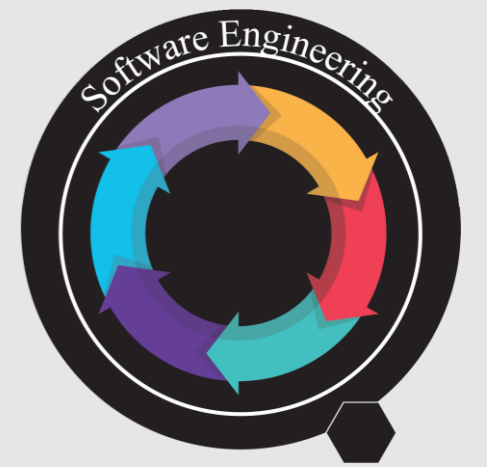




AGROBEE Autonomous Agricultural Unmanned Ground Vehicle

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Abstract

This project develops an autonomous system to detect and report harmful plants in agriculture, using AI. We created an autonomous driving algorithm, designed a simulation map, trained object detection models, and enabled system communication. The project provided insights into object detection, ROS development, and simulation environments.

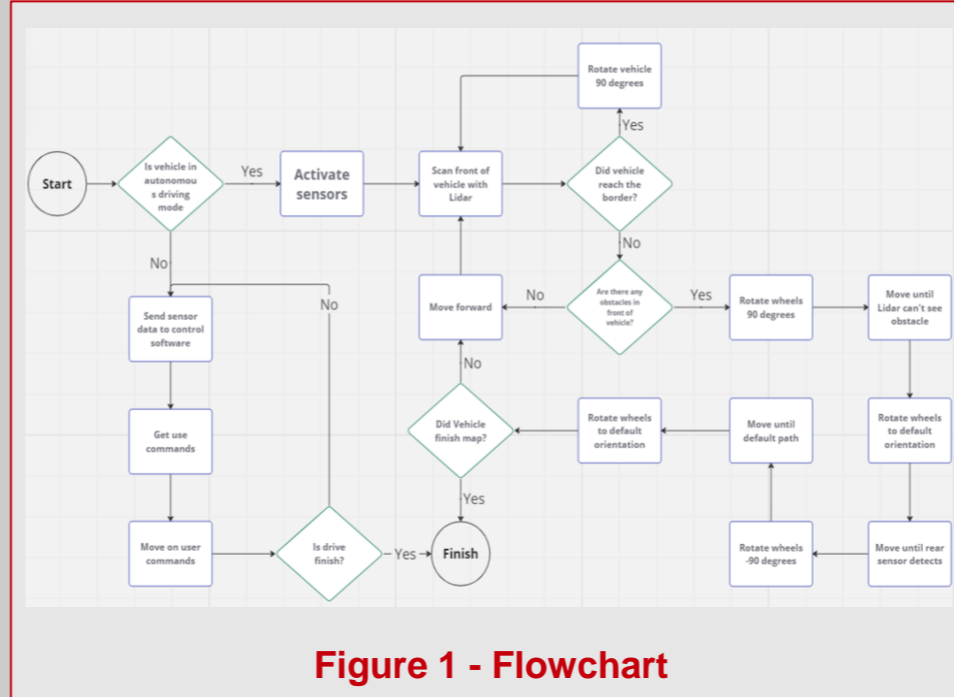


Figure 1 - Flowchart

Company Info

Initially developed for Teknofest's agricultural unmanned land vehicle competition, this project transitioned to a simulation environment due to interdisciplinary and financial challenges. Potential buyers include unmanned vehicle and robotics companies, AI developers, and agricultural tech firms, with end users being farmers and villagers.



Introduction

This project, initially for Teknofest, focuses on autonomously detecting and removing harmful plants in agriculture, ensuring safety and efficiency. It uses advanced technologies like ROS, YOLOv8, and Gazebo Simulation to navigate difficult terrains and transmit data. Drawing on various engineering disciplines, the project showcases the integration of cutting-edge technology to meet the competition's requirements and contribute to the agricultural sector.

