Smart Delivering Robot AUCTUS

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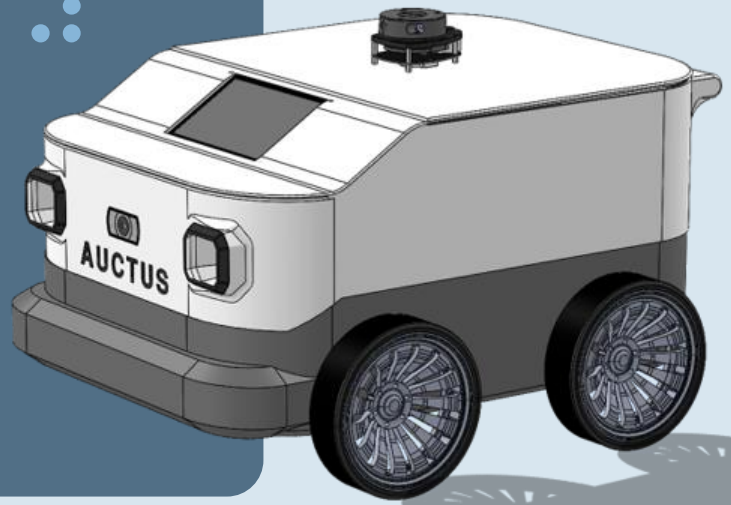
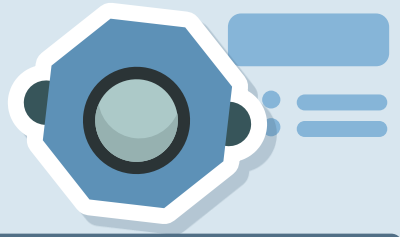


Outline



01 Introduction

02 Problem Statement

03 Objectives

04 Challenges

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06 Proposed Model

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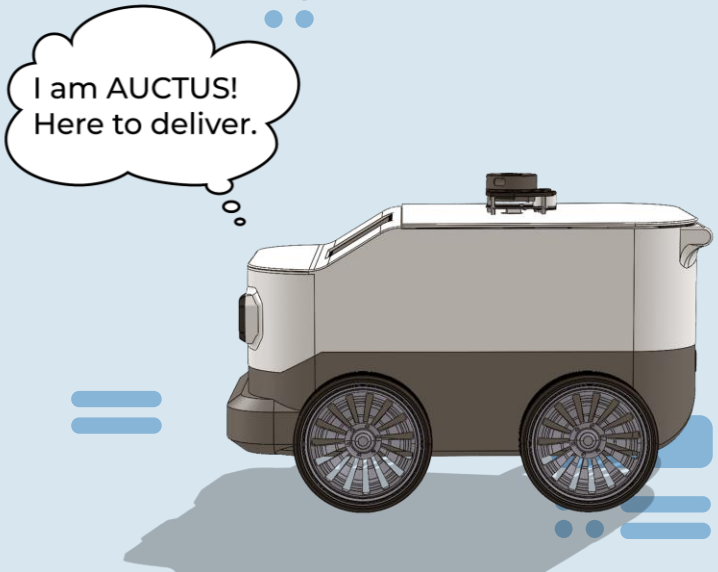
08 Any Questions

01

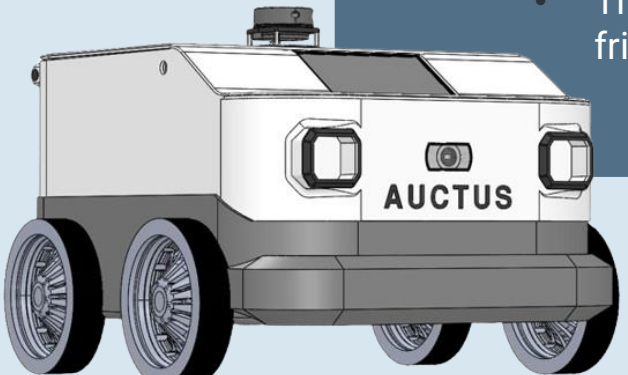
AUCTUS

“AUCTUS”?
It is a Latin word which means “Growth“.



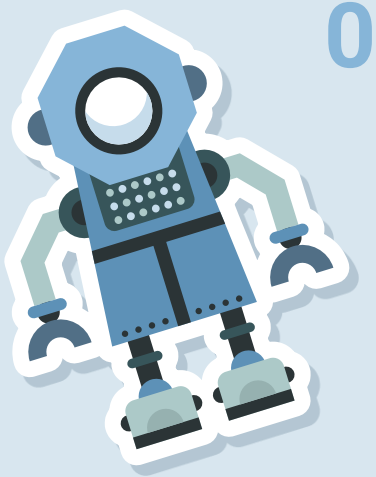
Introduction

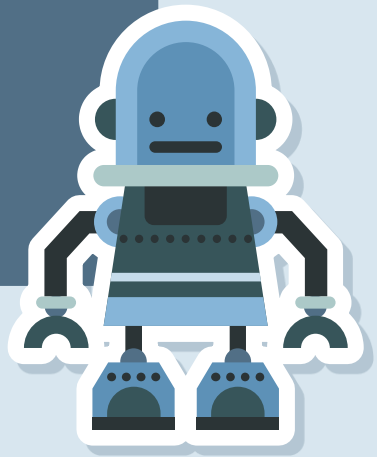
- Our project presents an autonomous delivering robot.
- Our goal is to adapt and extend its capabilities for outdoor applications.
- This process is orchestrated through a user-friendly mobile application.

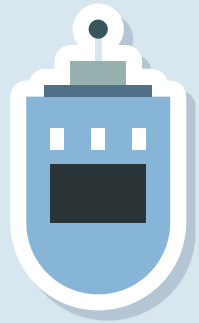


Problem statement

Traditional logistics rely heavily on manual labor, leading to inefficiencies such as slow delivery times, potential for human error, and high operational costs. The Smart Trolley project seeks to address these challenges by developing an autonomous goods transportation system for accurate navigation within dynamic environments.







Objectives

Eco-Friendly

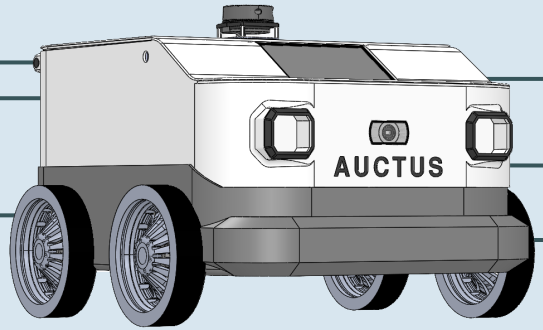
Zero carbon emissions

Autonomous Navigation and Obstacle Avoidance

Intelligent obstacle avoidance, running more smoothly

Energy-Efficient

Uses a battery system optimized for long durations and quick recharging.



User Authentication and Security

Incorporates QR-based user authentication to access and control AUCUS.

Real-time Tracking and Monitoring

Provides real-time tracking of the AUCTUS'S location and status via web interface.

