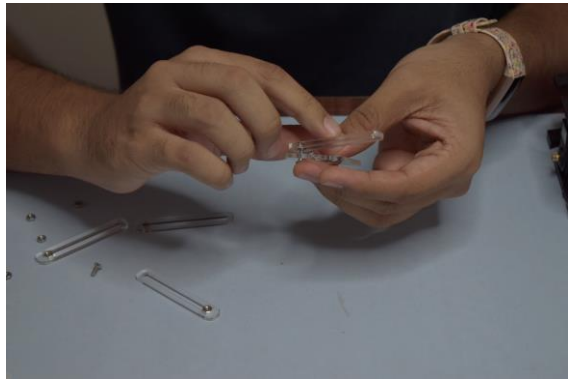
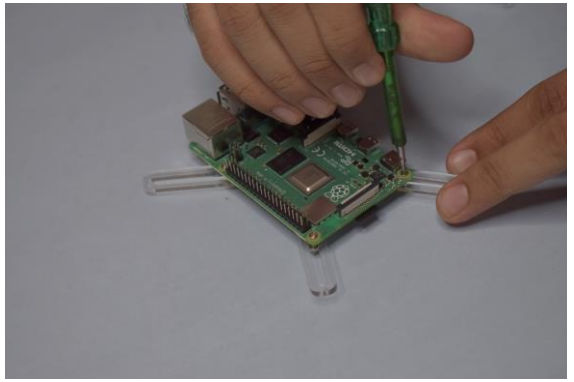
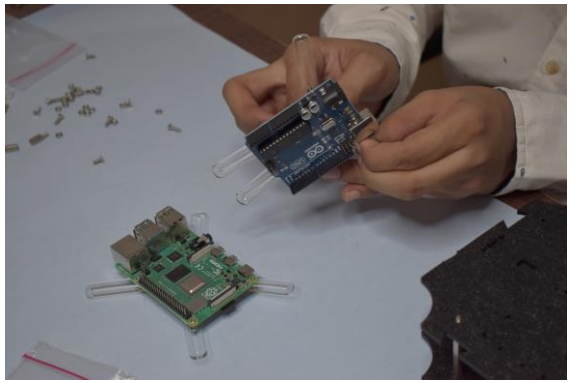
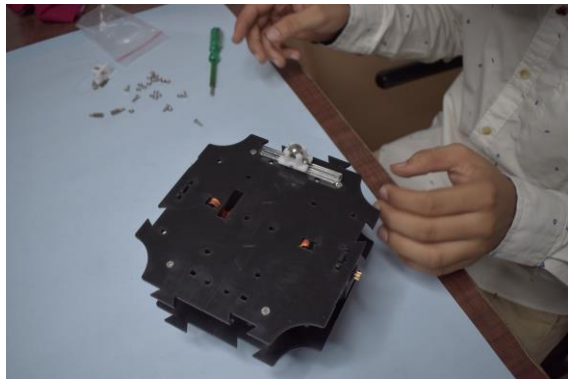
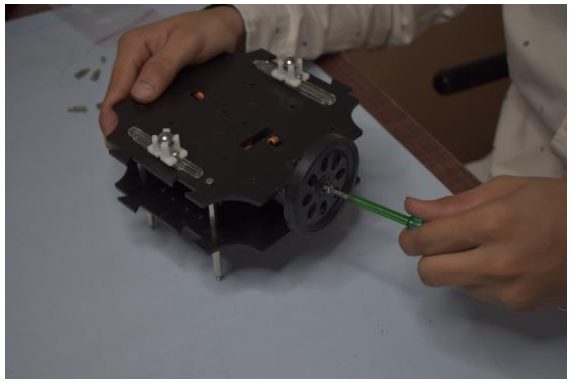
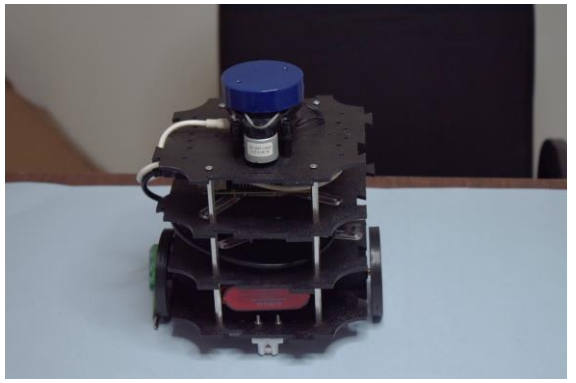
Solution Explanation