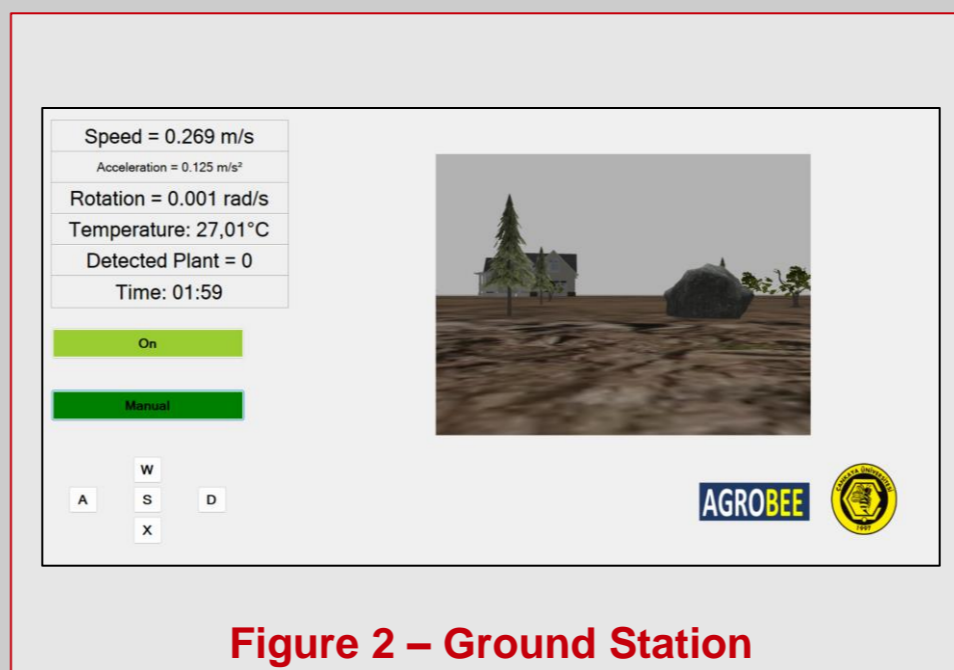


Figure 2 – Ground Station

Results & Conclusion

In this project, intensive research and work has been carried out in the fields of Robotics, artificial intelligence, advanced algorithms, interfaced form application development, simulation and socket & ssh communication. Awareness has been gained about the efficiency arising from the automation that such systems will provide in many different areas, especially agricultural areas. Considering the technological developments that will occur in this field in the future, we have gained very valuable gains and experiences thanks to this work we have done.

Solution

The solution offered by the project can be examined under 4 basic components. These are the autonomous driving algorithm that enables movement with the help of sensors such as LIDAR and cameras, the object detection model that detects the target plant, simulation environment preparations and ground station software that will serve to simulate all of these. The vehicle processes data from its sensors and uses it in autonomous driving with the virtual physical environment derived in a simulation environment, and also processes data from its camera and detects objects. Simultaneously, it provides data communication with the ground station with the help of socket and SSH technologies.

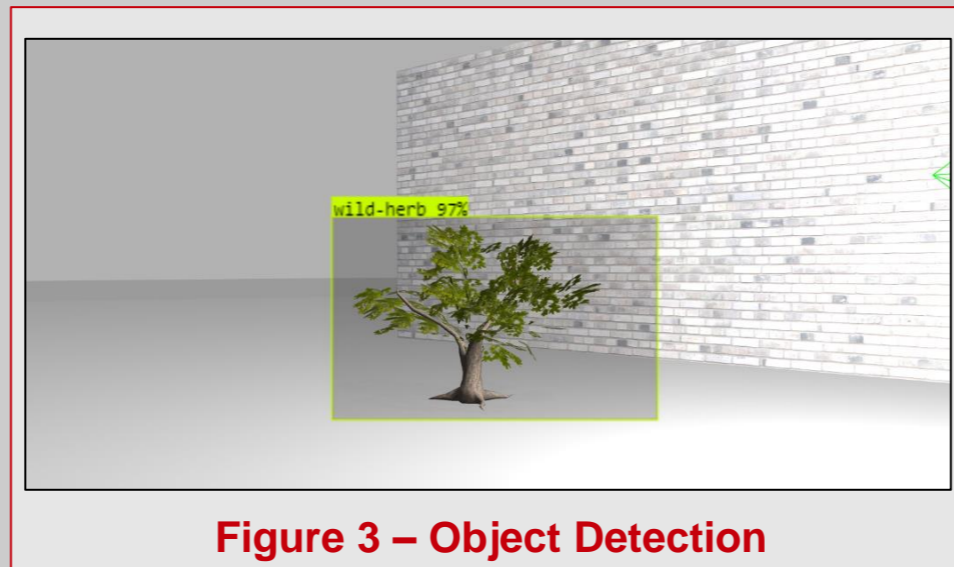


Figure 3 – Object Detection

Acknowledgement

We would like to thank Prof. Dr., who is also the advisor of our project, for his valuable contributions to us. dr. We would like to thank Mehmet Reşit Tolun. During the project development process, we consulted a lot with our friends from different departments or schools who have dealt with ROS.