Interactive User Interface

Features an easy-to-use interface for setting up deliveries, monitoring status, and receiving notifications.

Challenges:

1. Navigation

Challenge

Dynamic indoor environments

Challenges:

2. Cost Efficiency

Challenge

Reduce components cost

Challenges:
3. Security

Challenge

System security and durability of the box

Challenges:

4. Integration

Challenge

Seamless communication

Challenges:

5. Power Management

Challenge

Managing the power consumption

Literature Review

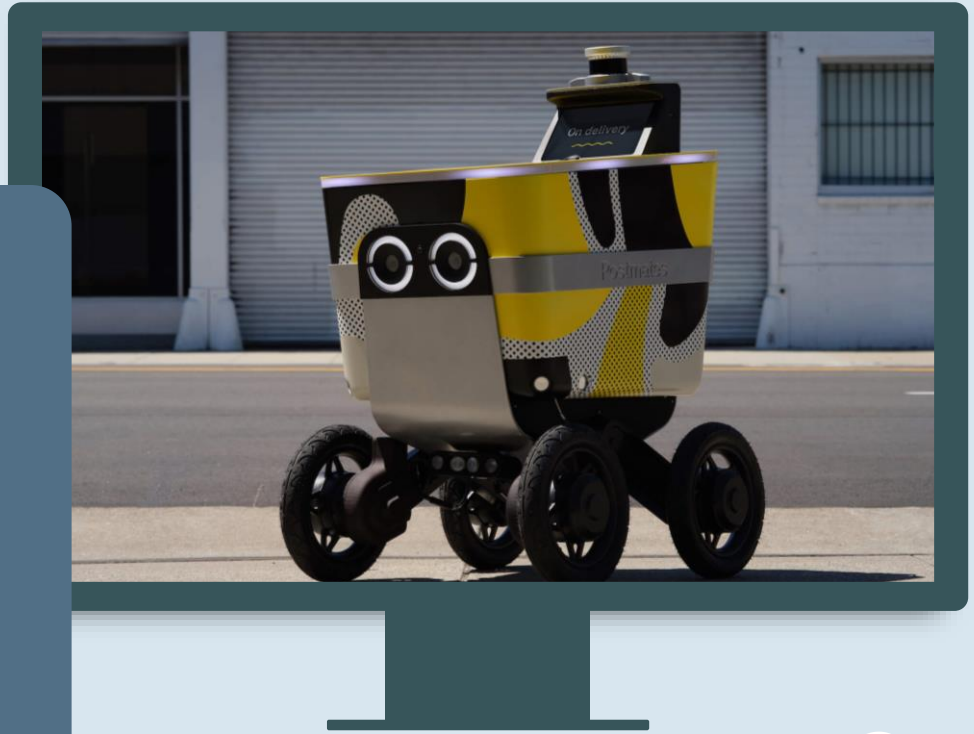
Starship

- Manufacturer: Starship Technologies
- Inception: 2015
- Speed: 4 mph
- Over 5 million autonomous deliveries now completed

Amazon Scout

- Manufacturer: Amazon Company
- Inception: 2019
- Goal: net zero carbon emissions by 2040
- Available as amazon shipping option for prime members

Literature Review



Postmates X

- Manufacturer: Nvidia with Uber Eats
- Inception: 2026
- Unlocking: phone or passcode
- 50 pounds of goods for 25 miles on a single charge

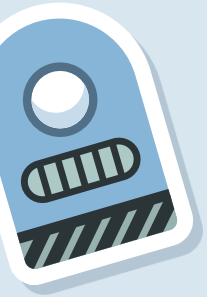
Services

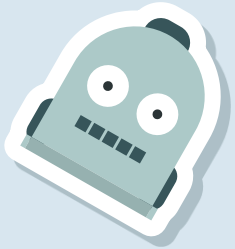
Express Delivery

Supermarkets

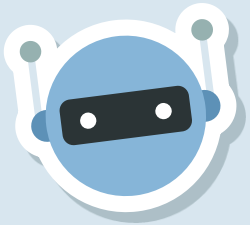
Documents

Food/Drinks Delivery





Proposed model



1
Robot Description

2
System Operational Process

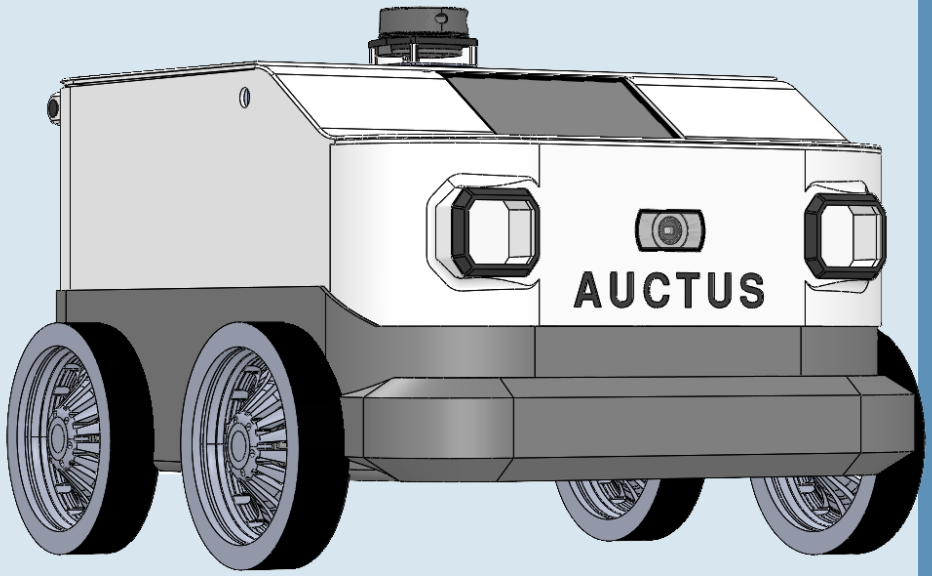
3
3D Model Design

4
Hardware Implementation

5
Software Implementation & Simulation

6
Web Interface

Robot Description



Project	Parameter
Machine Size	Width 49 * L 62 * H41.5(cm)
Storage Size	36*24*13（cm）
Maximum Carrying Capacity	6Kg
Velocity	2 km/h
Network	Wifi
Climbing	≤ 25°
Batteries Capacity	18Ah
Performance Period	Continuous run for 1.5 hours
Charging Interval	30 Mins

Proposed model :
System Operational Process

Website Login

Select Items

Confirm Order

Head to Pickup Room

Receive Package

Go to Delivery Room
(Drop-off Location)

