

"YOLOv9" Team

@Home Education Challenge

PERTER ROBOT

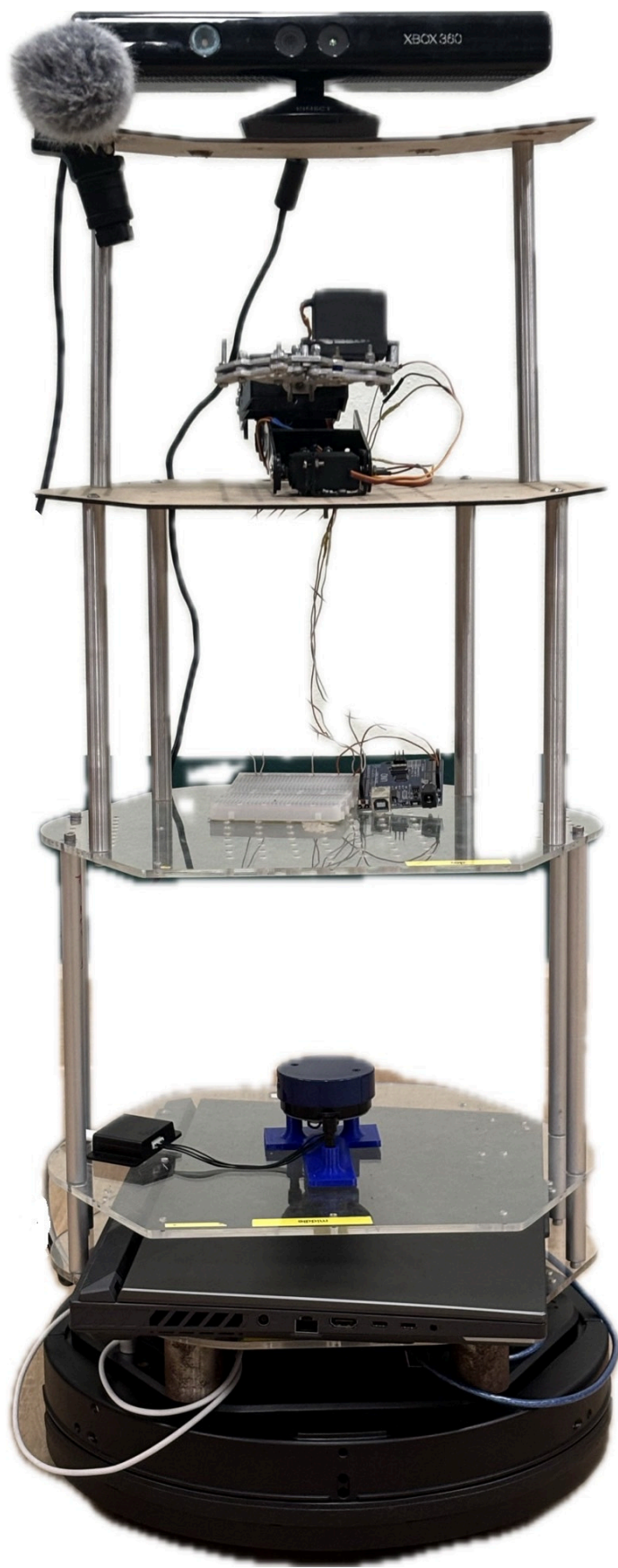
Introduction

"YOLOv9" a team that reached the Final 4 of the @Home Education Challenge Thailand Open 2024 in the high school category, is now preparing to participate in the RoboCup Malaysia @Home Education Challenge. Building on their success in Thailand, the team continues to push the boundaries of domestic robotics.

The "YOLOv9" team was formed by individuals passionate about artificial intelligence (AI) and domestic robotics. The team members have a strong interest in robotics and have gained substantial experience through participating in various robotics competitions, showcasing their expertise in both software and hardware development.

Participating in RoboCup Malaysia represents a valuable opportunity for the "YOLOv9" team to test and evaluate the potential of their developed robots. It also serves as a platform to demonstrate advancements in robotics and AI that can address everyday needs and enhance human life.

ROBOT DESIGN



Experience and Reflection

In our recent experiences, we've come to understand the importance of meticulous planning. When we take the time to plan well from the beginning, our work not only turns out better but also takes less time to complete. However, one area we recognize we need to improve on is time management. There are moments when we find ourselves with too little time to finish our tasks. Despite this challenge, what has impressed us the most is our ability to solve problems together as a team. The sense of pride we feel when we work so well together is truly rewarding.

Abstract

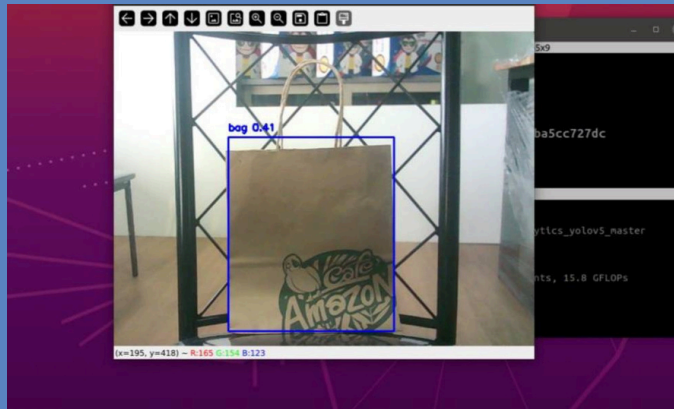
Yolov9 developed domestic robots to address significant societal needs by reducing the time spent on household chores and enhancing quality of life. Leveraging their knowledge and skills, the team aims to develop robots that efficiently meet these demands. The growing interest in domestic robots stems from their potential to alleviate household burdens and provide residents with more leisure time. The "YOLOv9" team is committed to advancing the capabilities of these robots so they can autonomously perform tasks such as cleaning, cooking, and managing various household activities. This not only makes daily life more convenient and efficient but also supports the independence and safety of the elderly and those with physical disabilities.

