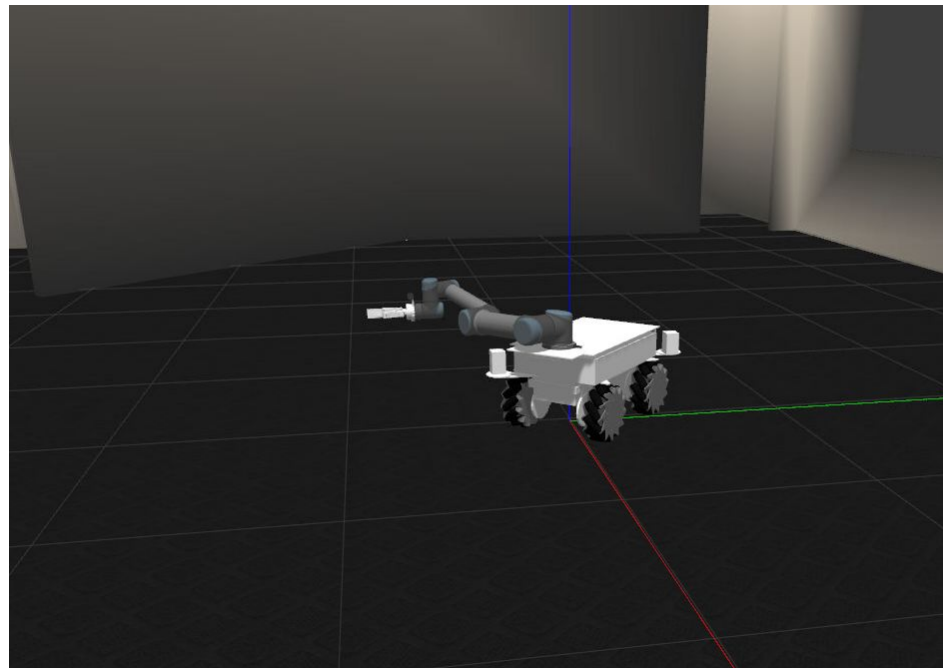


Robotic Search and Rescue (SAR)



Task Goals

- **Base goal:**
 - Explore indoor environment and build a map, save the map, return to starting location
- **Stretch goals:**
 - Find objects / people in indoor environment through camera
 - Update existing map with what has changed

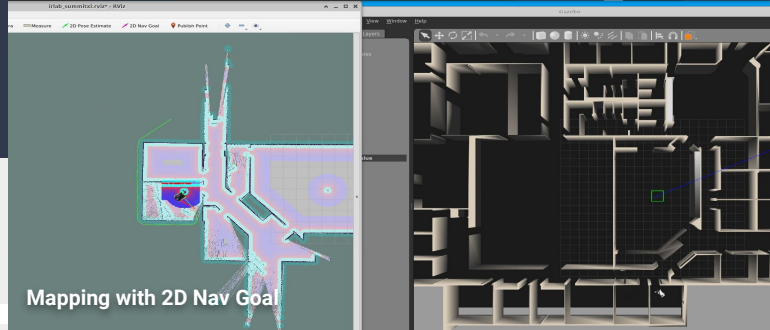


Methodology Adopted

01

Familiarization with the platform

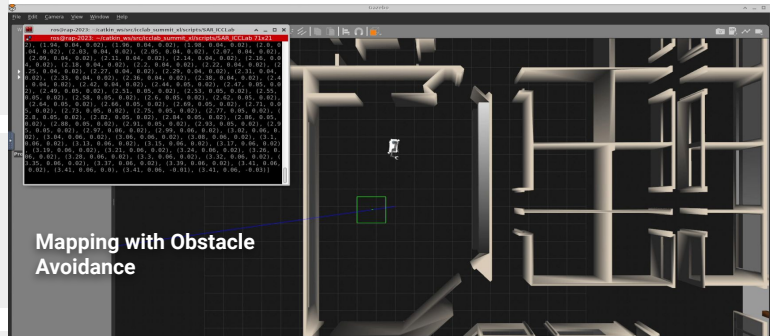
- Used summit_xls launch file
- Used 2D Nav Goal to move the robot around