Send Website Notification

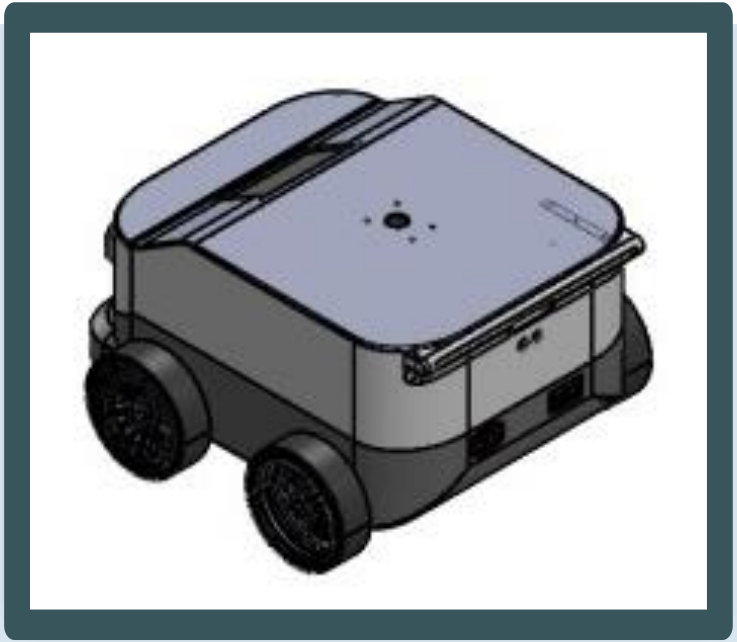
Scan QR Code
(Authentication)

