SoET Tech Expo, Spring/Fall 2026 – Team 35

Gesture Controlled AMR

Team: Maddie Little, Patrick Shea, Aidan Christy, Dylan Scheumann, Gabriel Bigot, Jose Rodriguez

Mentors: Fred Berry, Varshitha Yalamanchili

Purdue University Polytechnic Institute

GyroPalm

Problem Statement

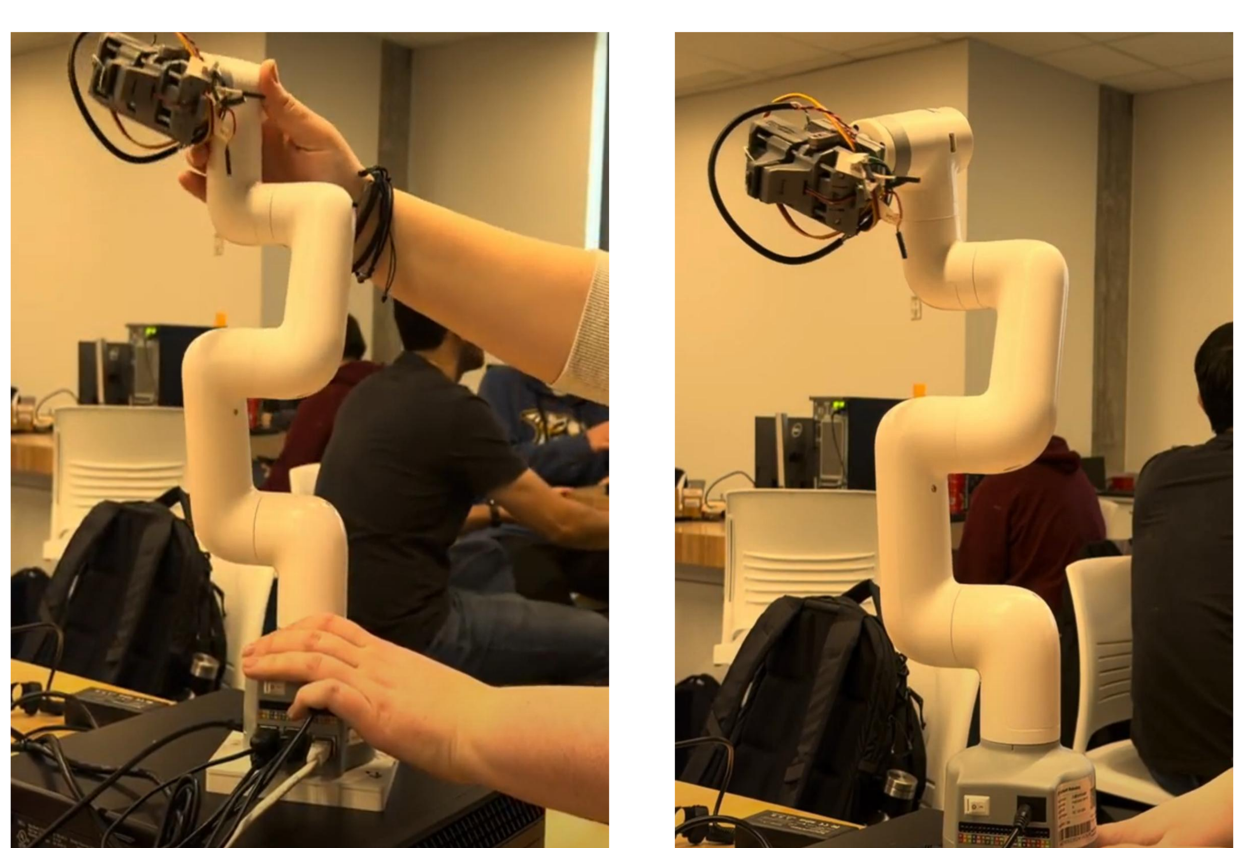
GyroPalm VIMPAACT technology needs to be fine-tuned in use with Spectrum technology to navigate more efficiently in obstacle-dense environments. The completion of this goal will allow to more easily use GyroPalm's technology together with the Vuzix Blade and Spectrum technologies. At the end of the project, GyroPalm wearable has to be integrated with myCobot arm and additionally the Omnibot V2 will be autonomously navigated in the Lambertus fourth floor.