02

Gmapping with 2D Nav Goal

- Used summil_xls with gmapping extension
- Navigated the bot using 2D Nav Goal



03

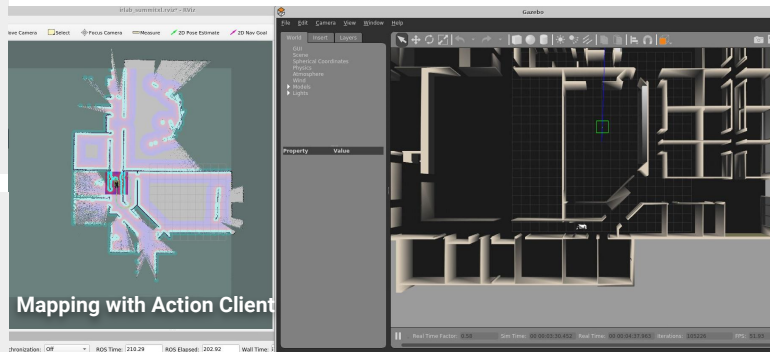
Gmapping with Obstacle Avoidance

- Used summil_xls with gmapping extension
- Ran a node with basic obstacle avoidance sequence
- Modified the code with a position tracker to avoid visiting the same location twice

04

Gmapping with move_base Action client

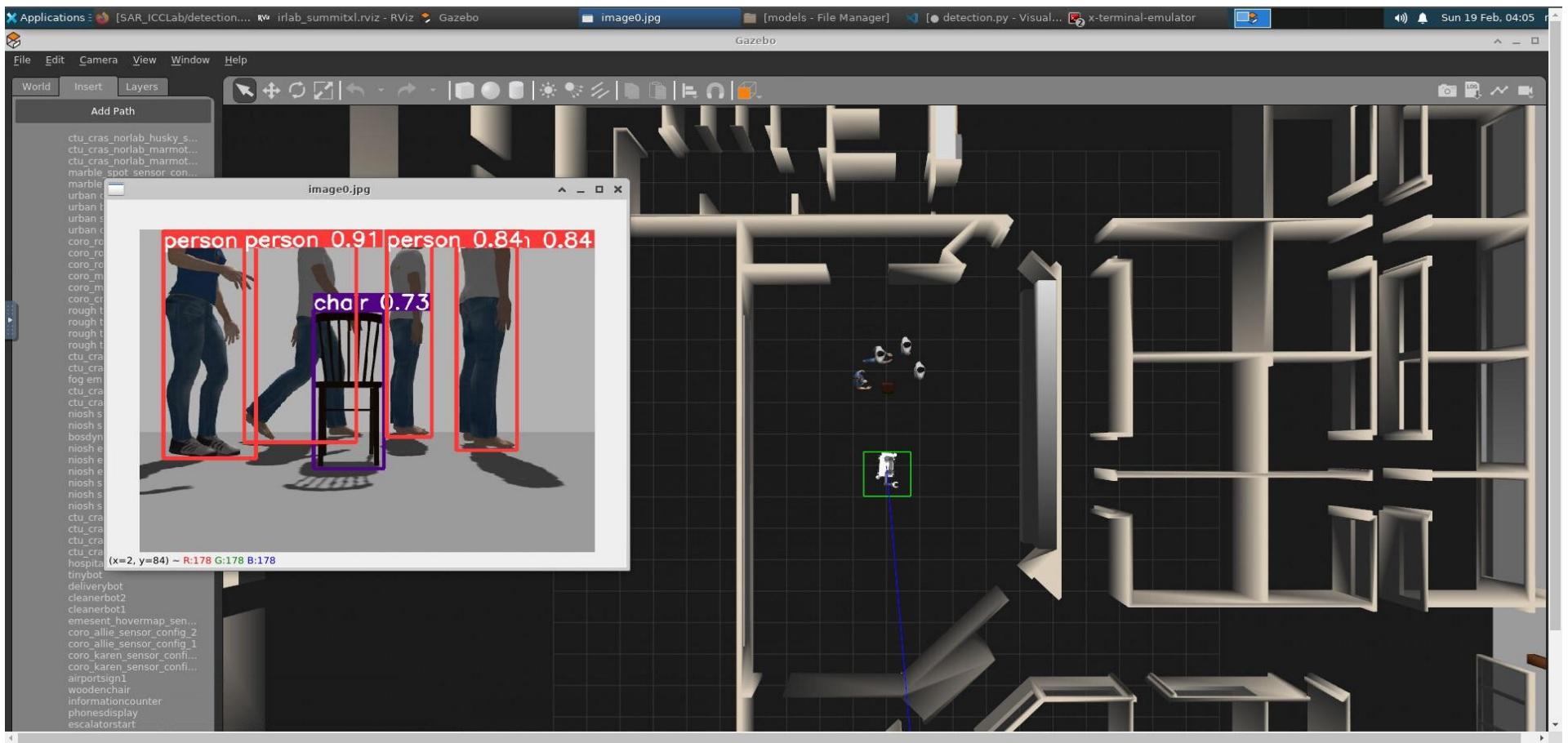
- Used summil_xls with gmapping extension
- Ran a action client node with random goal locations
- Modified the action client node with selecting the goal positions from the boundaries of the explored region using Occupancy Grid