Drop-off the Package

Return to Home Location

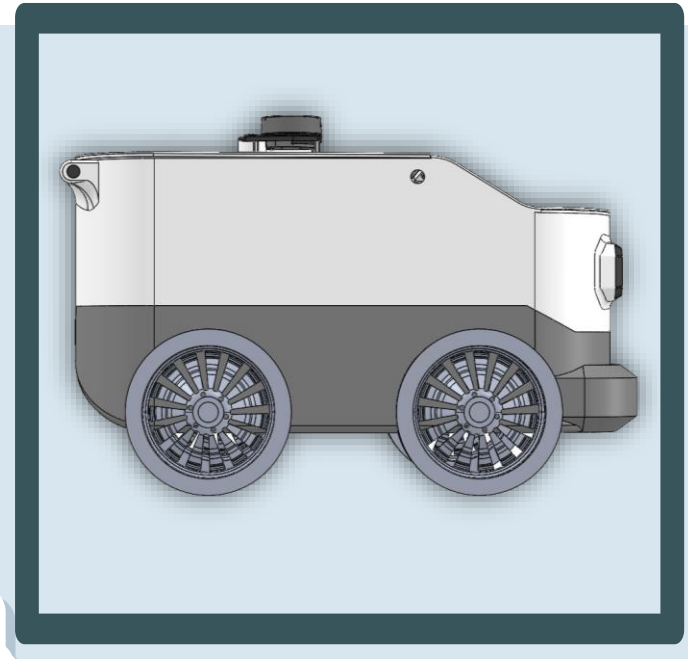
Proposed model:
3D Model Design

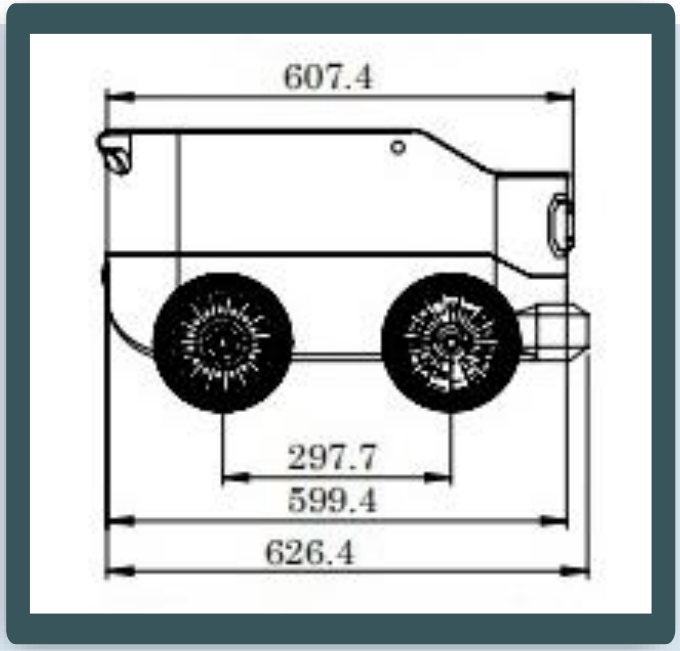
- **Full robot view**



Proposed model :
3D Model Design

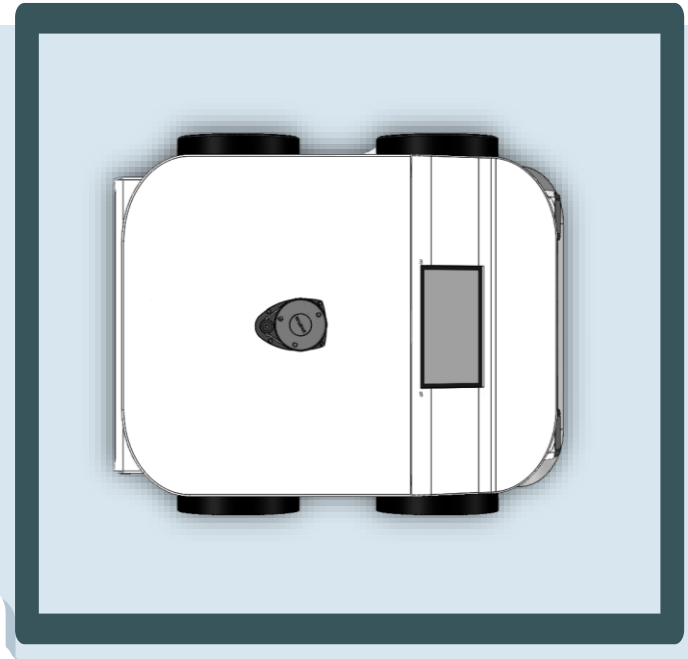
- **Side view**

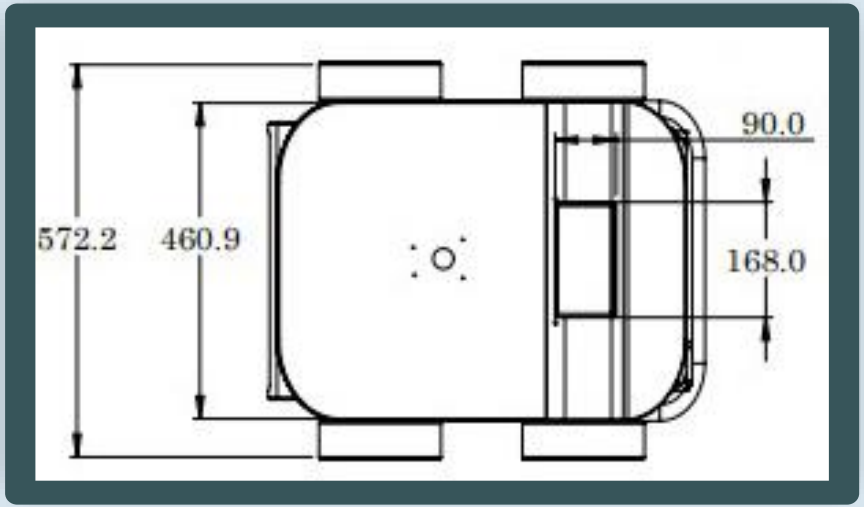




Proposed model :
3D Model Design

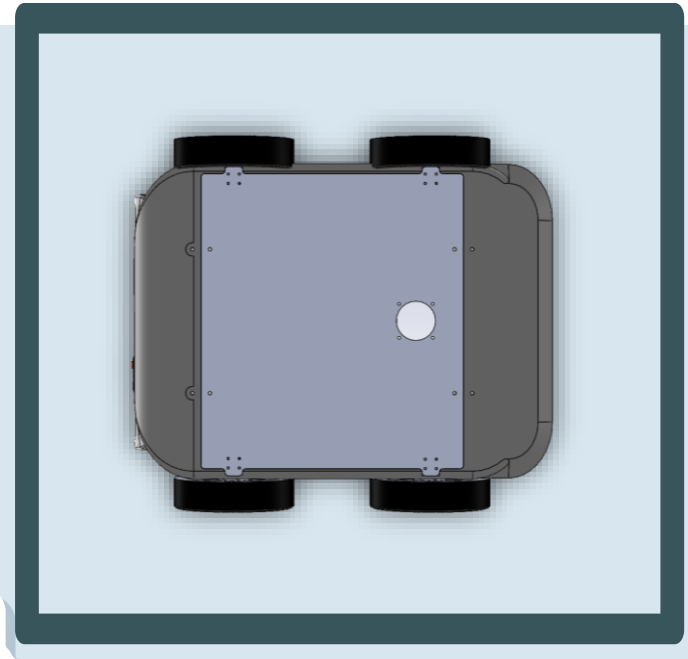
- **Overhead view**

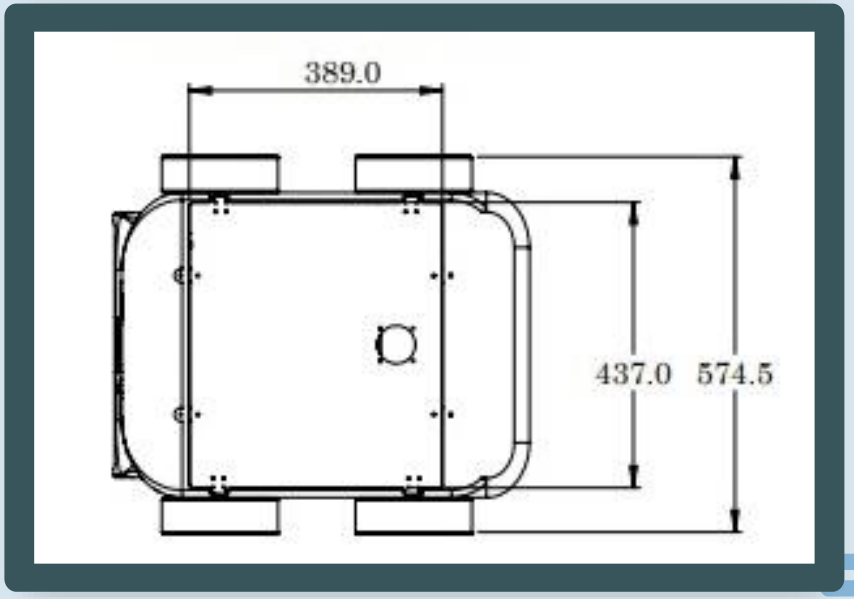




Proposed model :
3D Model Design

- **Bottom view**

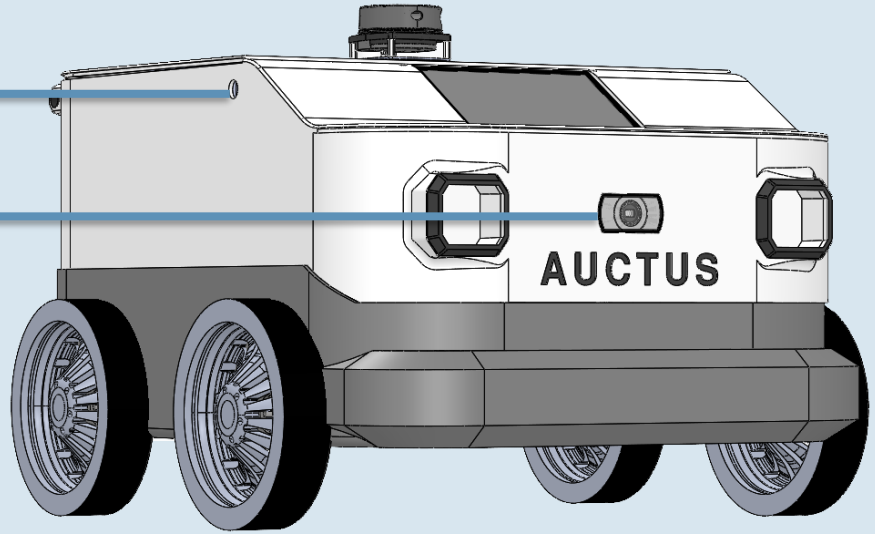




Proposed model :
Hardware Implementation

Flag for safety

LiDAR for autonomous navigation and mapping

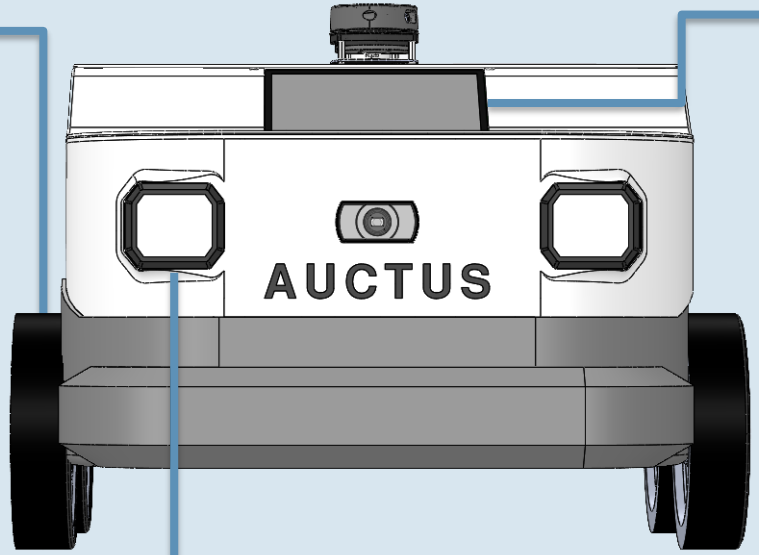


Camera for streaming

Proposed model:
Hardware Implementation

4 Motorized custom wheels with encoders

Touch screen for interaction and authentication

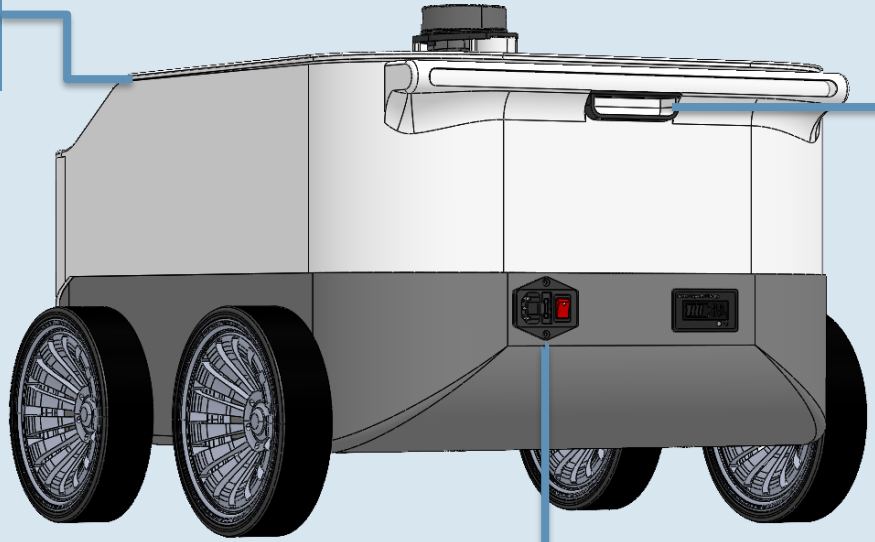


Front lights for low light adaption

Proposed model :
Hardware Implementation

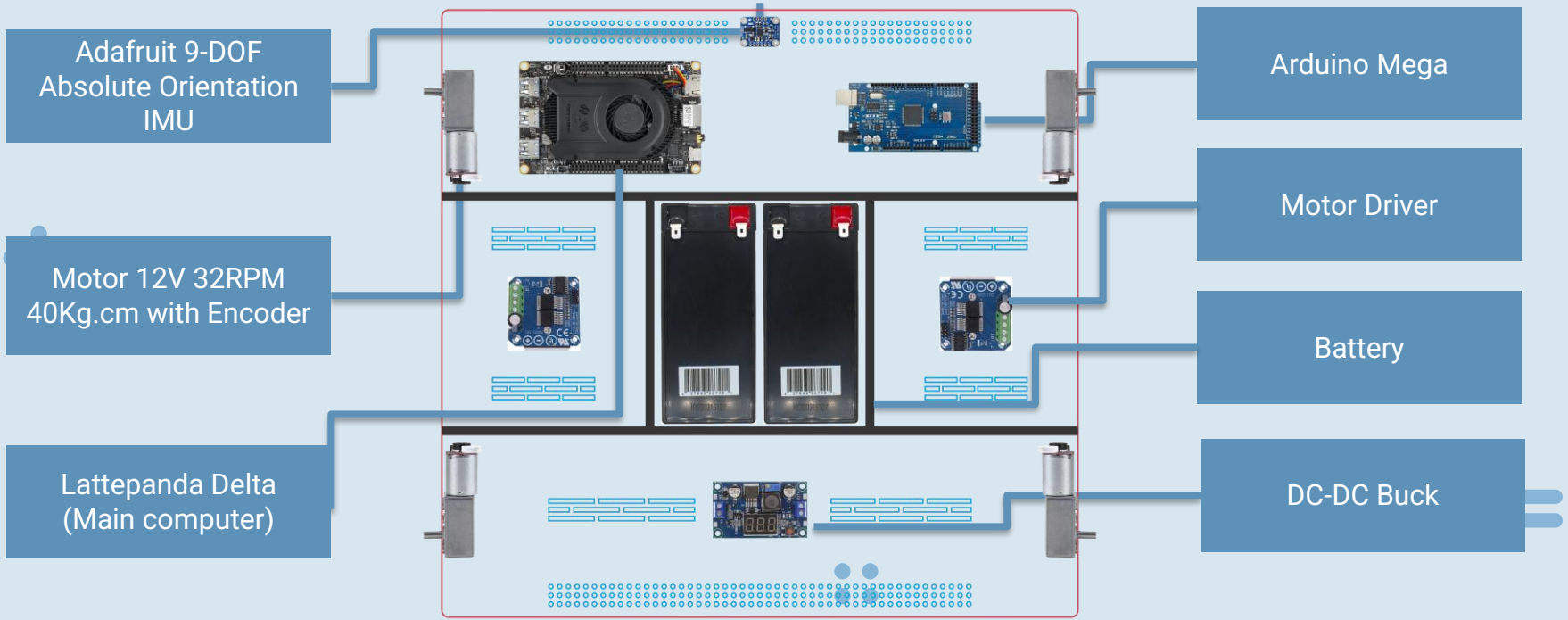
Auto lock basket with high security

Back lights for stop warning



Charger Plug and On/Off switch

Proposed model :
Hardware Implementation



Proposed model :
Hardware Implementation

- **Components**

Name	Company	Price
