WARTHOG ROBOTICS @HOME TEAM 2023

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INTRODUCTION

Antares, widely used in competitions, is Warthog Robotics' first and only service and assistive robot. Antares' hardware structure contains a Pioneer P3-DX robot, a robotics manipulator, a LiDAR, and a Kinect 2. Meanwhile, its software is developed using ROS and provides speech, parser, navigation, object recognition, face recognition, people following, and object manipulation systems, all integrated and working by voice command.

NAVIGATION

The navigation system is one of the main parts of the robot, as it must be capable of moving independently. To properly move, the system needs to understand its current position, have a goal position, create a route between these positions, and avoid obstacles that may show up.

For that, a laser sensor (LiDAR) located in the front of the robot is responsible for generating an environment map. For the map visualization, we use the ROS tool RViz. To facilitate the development and improvement of the navigation system, we opted to use a simulated model in Gazebo. Then, we could create different home environments with challenges to test our system.

GOAL POSITION

The LiDAR maps the surrounding of the robot, locating the fixed obstacles. Then, we set the rooms' coordinates in the code, and when the voice command indicates a location to go, the state machine transit to the Navigation state to get the related coordinates and trace a route between the current position and the goal position.

OBSTACLE AVOIDANCE

When an unexpected obstacle gets in the way of the robot, the LiDAR detects a barrier. Then, the map creates a temporary block on the area, and the robot process another way to avoid the obstacle. At last, it returns to its previous route, and the map returns to its original.

CONCLUSION

The navigation development is an important project in the group, as it well-integrates hardware and software functionalities. By doing that we created a safe and well-working system that prevents Antares from causing an accident and enables it to help moving in the same or different rooms in a house. For future work, we expect to keep improving this and other software systems and developing a better way to navigate through a home.

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