Customer Background

GyroPalm is a company founded by a former Purdue capstone student, Dominick Lee. The company's main product is the GyroPalm Encore, a smart watch enabling gesture control of various smart products. GyroPalm has also won awards for their GyroPalm Spectrum AR glasses package. Now, GyroPalm is working on an AMR called Gyropalm Omnibot V2, which may be integrated with the Gyropalm Encore and Gyropalm Spectrum for seamless control in industrial, home, and workplace settings.

Tabletop Robot Arm

While the simulation team was working on ROS2 simulations, the cobot team was working on learning more about programming by using a myCobot 280pi tabletop robotic arm. The team learned how to control the robotic arm using the integrated block code system, python, and were able to upload the robot into RViz and simulate movement in RViz as well. Using python code, the team programmed the robot to "drag teach" . Later, the team worked on integration of the myCobot arm with Gyropalm wearable technology. The cobot team was able to control the robot using the wearable manually with buttons on the watch screen with Bluetooth.

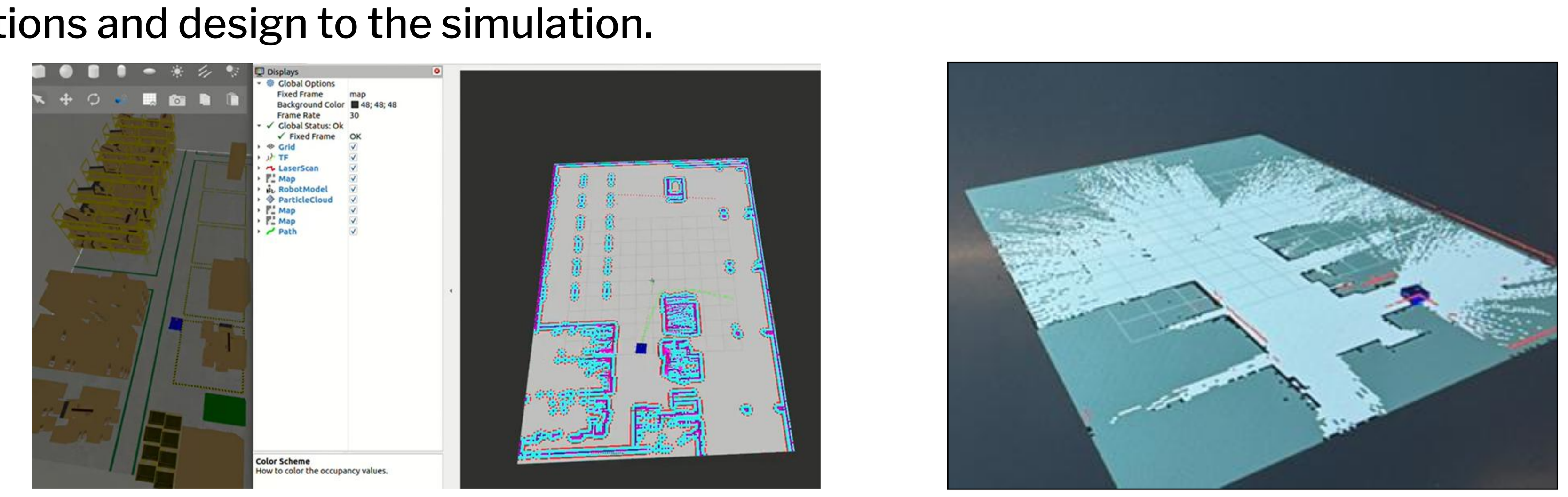


Elephant Robotics MyCobot 280pi controlled through drag teaching and python scripts

Testing and Simulation Design

Prior to utilizing the physical robots, the team worked on computer simulations to gain a better understanding of Robotic Operating System (ROS2) and its tools (such as: Gazebo, RViz, SLAM, and NAV2). Gazebo was used to simulate and apply physics to a virtual world. Whereas RViz was used to visualize the data the robot was collecting (ex. Lidar Scans, Robot Positioning). Once these worked properly, teleoperation was made possible using the computer keyboard and controllers.

