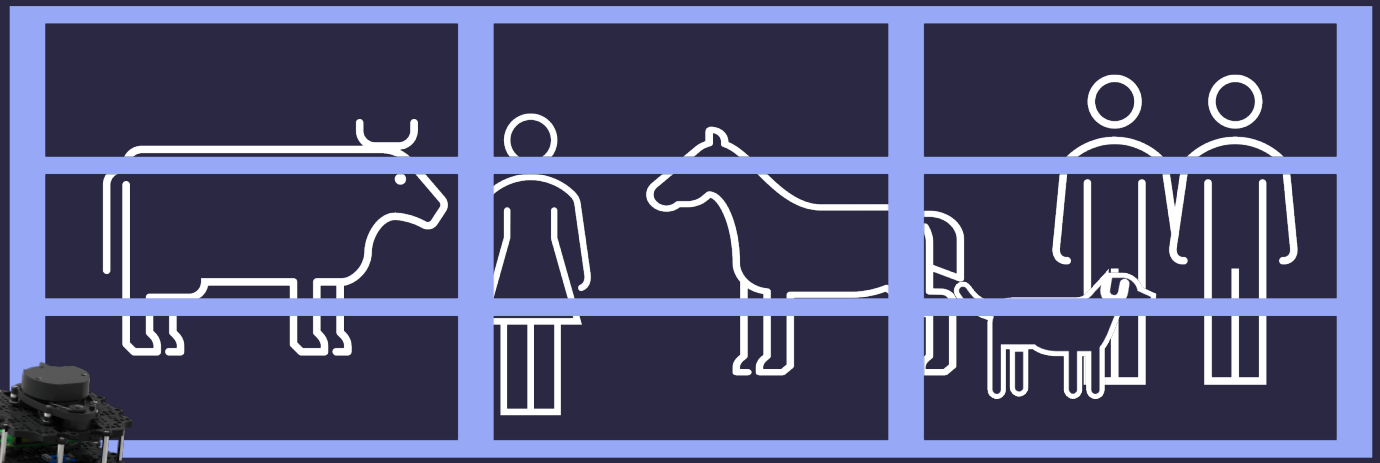
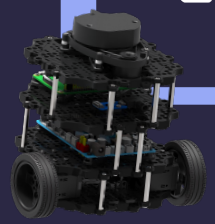
AA 274A Final Project

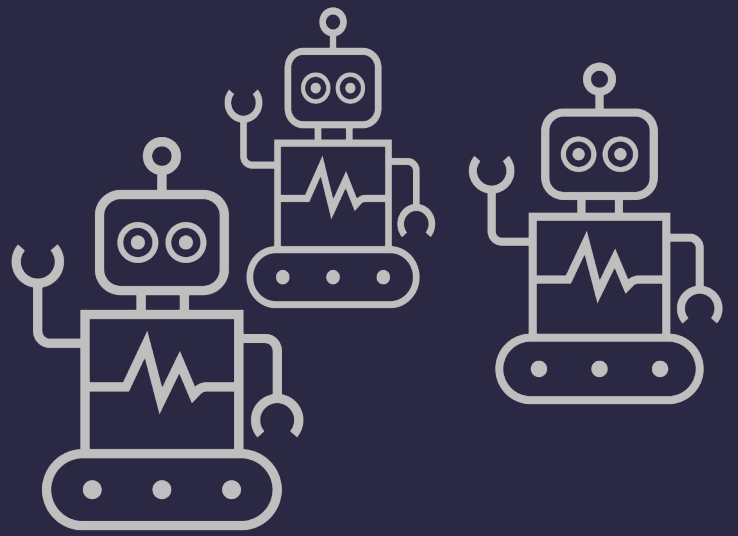
Backstory

iRobot2 – the Zoo

In the year 2122, robots have taken over the world and keep all animals and humans, including Will Smith, hostage. However, among all the evil robots, one good one is still left, Turtlebot. Although admittedly inferior in terms of technology and design, his goodwill and courage make him the biggest hope for humankind. In a crucial mission, he has to rescue animals and humans from a so called zoo.

