

A decorative graphic on the left side of the slide, consisting of white lines and circles on a blue background, resembling a circuit board or a network diagram.

NAVIGATION AND OBJECT DETECTION USING A CUSTOM- BUILT ROBOT

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INTRODUCTION

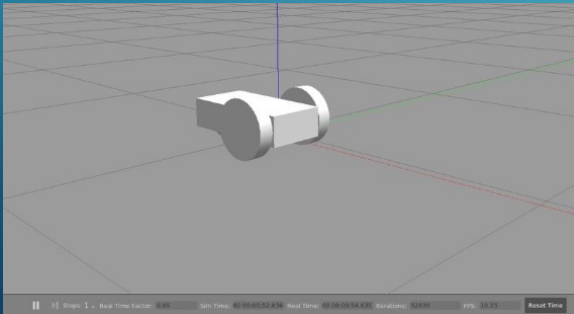
- AIM: Develop a robot that can navigate in a known environment and identify different objects/entities in its surrounding.
- Implementation-based project focused on navigation and perception.

Sensors Used:

- IMU Sensor
- Camera Controller (640x480 resolution)
- Differential Type Controller

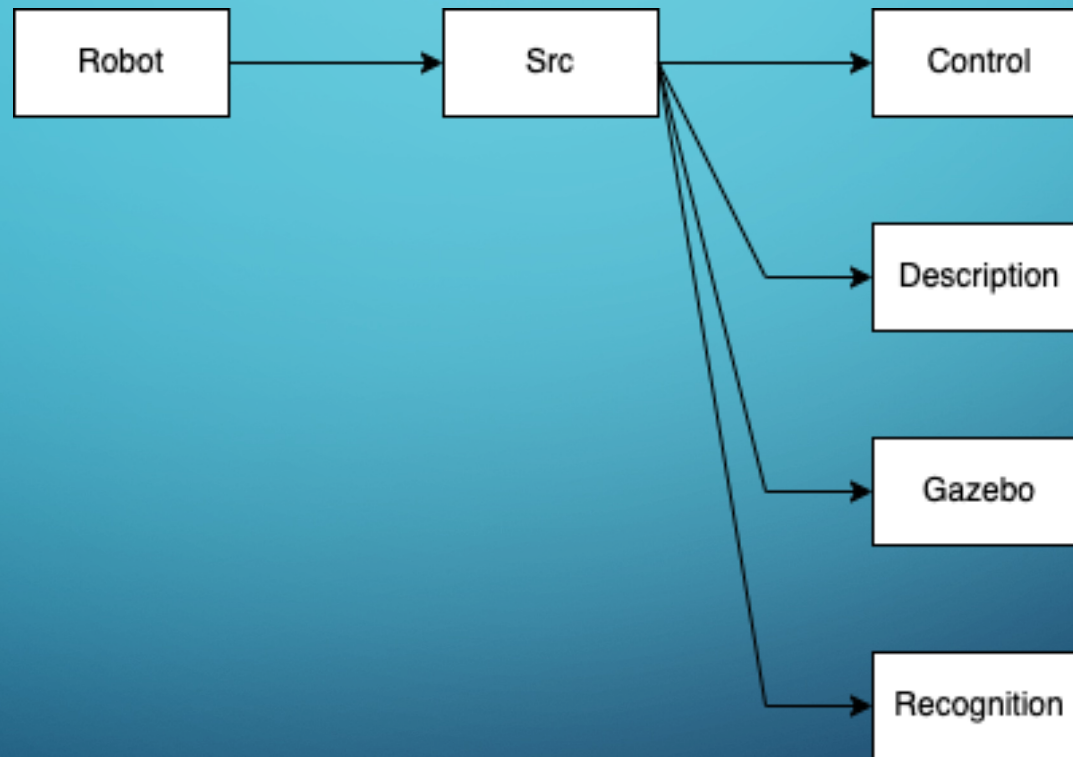
IMPLEMENTATION

- Simulation Environment: Gazebo
- Robot: Wheeled robot with a camera
- Perception: YOLO v5 (based on PyTorch Implementation)
- Navigation/Control: teleop_twist_keyboard for ROS 2

