

# Repository README

## Coordinated Robot Search

Bachelor Project 2025

- [Thesis Report](#)
- 

### **botbrain documentation**

#### **botbrain**

Rust library crate containing the core logic of the project including the search algorithms. Documentation can be found [here](#).

#### **simple\_sim**

A simple simulator for running behaviors defined in [botbrain](#).

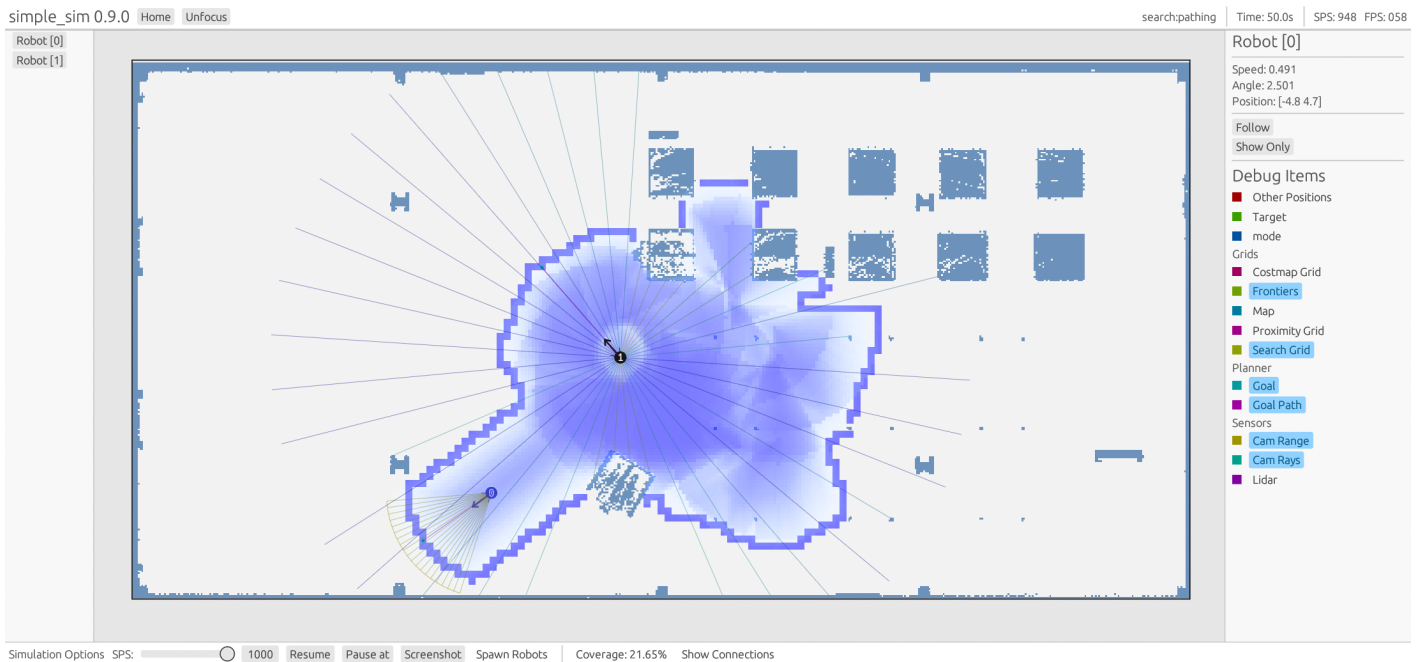
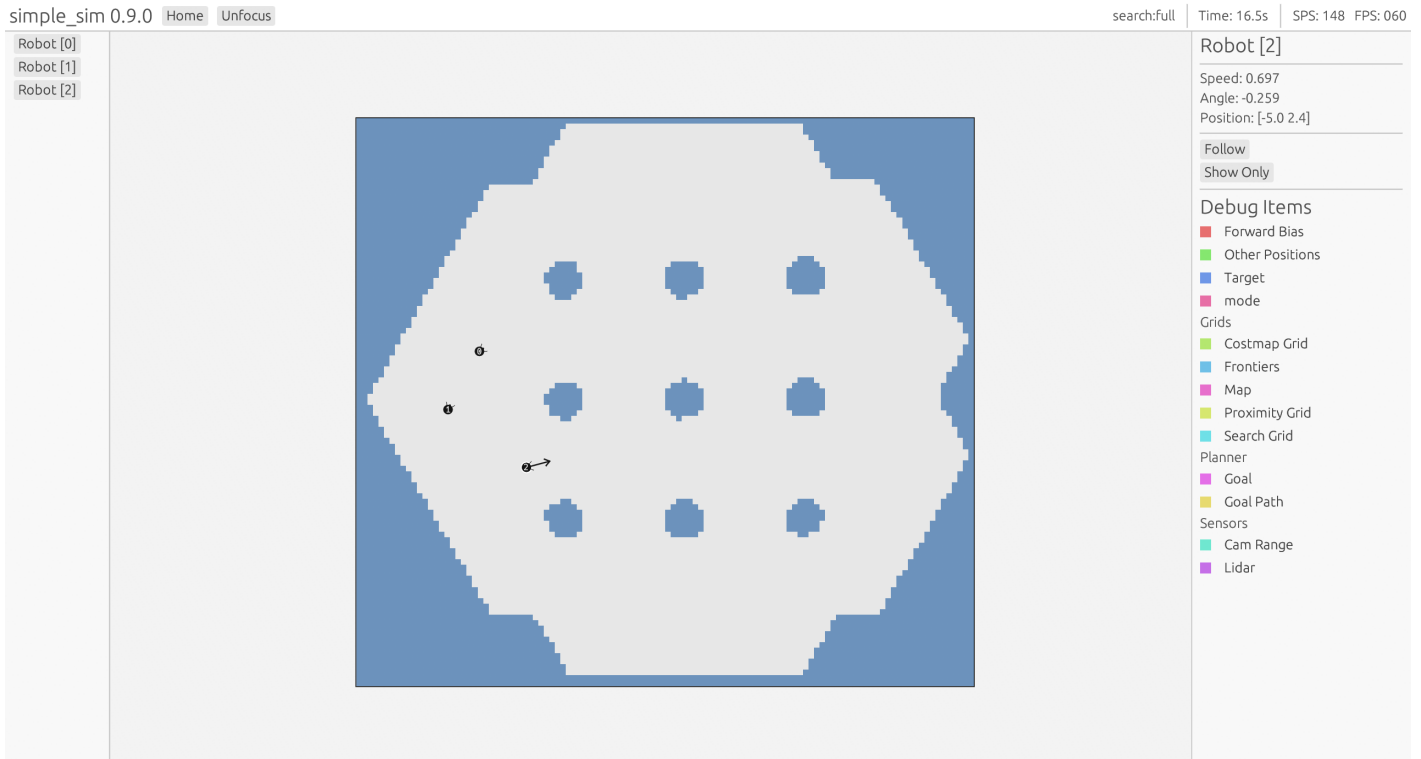
Start the simulation with:

```
cd simple_sim
cargo run --release -- run ../worlds/bitmap/depot/depot.yaml search:pathing
```