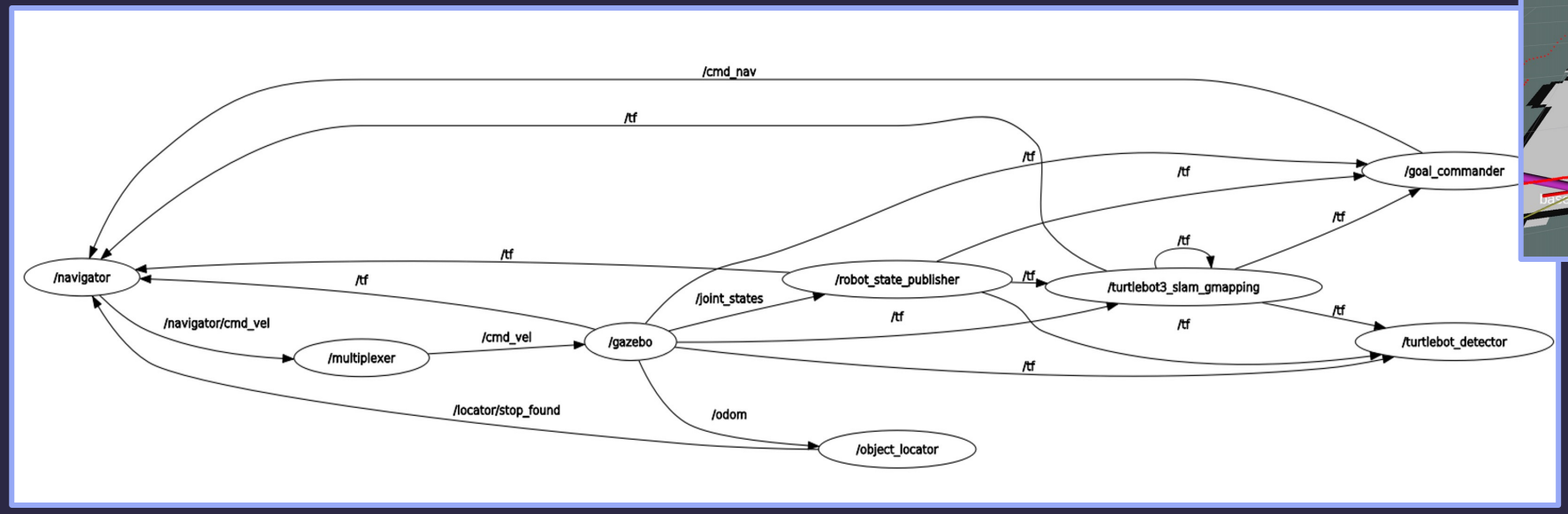


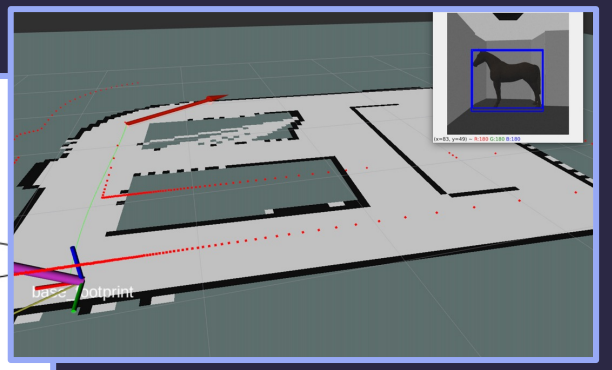




Baseline Mission

- We manually set several waypoints needed to explore the map
- While exploring the map, the turtlebot's object detector localizes different animals and humans and saves their type and position
- After the exploring the map fully, turtelbot start his rescue missions in the user defined order