LattePanda Delta 3	lattepanda	17,000 L.E

Proposed model :

Hardware Implementation

- **Components**

Name	Company	Price
Lidar A1M8	Slamtes	9,500 L.E

Proposed model :

3. Hardware Implementation

- **Components**

Name	Company	Price
Adafruit 9-DOF Absolute Orientation IMU	Adafruit	4,000 L.E

Proposed model :

3. Hardware Implementation

- **Components**

Name	Company	Price
Arduino mage	Arduino	1,300 L.E

Proposed model :

3. Hardware Implementation

- **Components**

Name	Company	Price
HW-039	Original	4,000 L.E

Proposed model :

Hardware Implementation

- **Components**

Name	Company	Price
Motor 12V 32RPM 40Kg.cm with Encoder	Generic	1,100 L.E

Proposed model :

3. Hardware Implementation

- **Components**

Name	Company	Price
FT5835M 35.5kg Metal Gear Digital Servo	FeeTech	3,000 L.E

Proposed model :

3. Hardware Implementation

- **Components**

Name	Company	Price
batter 12v 9A	Ultracell	1,100 L.E

Proposed model :

3. Hardware Implementation

- **Components**

Name	Company	Price
DC-DC Buck Converter	Generic	200 L.E

Proposed model :
Hardware Implementation

- **Components**

Name	Company	Price
Fabricated Body (Fiber)	custom made	8,000L.E

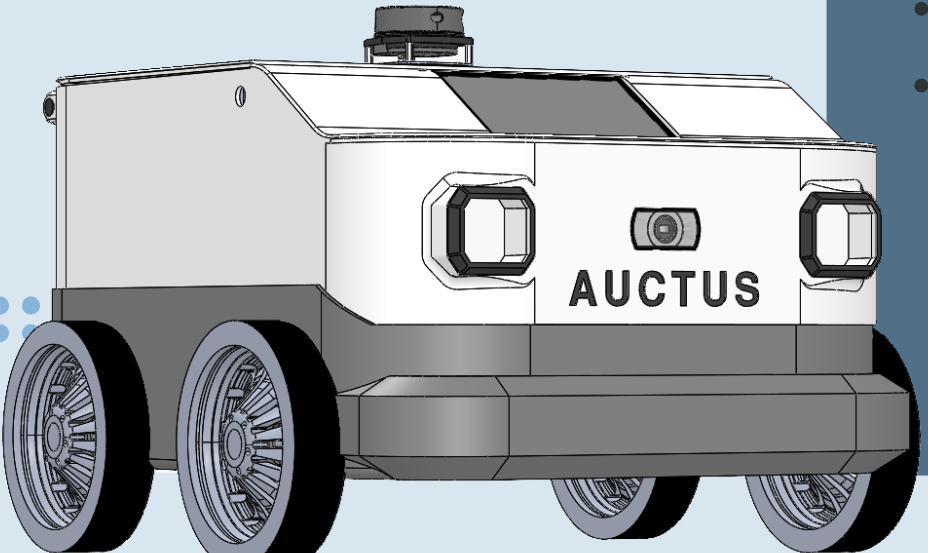
Proposed model :
Hardware Implementation