- Assembly

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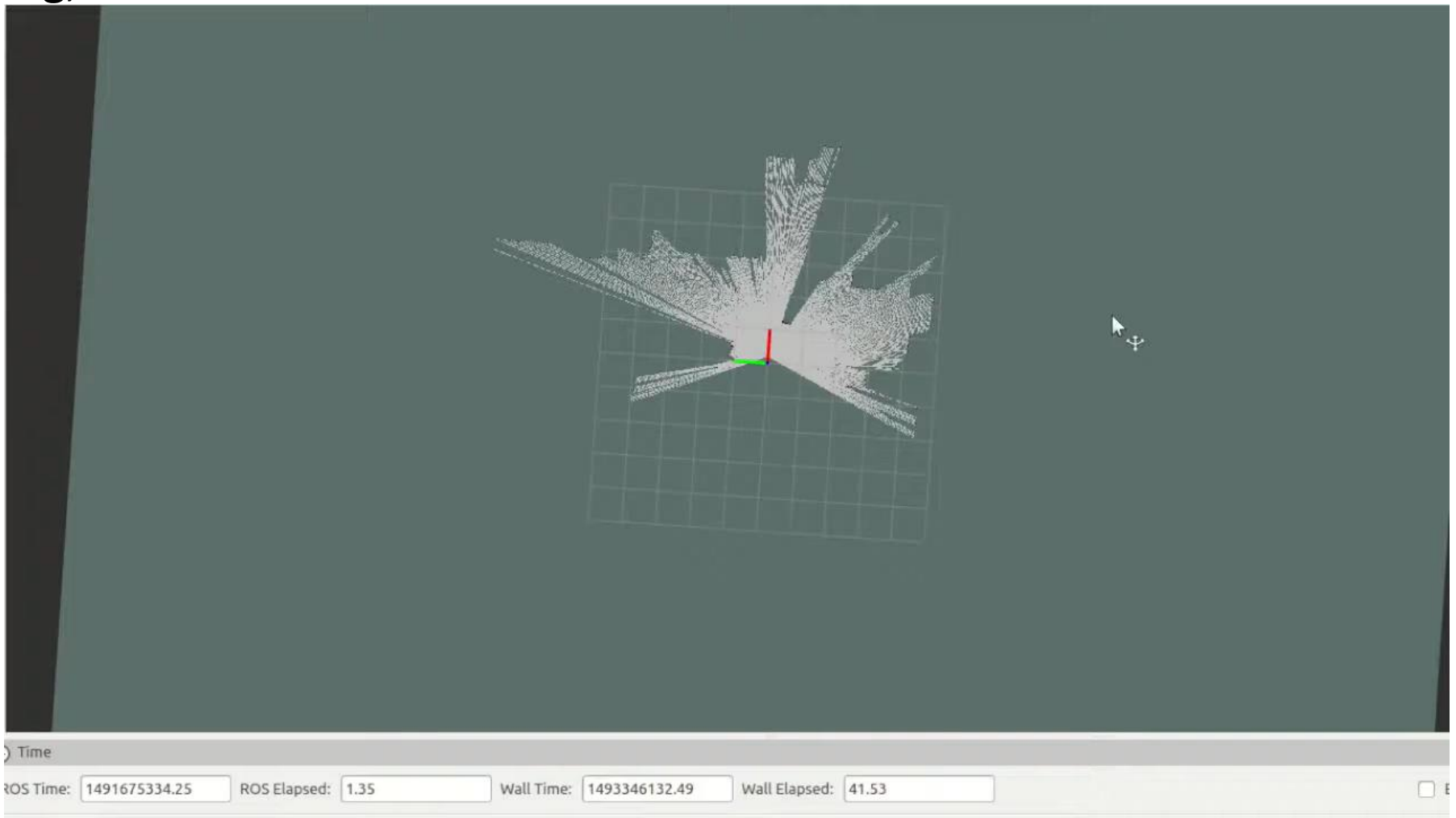
Solution Explanation

- Working, what can it do?



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Closure

Connecting with robot scenario

Connecting with D

Learnings

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Thank You