Developing domestic robots is a crucial step toward improving quality of life and simplifying daily routines. The team's approach to solving challenges in the @Home Education competition focuses on key areas such as gesture recognition, robot control, navigation, human tracking in both familiar and unfamiliar environments, voice interaction, and human-robot collaboration. These elements are essential for creating robots that can assist with household tasks autonomously with minimal user intervention. The use of sensors and AI enables robots to adapt to and respond effectively to changing home environments.

The "YOLOv9" team hopes that the results of this competition will be a significant step toward introducing and developing robots that can efficiently collaborate with humans in the future.

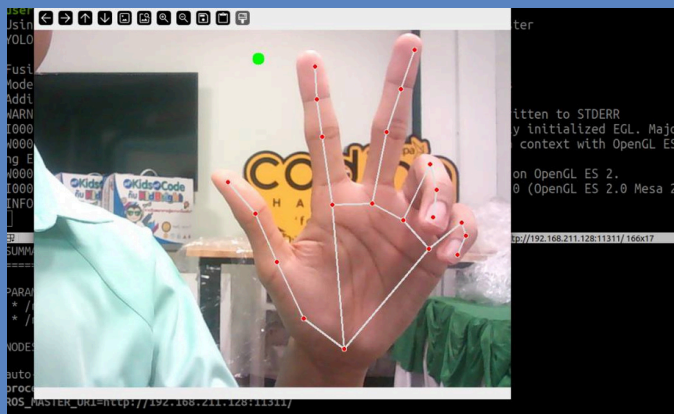
Technical Explanation

Object Detection



The robot performs object detection using the YOLOv5 model.

Hand Pose Estimation

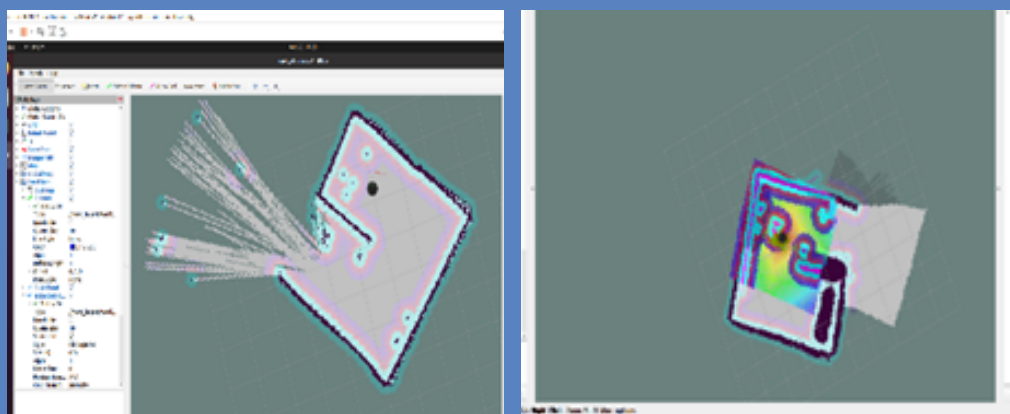


The robot integrates the MediaPipe library for hand pose estimation, allowing it to detect and interpret human hand gestures.

Voice Command Processing

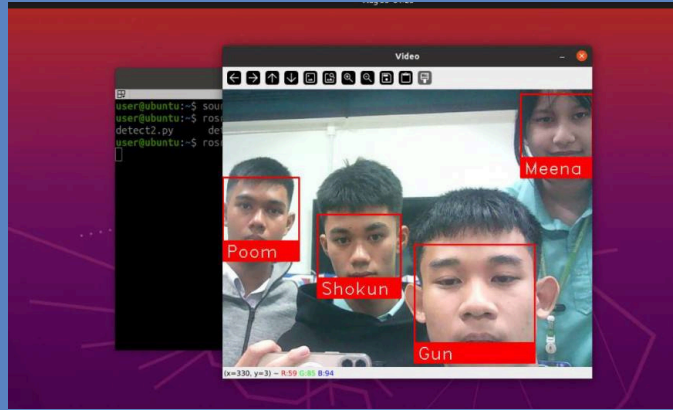
The audio data is processed using Google's Speech-to-Text API, which converts spoken language into text. Additionally, the robot uses Google Text-to-Speech (TTS), which enhances the interaction between humans and the robot.

Navigation and Mapping



The robot's navigation system effectively integrates Gmapping, SLAM, and Adaptive Monte Carlo Localization (AMCL).

Face Detection and Recognition



The robot utilizes the OpenCV library for face detection. Once a face is detected, the robot sends the data to a Face Recognition program.