05

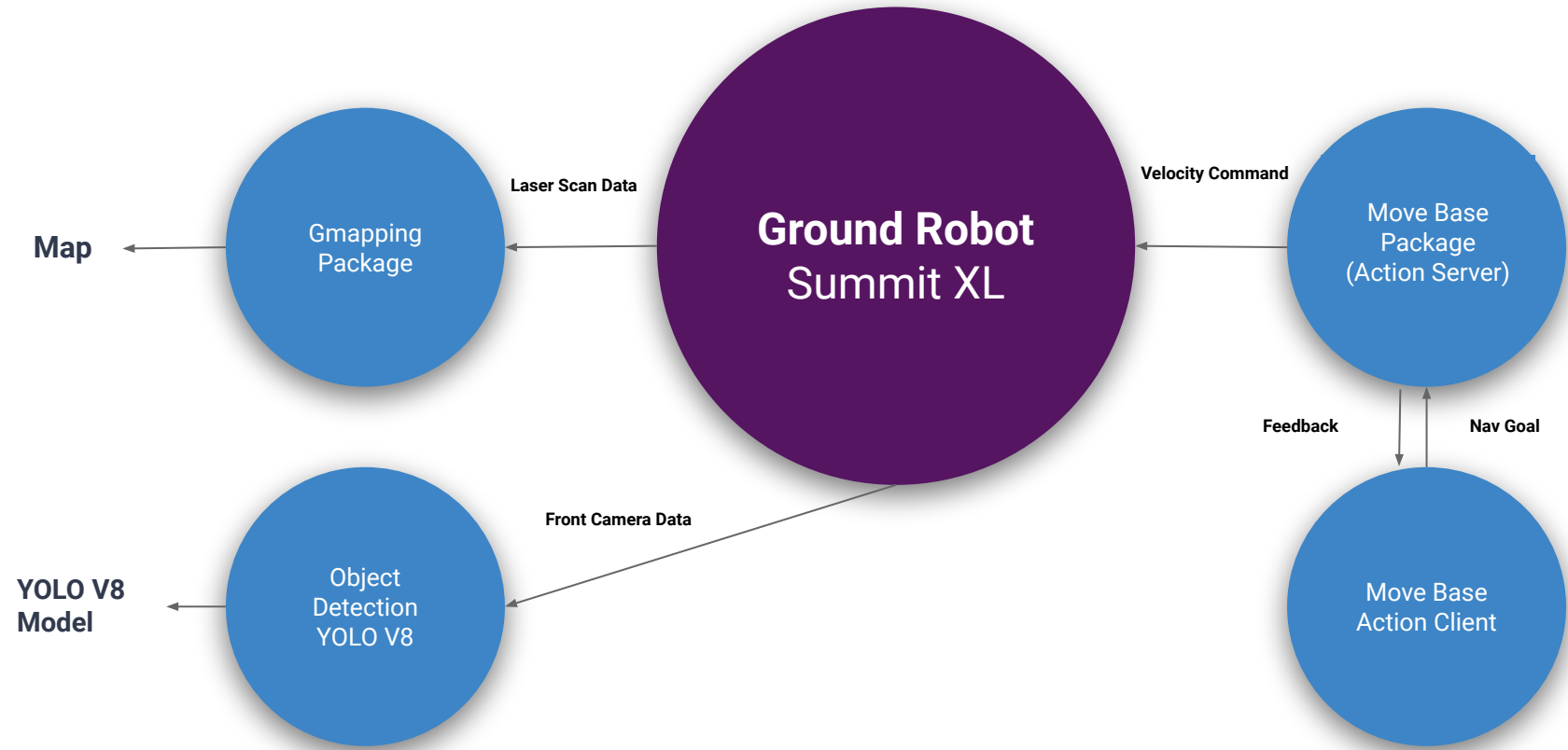
Object Detection While Mapping

- Used the modified action client node with gmapping launch file
- The detection was achieved using YOLO V8 object detection model.



Mapping with Object Detection

Functional Architecture



Incomplete Tasks

- The complete map generation was not achieved
 - A suitable strategy to scan the full region and to stop ones when the entire region was scanned was not formulated
- The return to origin sequence was not implemented
 - Had dependency in the map completion task
- Dynamic Map updation was not done

Challenges

- Technical
 - Couldn't bring up the simulation on the local machine, had to rely on the online platform
 - Initially, was unable to decode the laser scan data
 - Took some time to relearn ROS (was not in touch with it for over 2 years)
- System
 - Simulations were not working properly (Local machine)
 - Managed to get a moderately abled machine for this task
 - Internet connectivity was not very reliable (during travels, which I had to do a lot)

Final Output