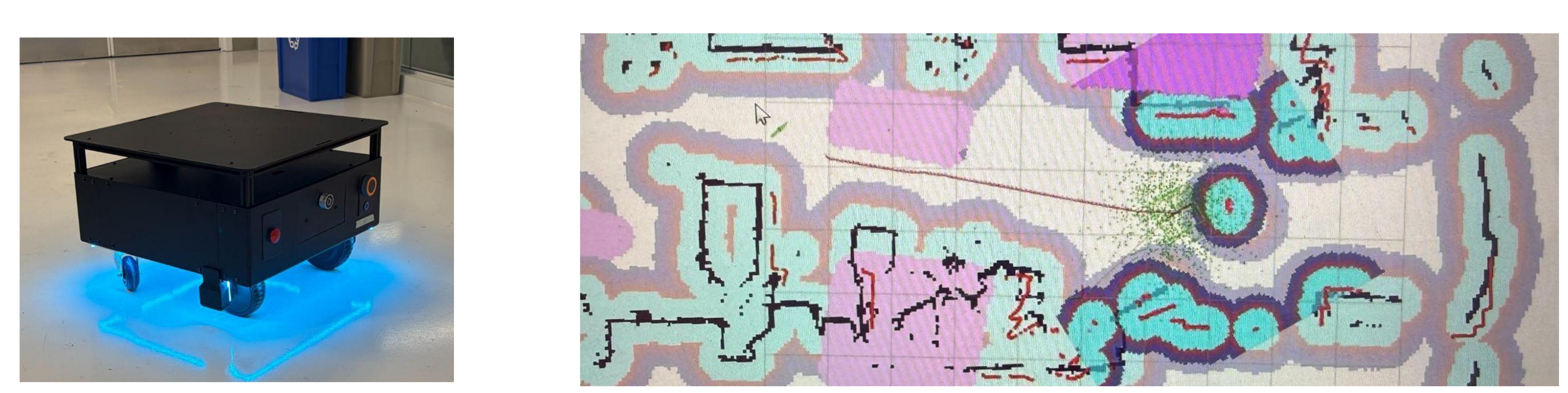
The second portion of the simulation was the utilization of SLAM mapping and NAV2. By utilizing teleop, the simulated robot was driven in a virtual world and mapped its surroundings (see left Figure). Once this map was attained, NAV2 was used to generate global and local costmaps. These maps were used to path plan for autonomous navigation. The global costmap accounted for obstacles found while mapping, and the local costmap accounts for the robot's immediate and changing surrounding. The physical robot had utilized similar functions and design to the simulation.



Gyropalm Omnibot V2 and Gyropalm Encore Wearable communicating wirelessly through ESP-NOW or Teleop. Successful SLAM map and NAV2 displayed

Physical Design and Final Results

The GyroPalm Omnibot V2 is a fully functioning product, along with gesture-control capability. The first task for the team was learning to control the physical robot via teleoperation with ROS2. A remote desktop was used to access the computer inside of the GyroPalm Omnibot V2, and from there teleoperation was possible not only with a keyboard, but with a GyroPalm Encore wearable, as in the simulation. The next task was to implement NAV2, having the GyroPalm Omnibot V2 navigate autonomously to any point in an environment. Through the remote desktop, the team was able to create SLAM maps for both the Smart Manufacturing Lab and the entire 4th floor of Dudley and Lambertus Hall. From there, the team used RViz on the remote desktop to give the robot the SLAM map and its initial position. NAV2 capabilities in RViz then allow the robot to navigate to any point in the environment that the team may choose. The GyroPalm Omnibot V2 also has the ability to be controlled manually by a user through a custom-made button interface made by the team or preprogrammed gestures, both on the Gyropalm Encore wearable.



Gyropalm Omnibot V2 and the COST map of the Smart Manufacturing Lab.

Gyropalm Omnibot V2 and Gyropalm Encore Wearable communicating wirelessly through ESP-NOW or Teleop

GyroPalm Encore Wearable

The GyroPalm Encore wearable allowed the team to interact with the technology around us all through our wrist. GyroPalm has a custom GUI designer to allow for the interface of the watch to be whatever is needed. The team designed firmware to communicate to the myCobot 280pi, the ROS2 simulation, and the physical GyroPalm Omnibot V2. Bluetooth was used to sending signals to move different joints of the myCobot 280pi as well as control the simulated Omnibot within ROS2. ESP-NOW protocol was used to communicate to another microcontroller within the GyroPalm Omnibot V2 which then signals the ROS2 mini-PC to direct the GyroPalm Omnibot V2 it's destination.

Custom programmed screen with "Team 35" and teleop keyboard