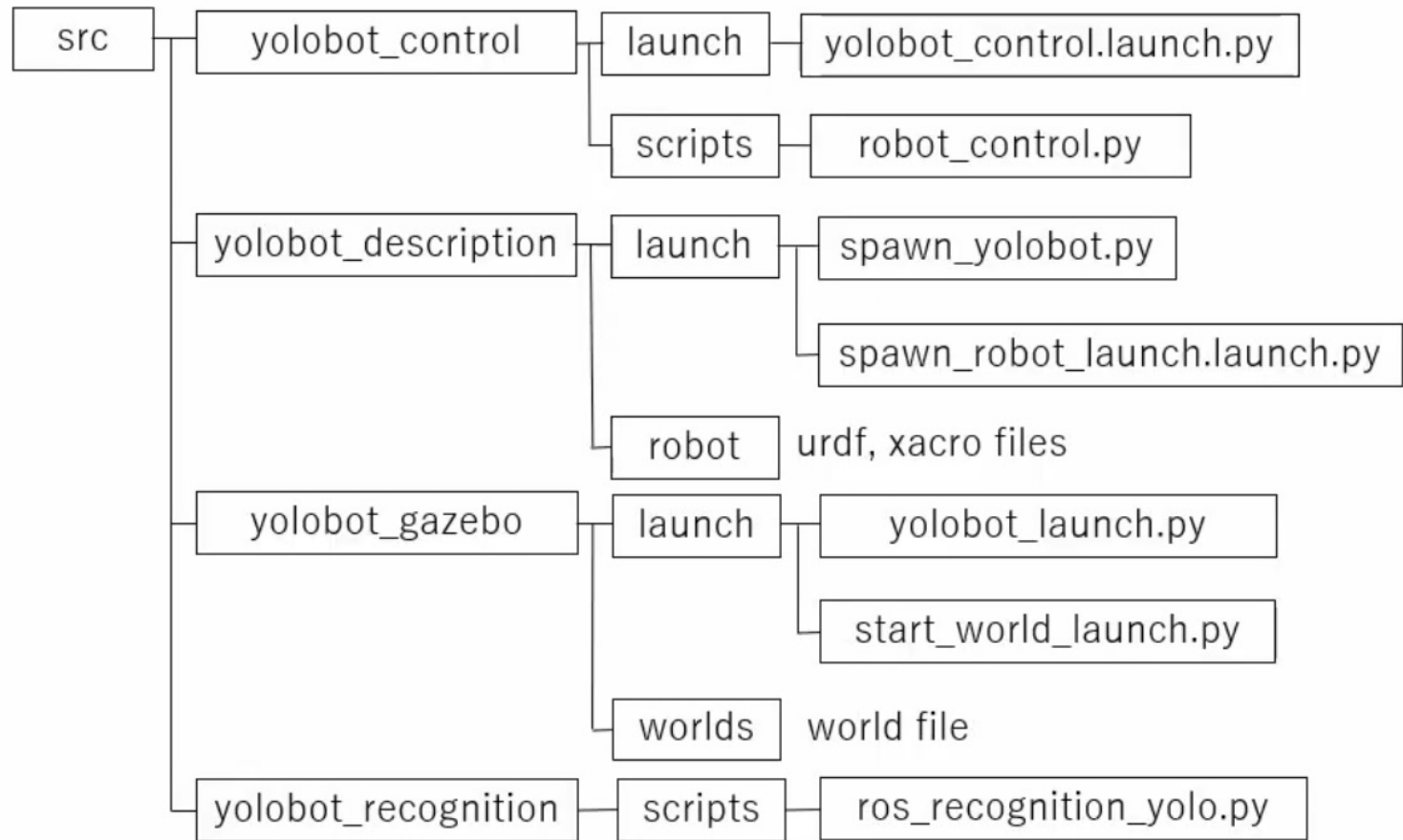


```
Reading from the keyboard and Publishing to Twist!  
-----  
Moving around:  
  u   i   o  
  j   k   l  
  m   ,   .  
  
q/z : increase/decrease max speeds by 10%  
w/x : increase/decrease only linear speed by 10%  
e/c : increase/decrease only angular speed by 10%  
anything else : stop  
  
CTRL-C to quit
```