- **Components**

Name	Company	Price
wheel	custom made	1,000 L.E

Proposed model :
Software Implementation

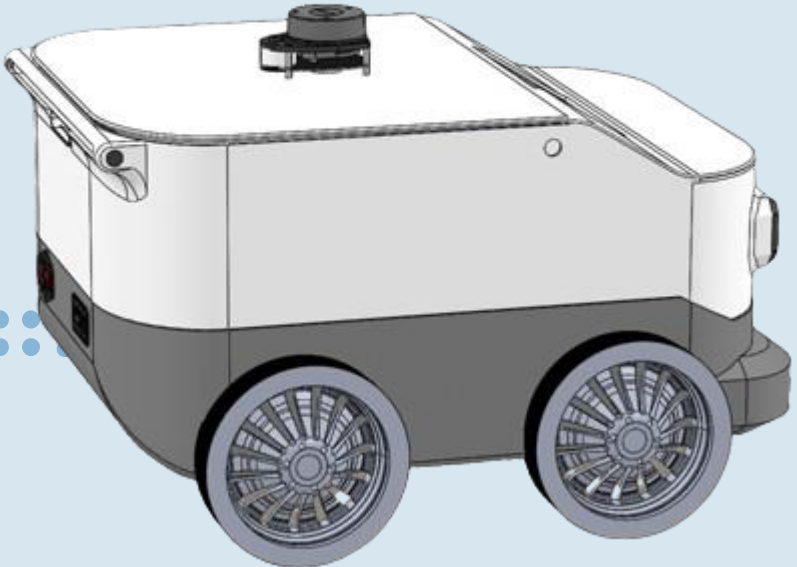
- ROS Melodic
- SLAM Algorithm
- Obstacle Avoidance
- Communication with Arduino



Proposed model :
Software Implementation

ROS (Robot Operating System) Melodic

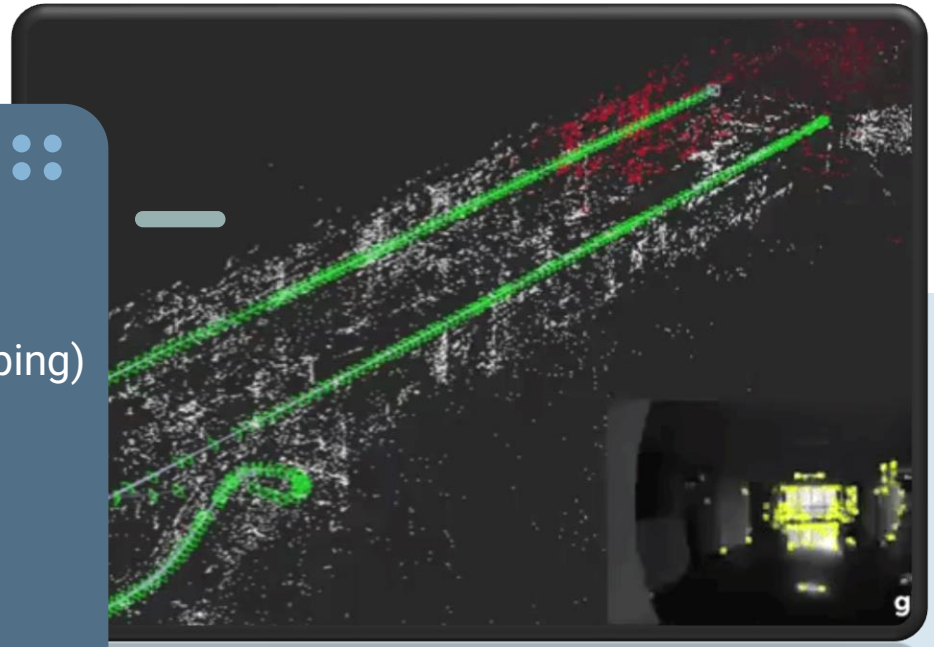
- Path Planning (Global, Local)
- Mapping and Localization

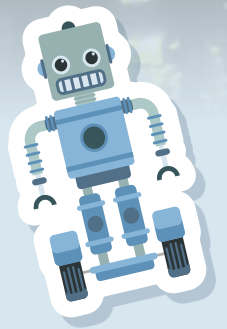


Proposed model :
Software Implementation

SLAM (Simultaneous Localization and Mapping) Algorithm

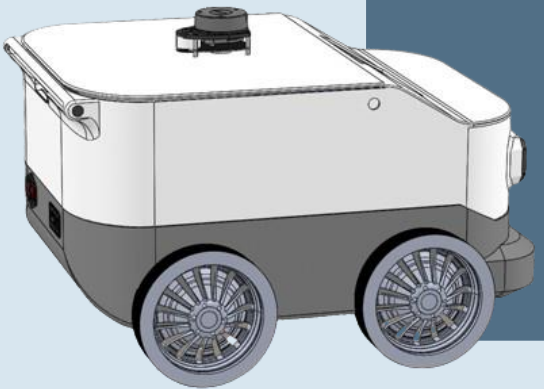
- Unknown environments
- Integrates sensor data
- Estimating location (Using sensor fusion)





