NAVIGATION AND OBJECT DETECTION USING A CUSTOM-BUILT ROBOT

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INTRODUCTION

• AIM: Develop a robot that can navigate in a known environment and identify different objects/entities in its surrounding.

• Implementation-based project focused on navigation and perception.

Sensors Used:

• IMU Sensor

• Camera Controller (640x480 resolution)

• Differential Type Controller
IMPLEMENTATION

• Simulation Environment: Gazebo
• Robot: Wheeled robot with a camera
• Perception: YOLO v5 (based on PyTorch Implementation)
• Navigation/Control: teleop_twist_keyboard for ROS 2
Creating packages using ROS2 pkg and Colcon for building
EXPERIMENTS

Tests

• Single Object Detection vs Multiple Object Detection
• Correct Classifications vs Incorrect Classification

Observations

• Detection accuracy depends on the distance of the object
• Accuracy is not affected by having multiple objects in the frame
Accurate Predictions:

- person 0.93
- truck 0.52
- truck 0.86
- stop sign 0.92
- cat 0.46

Inaccurate Predictions:

- airplane 0.65
- airplane 0.74
- dog 0.38
DEMO

(This video is shown separately in the class. Video attached with the deliverables)
FUTURE SCOPE

• In our implementation, we are using a basic YOLO model with pre-trained on a small number of objects (still, the performance is good). This model can be extended for any specific application usage.

• Robot navigation controls can be improved further.
THANK YOU