

# TURTLEBOT 3

## WAFFLE PI: FULLY AUTONOMOUS EXPLORATION ROBOT WITH OPEN SOURCE SOFTWARE

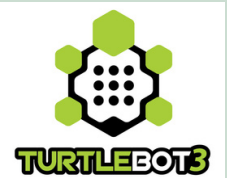
### PROJECT AIM

This project aims to develop a fully autonomous exploration robot with open-source software and LiDAR-based SLAM navigation.

### OBJECTIVES

- Develop a SLAM-based software solution for exploration task
- Develop robot prototype with Turtlebot3 hardware and ROS Software
- Develop improvements for SLAM-based software to achieve fully autonomous and efficient exploration task performance

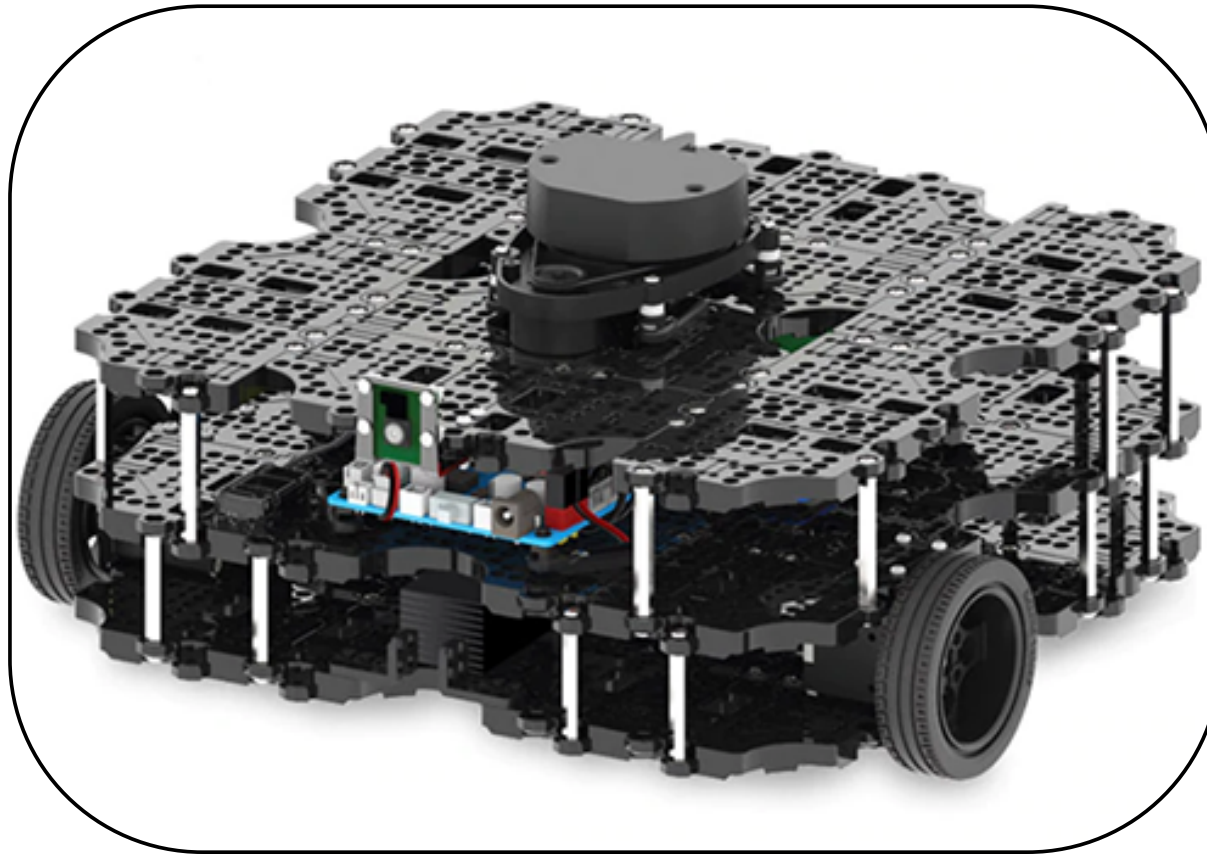
### TECHNOLOGIES



ROS



LiDAR



### PROCESS AND PROGRESS

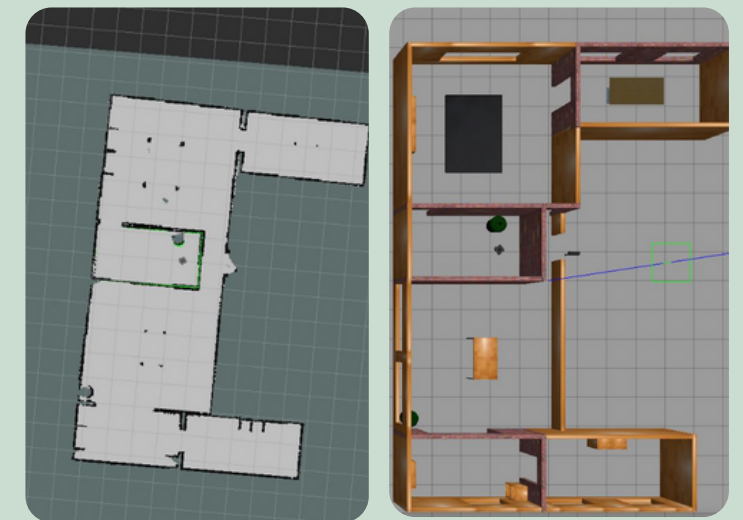
- The initial step was to develop software with ROS available open-source software and use it in the Gazebo simulation tool.
- Afterward, combine software with the hardware part of Turtlebot3 Waffle Pi
- Lastly, increase the efficiency of software tools by developing the implementation of improved navigation packages

### CONCLUSION

- The robot is able to perform exploration tasks successfully with great results.
- The project's performance is gradually increasing day to day. SLAM is still a widely open topic for research which is to be improved.
- There is further potential and scope for this project, as other SLAM packages are available and were not used in the scope of this research

### TESTING AND RESULTS

Tests were performed within the Gazebo simulation tool with a complex House map along with a real-world environment including obscured and mobile objects.



Multiple tests performed include results of performance from different packages used. And clearly provide visibility on their performance. Artifact is not ideal, as SLAM is a complex question not yet answered, however excellent performance results were achieved by Explore Lite.

### APPLICATIONS

- Autonomous navigation, localization and mapping
- It is used as an intelligent system that aids armed forces in difficult situations and time
- It can be used to automate tasks in a home environment, such as cleaning or surveillance.
- It can be used in agricultural settings to automate tasks such as planting, watering, and harvesting crops.
- It can be used for surveillance and security purposes, such as monitoring a building or a public area.
- In research and as an educational tool