Proposed model :
Software Implementation

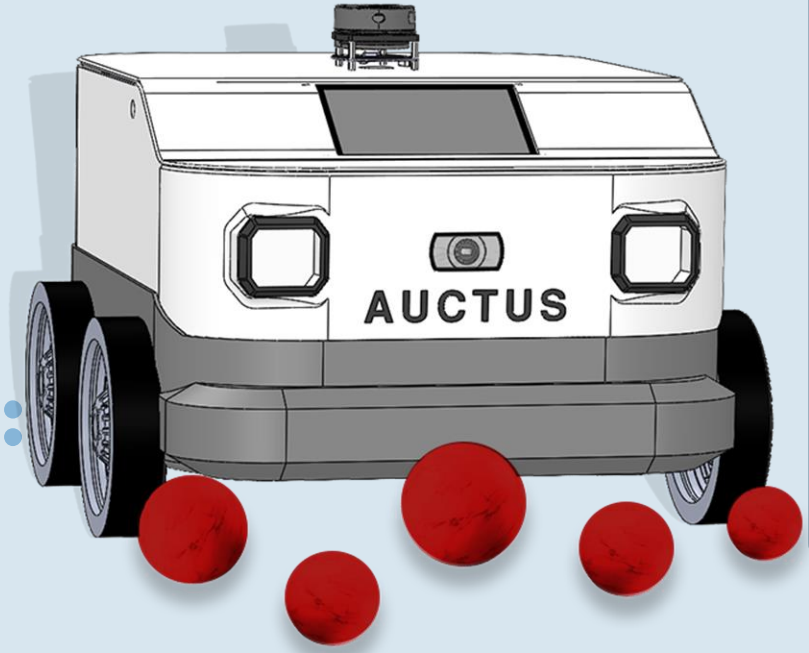
EKF Filter VS Particle Filter



Proposed model :
Software Implementation

Obstacle Avoidance

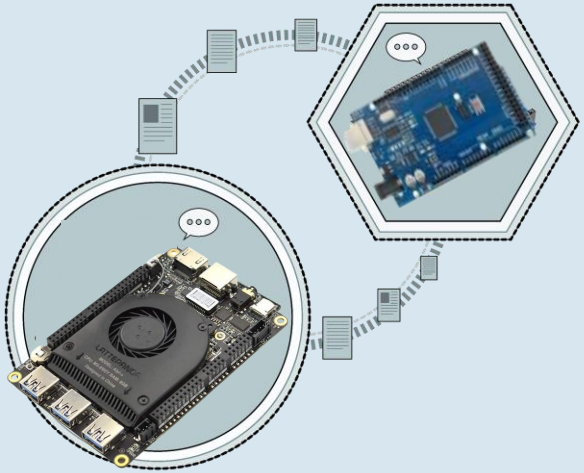
- Sensor Fusion
- Obstacle Mapping



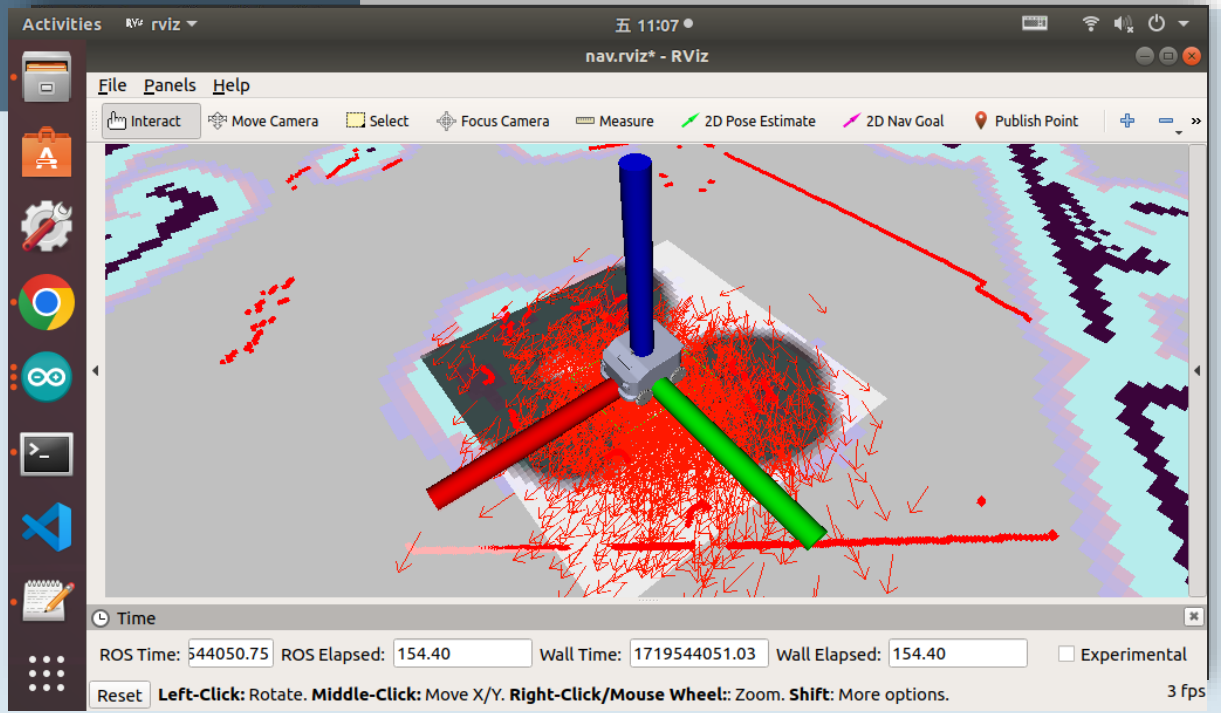
Proposed model :
Software Implementation

Communicating with Arduino

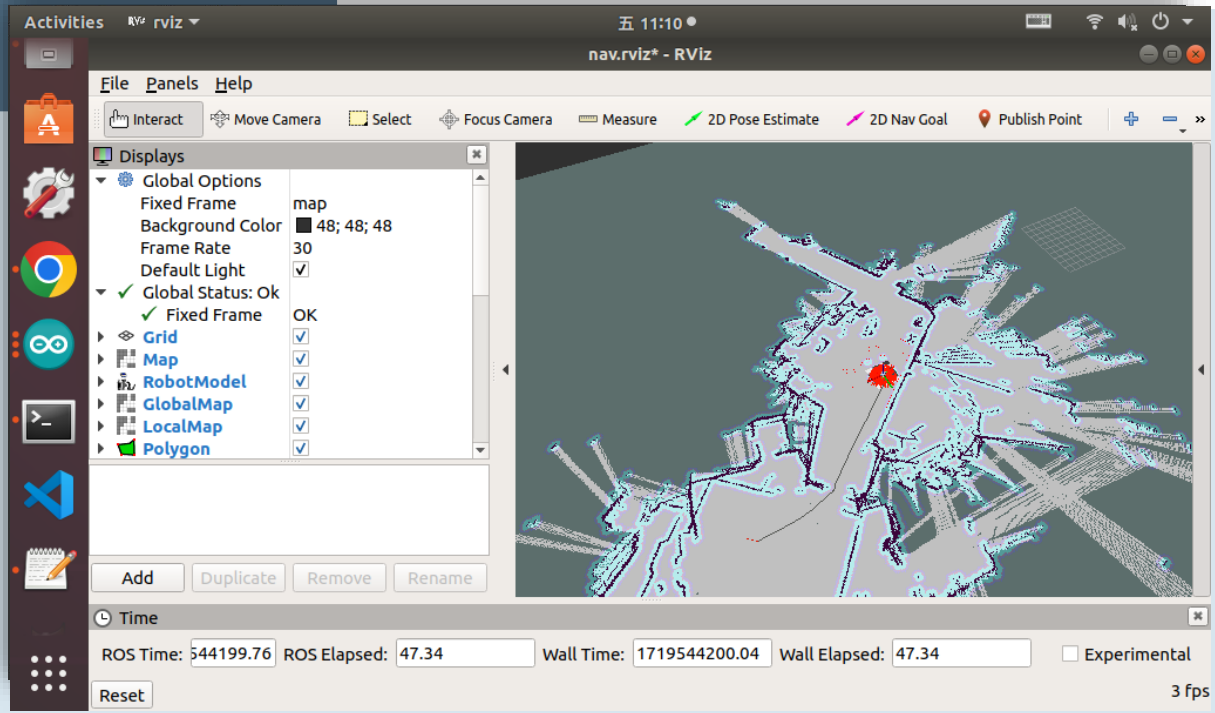
- Serial Communication through UART
- Data Exchange and Control



