

Robotics Scripts

You have been hired by a top secret government agency to deploy a robot to monitor an environment looking for a suspicious object. The robot is a simple turtlebot, for government budget reasons. The environment is given to you in figure 2.1.

[Camera fades in to a simulated environment within Gazebo]

Narrator (Voiceover): "Imagine a robot, autonomously exploring an environment, mapping its terrain, and seeking a specific object. This has been made possible with the development of an autonomous navigation system for a TurtleBot. "

[Show TurtleBot exploring the environment in Gazebo]

Narrator (Voiceover): "We used Gazebo for simulation, gmapping for building maps, and a custom node for navigation. Our robot can now explore, identify a specific green utility cart, and navigate to any given coordinates."

[Show gmapping in action, mapping the environment]

Narrator (Voiceover): "By using the gmapping package, a ROS package implementing SLAM, the robot creates a 2D occupancy grid map in real-time, updating its knowledge about the surroundings as it explores. Once the map is complete, it is saved and then converted into an occupancy map using OpenCV."

[Show the maps in various formats]

Narrator (Voiceover): "The resulting map generates a binary image distinguishing free and occupied spaces by 0s and 1s respectively."

[Show PID controller and the TurtleBot smoothly navigating]

Narrator (Voiceover): "To navigate smoothly and accurately, we used a PID controller, minimizing the error between the desired and actual location of our robot."

[Show the RRT algorithm and the robot moving along the path]

Narrator (Voiceover): "The key component is the Rapidly-exploring Random Tree, or RRT algorithm. It effectively handles path planning in complex and dynamic environments, providing feasible paths from the robot's current location to the target coordinates."

[Show Gazebo state service and utility cart detection]

Narrator (Voiceover): "The robot's real-time location in the simulation is obtained through Gazebo's state service. As for the utility cart, the robot detects it by processing its own RGB images to isolate the green color, which represents the utility cart."

[Show the robot locating the green utility cart]

Narrator (Voiceover): "Once the cart is detected, a message is published to the '/witsdetector' topic. The size and shape of the detected green object is then verified to confirm it as the utility cart."

[The camera fades out, ending the video]

Narrator (Voiceover): "With this technology, we've created a system that enables robots to navigate and interact with their environment autonomously. The future is here."

[End Screen]