When the simulator opens, click **Spawn Robots** and click on the map to spawn robots. The speed of the simulation can be adjusted by dragging the slider in the bottom left. Information in the **Debug Soup** can be visualized by clicking on the robot and choosing a **Debug Item** in the right panel.

More launch options can be found with

```
cargo run --release -- --help
```



## ROS 2

The `multi_robot_control` ROS 2 package, contains the nodes needed to run the robot behaviors in ROS 2. `ros_agent` is the main behavior node which manages the `botbrain` robot state.

The ROS 2 packages can be built with:

```
source /opt/ros/jazzy/setup.bash
cd ros_ws
colcon build --symlink-install
source install/setup.bash
```

And run with:

```
ros2 launch multi_robot_control multi_robot.launch.py behavior:=search robots:=0,0,0:2,0,1 map:=../v
```

This will launch Gazebo and Rviz2 windows, where the simulation can be observed.

See [ROS 2 Agent](#) for more information.

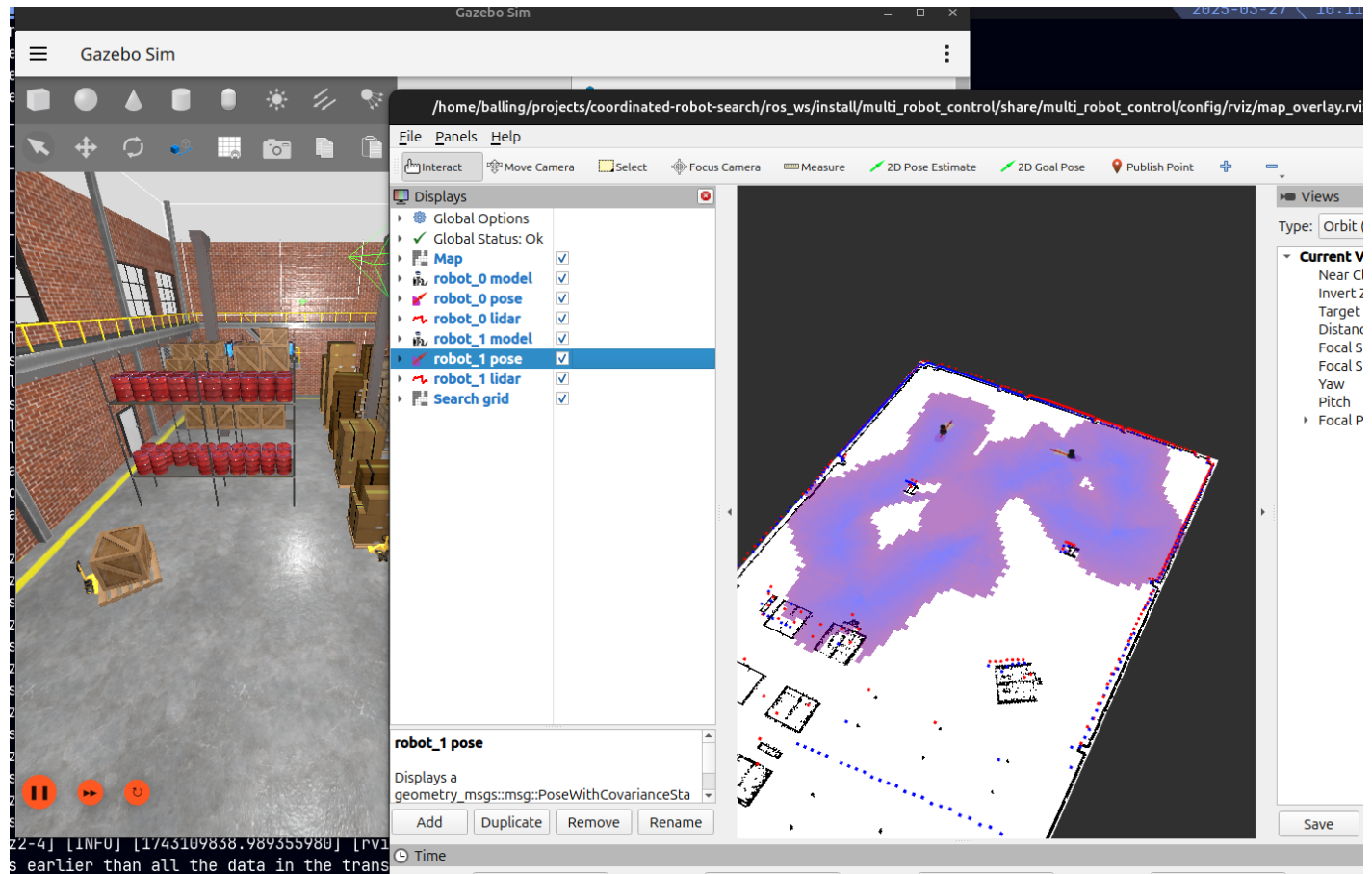


Figure 1: ROS 2 environment

## Dockerfile

A Dockerfile is provided to run ROS 2 and Gazebo. The provided [enter-docker.sh](#) can be used to build and enter the container.

```
./enter-docker.sh
```

To rebuild the container before running run

```
./enter-docker.sh --rebuild
```

## Trainer

The `trainer` crate can be used to train models defined in [botbrain](#). It defines the training loop and implements deep reinforcement learning.

See [the trainer README](#) for more information.

## Plotting

The `botplot` python library is used to run `simple_sim` and Gazebo in an automated manner to collect data, which can be plotted with the provided functions. Simulator runs are cached to avoid rerunning scenarios. The `plotting` directory contains scripts which use `botplot` to run the simulators and create plots.

### Using `botplot`

Install the package

```
python3 -m venv venv      # Create virtual environment
source venv/bin/activate  # Activate the environment
pip install -e ./botplot  # Install the `botplot` package
```

Run a plotting script

```
python3 ./plotting/report/sim_consistency.py
```

### Compiling the LaTeX Report

```
cd report
latexmk -pdf -bibtex-cond -shell-escape -interaction=nonstopmode main.tex
```

## Nix Integration

This project contains a `flake.nix` which allows self-contained build recipes and development shells. All dependencies are automatically downloaded.

**Build the Project** Build the entire project:

- Executables: `simple_sim` and `trainer`
- Documentation: `botbrain` and `simple_sim`
- LaTeX Report

```
nix build .
```

The output is located in the `result` directory.

Sub-packages can be listed with the following

```
nix flake show
```

**Development Shell** Use the following command to install dependencies and start the development shell. ROS 2 is not supported with this shell, the `Dockerfile` can be used instead.

```
nix develop
```