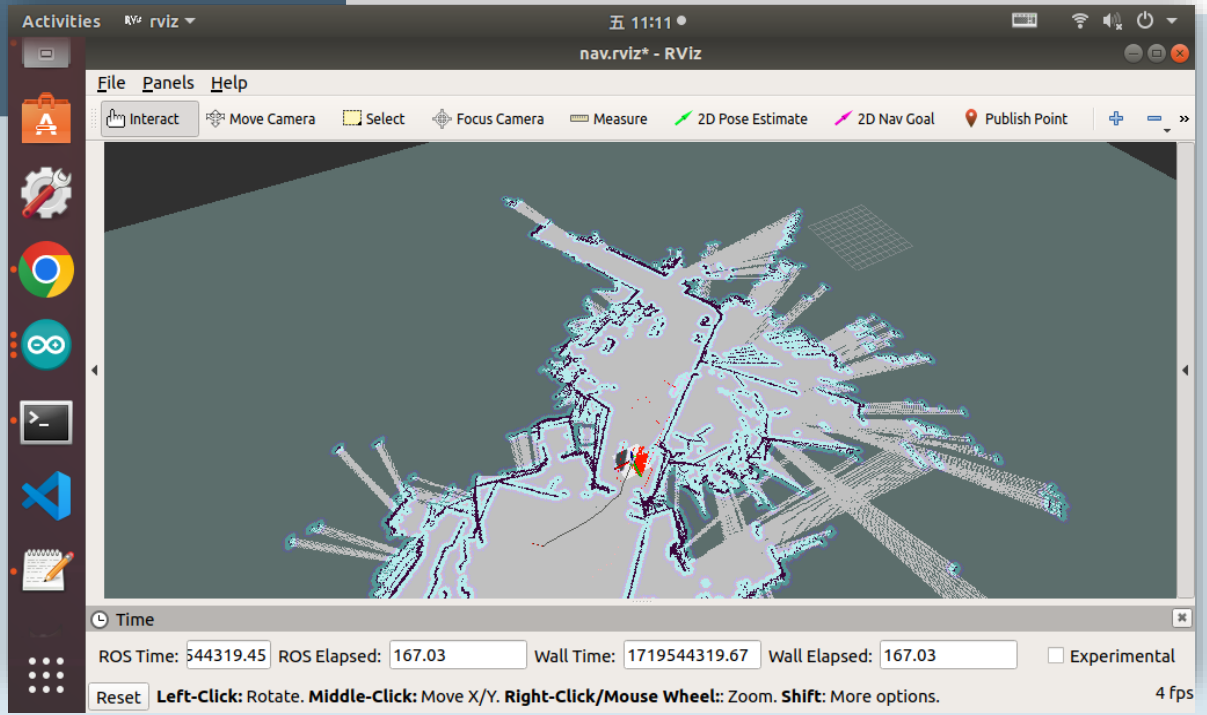
Proposed model:
Simulation



Proposed model:
Simulation



Proposed model:
Simulation



Proposed model:
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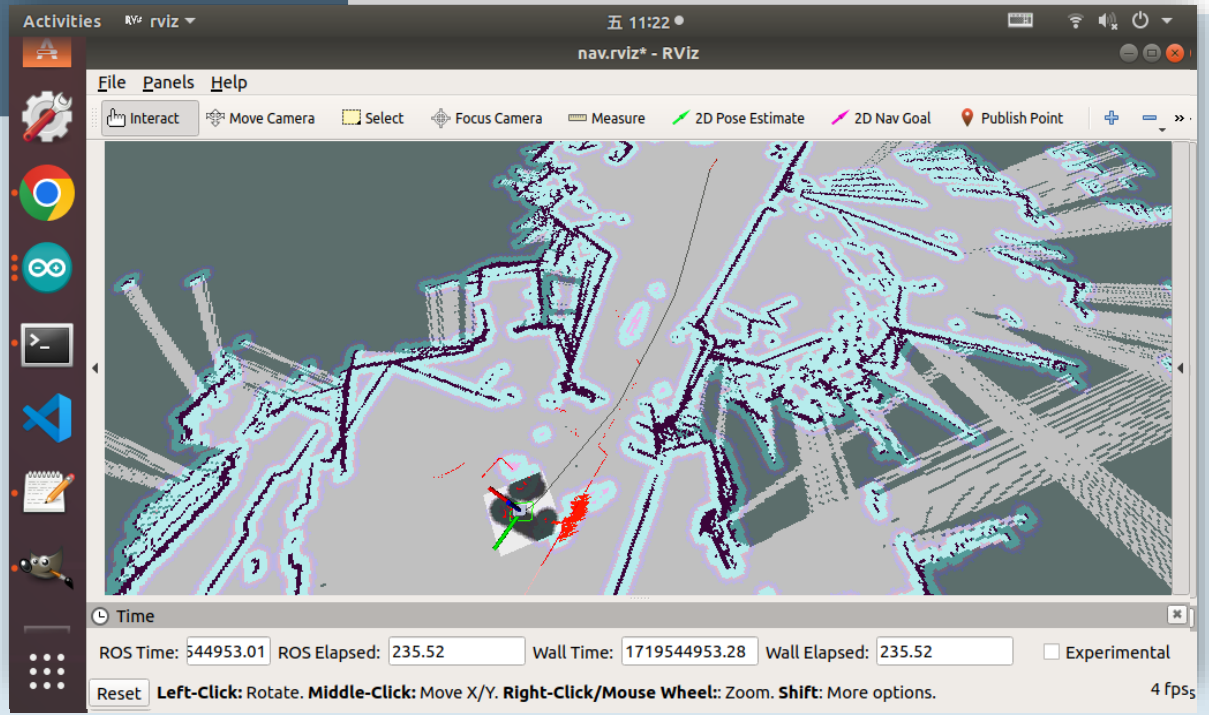
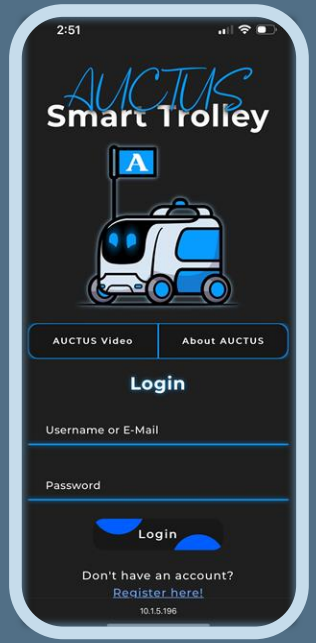


Proposed model :
Web Interface

http://www.cai.aast.edu/auctus



Achievements

The robot received a grant of 60,000 L.E. from the Academy of Scientific Research and Technology (ASRT).

Our team

Thank you!