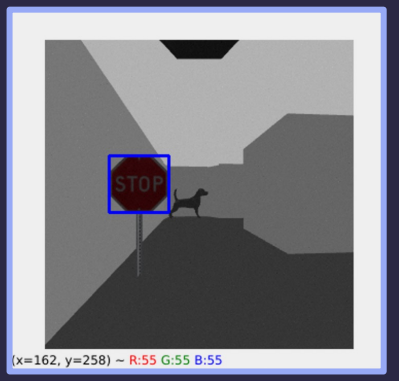
Extensions

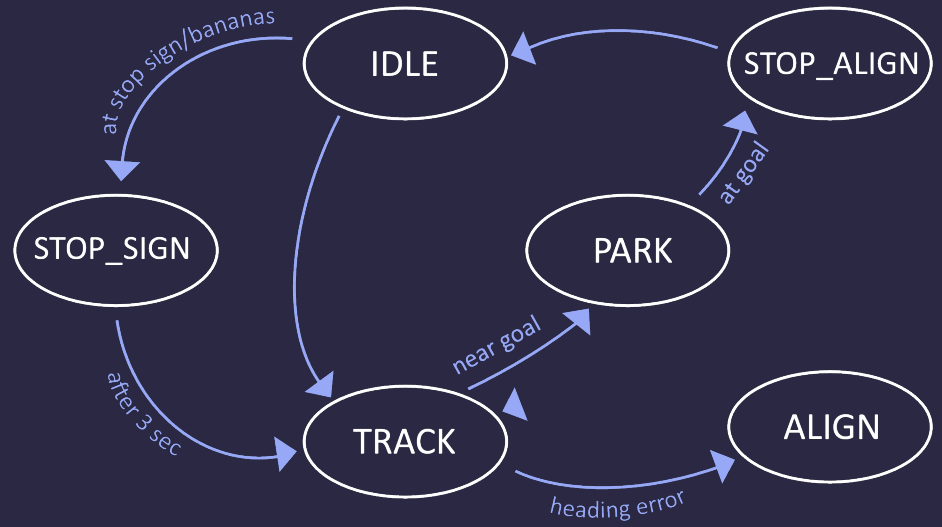
1. Stopping at stop signs and bananas

- Despite his high focus on completing the mission quickly, turtlebot stops at stop signs. Also, his weakness is his love of bananas, so when he finds one, he can't resist stopping briefly to snack on it

- The navigator switches to the STOP state when it receives a stop found message from the locator.

- It stops for 5 seconds and adds a crossing logic to ignore object for the next 3 seconds. This is to prevent the turtlebot from stopping for the same object.





Extensions

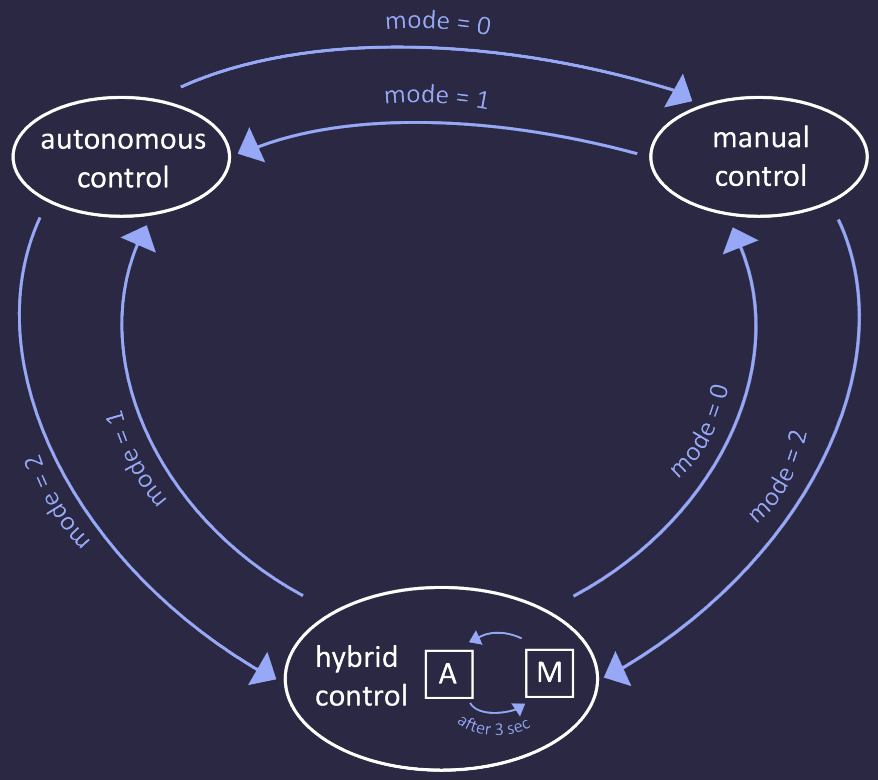
2. Smart multiplexer

We designed a multiplexer with three modes of operation:

1. Autonomous control: It routes the robot autonomously by consuming the commanded velocity from the navigator.

2. Manual control: It uses the keyboard commands to manually teleport the robot.

3. Hybrid control: It toggles the robot between the autonomous and manual modes seamlessly depending on the latest message received. We also added a 0.5-second grace period after receiving a manual input to avoid the autonomous system interrupting the user request.