PROJECT STRUCTURE



Creating packages using ROS2 pkg and Colcon for building



EXPERIMENTS

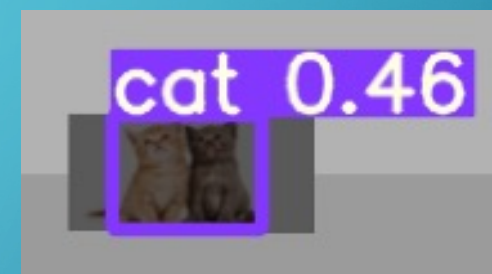
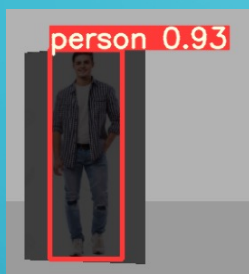
Tests

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

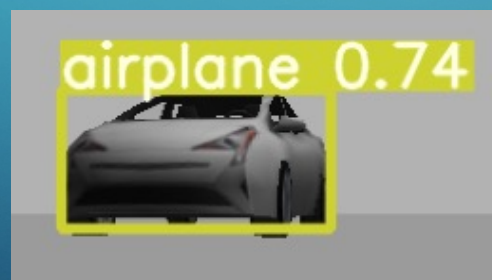
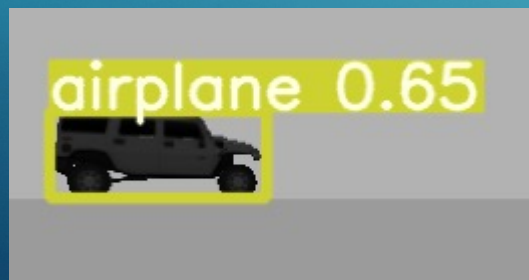
Observations

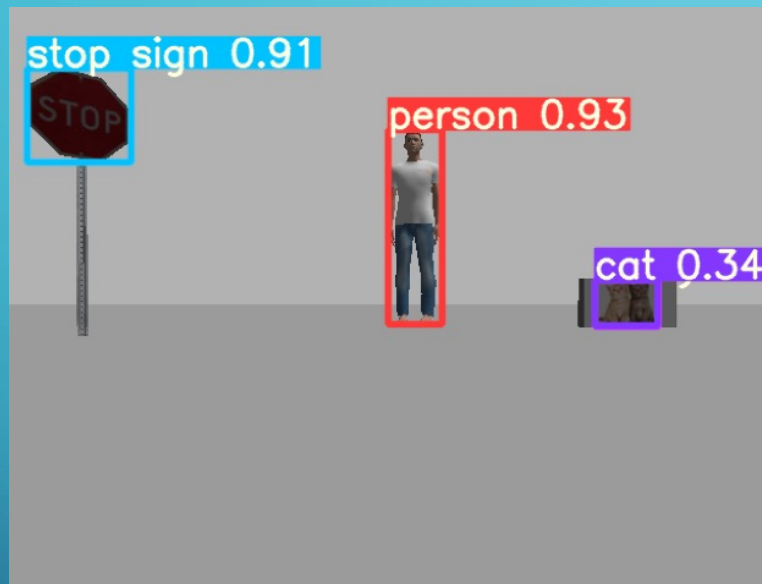
- Detection accuracy depends on the distance of the object
- Accuracy is not affected by having multiple objects in the frame

Accurate Predictions:



Inaccurate Predictions:





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.

The image features a blue gradient background with white circuit-like lines in the corners. These lines consist of straight paths that branch out and terminate in small circles, resembling a network or data flow diagram. The lines are positioned in the top-left, top-right, bottom-left, and bottom-right corners, framing the central text.

THANK YOU