KNIGHTS

ROBOTICS DOJO

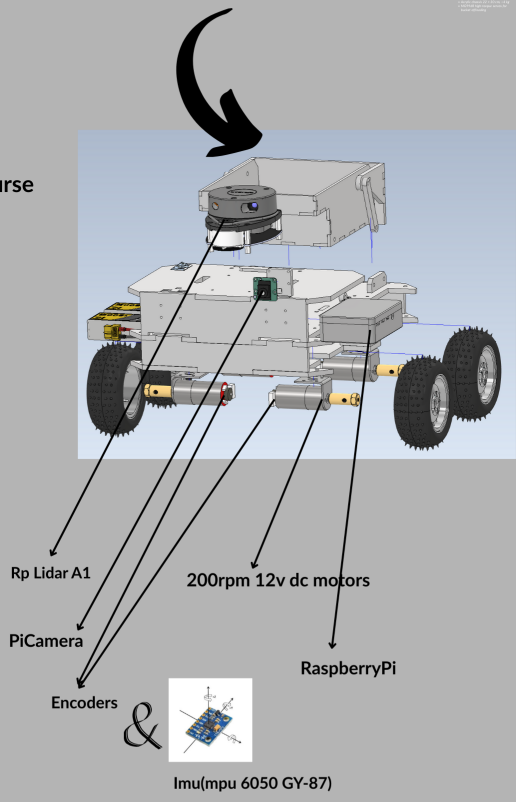
Robotics Dojo Competition 2025

Technical Overview

1. • Raspberry Pi 4 + STM32F4 for control
2. • RPLidar, PiCamera, encoders, IMU for sensing
3. • 4 × 12 V DC motors with spiked wheels
4. • 3S 2200 mAh LiPo and 18 W power bank
5. • Acrylic chassis 22 × 30 cm,
6. • High-torque servo motors for bucket offloading

Tech Insights

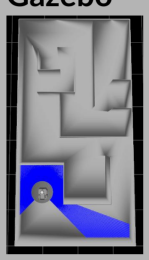
- Mapping and autonomous navigation – Builds and follows a map of the arena without manual control
- Real-time obstacle detection and avoidance – Detects new objects and reroutes instantly to stay on course
- Payload loading and offloading – Picks up and drops payloads using the bucket mechanism
- Potato leaf image classification – Uses the camera and ML model to identify healthy or diseased leaves
- Accurate sensor fusion with EKF – Combines IMU and encoder data for precise position tracking
- Behavior Tree control – Flexible decision-making for reliable task switching



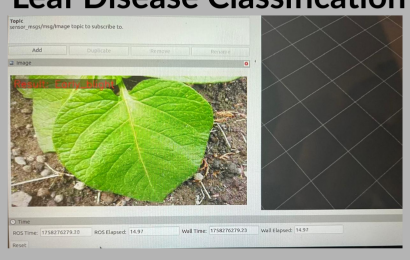
Simulation and Modelling

Utilizing digital twin technology for rapid testing and development

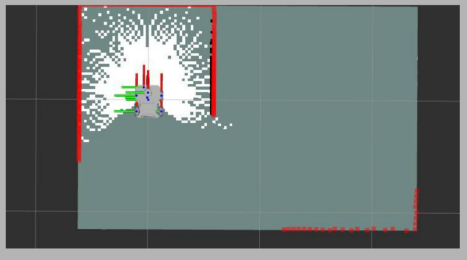
Gazebo



Leaf Disease Classification



Real-Time SLAM Visualization



Gamefield Terrain

Raspberry Pi ROS NAV2 OPEN NAVIGATION

"Human Inspiration, Robotic Precision"