Extensions

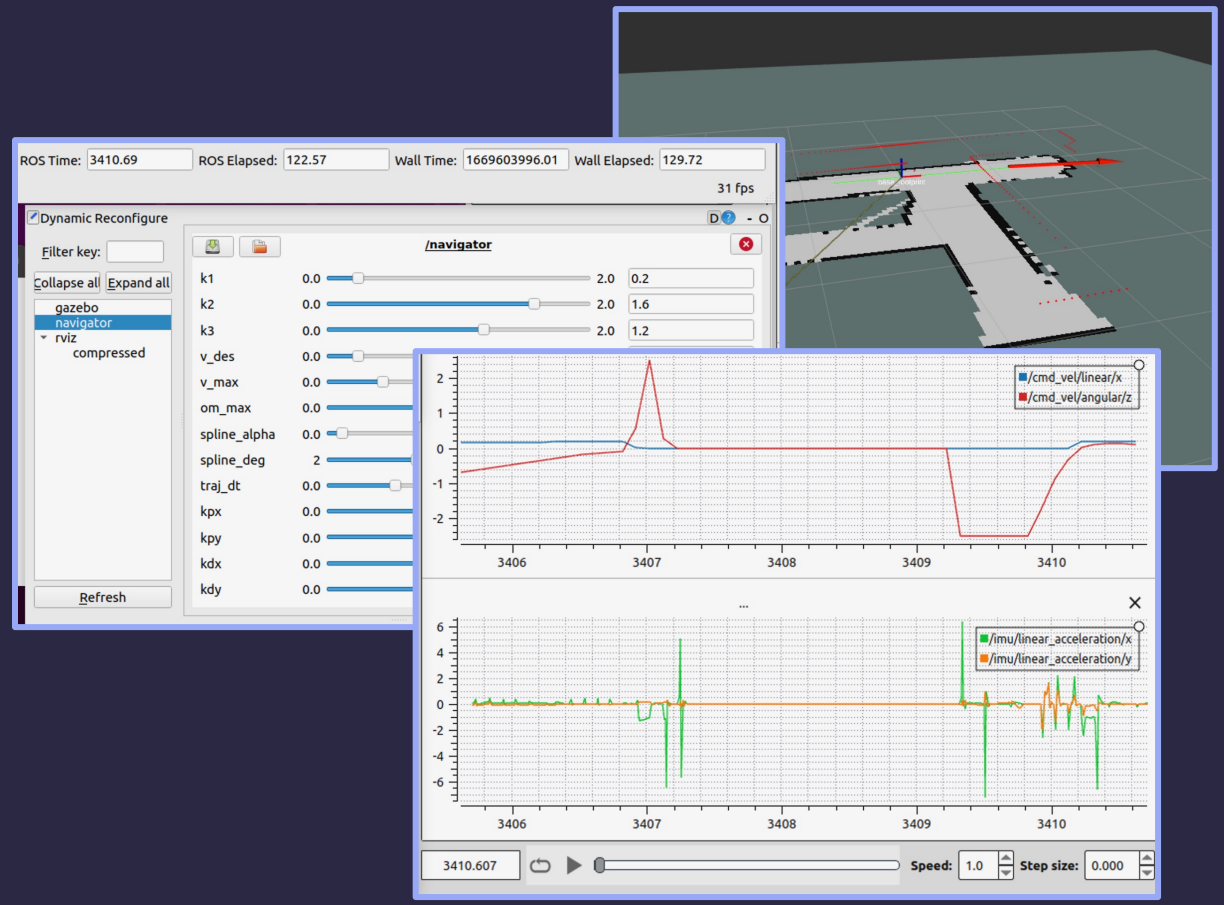
3. Interactive interface and polite animals

- After map exploration, the system (aka turtlebot) informs the user which animals he found and asks which animals to rescue
- The user enters the animals he wants turtlebot to rescue with his keyboard in the desired order
- If animals entered were not found, the system gives feedback on which animal is missing. Otherwise, turtlebot starts the rescue mission and prints the current status of the mission
- Animals are delighted when rescued and say thank you with cute pictures

Extensions

4. Live Data Introspection, Parameter Tuning, and Command Center Extension

- Extensive live data introspection with PlotJuggler. Plot Juggler is a lightweight visualization tool that directly connects to any running ROS topic and allows for live signal processing, like filters and math operations.
- We integrated a complete GUI for live parameter tuning to maintain an overview and intuitive control over all parameters.
- To have a good overview in rviz, we visualize the point cloud, the goal marker, IMU, and a laser scan.



Happy End

Turtelbot saved the world