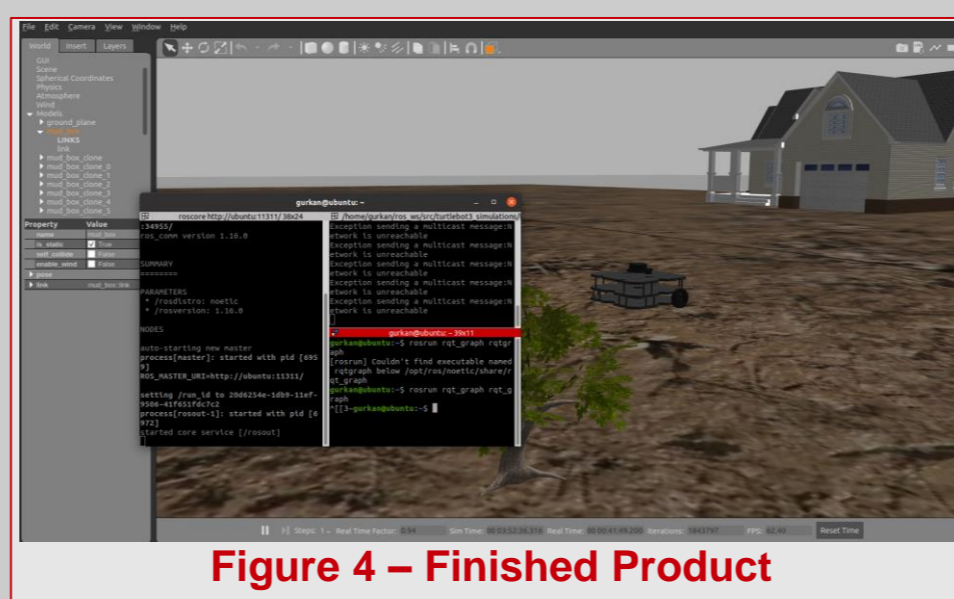


Figure 4 – Finished Product

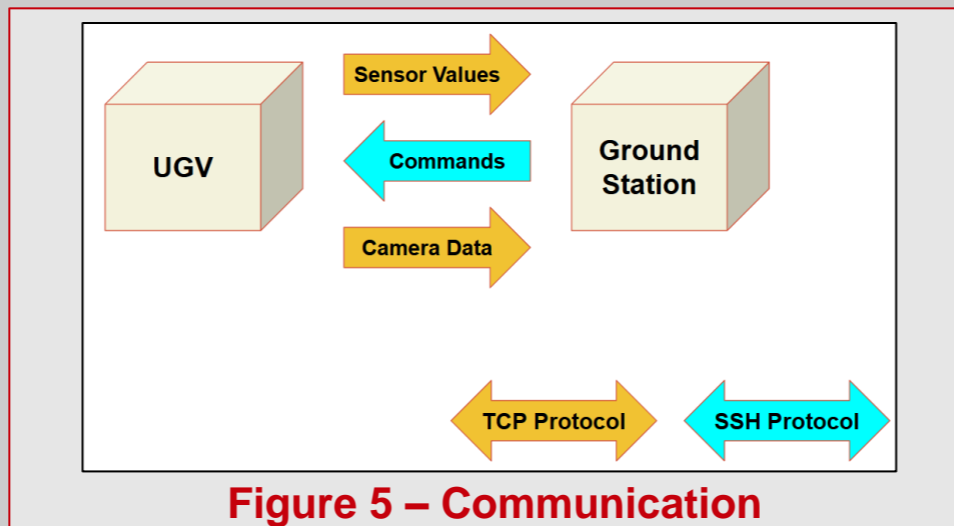
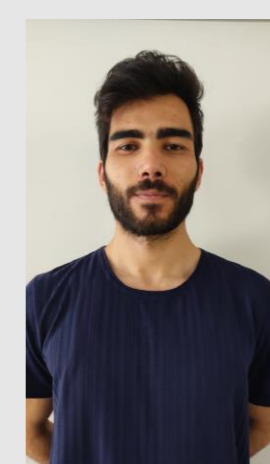
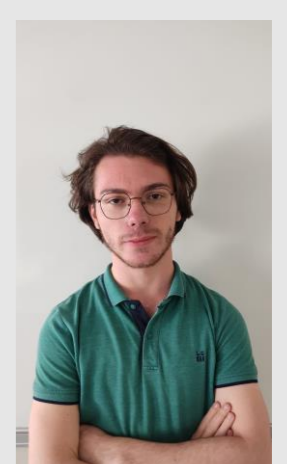


Figure 5 – Communication

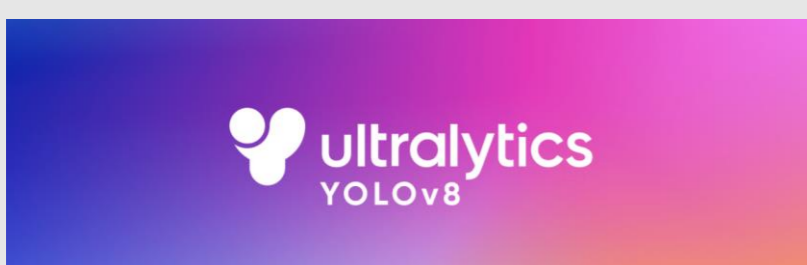
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