Semantic Mapping in Gazebo Simulator

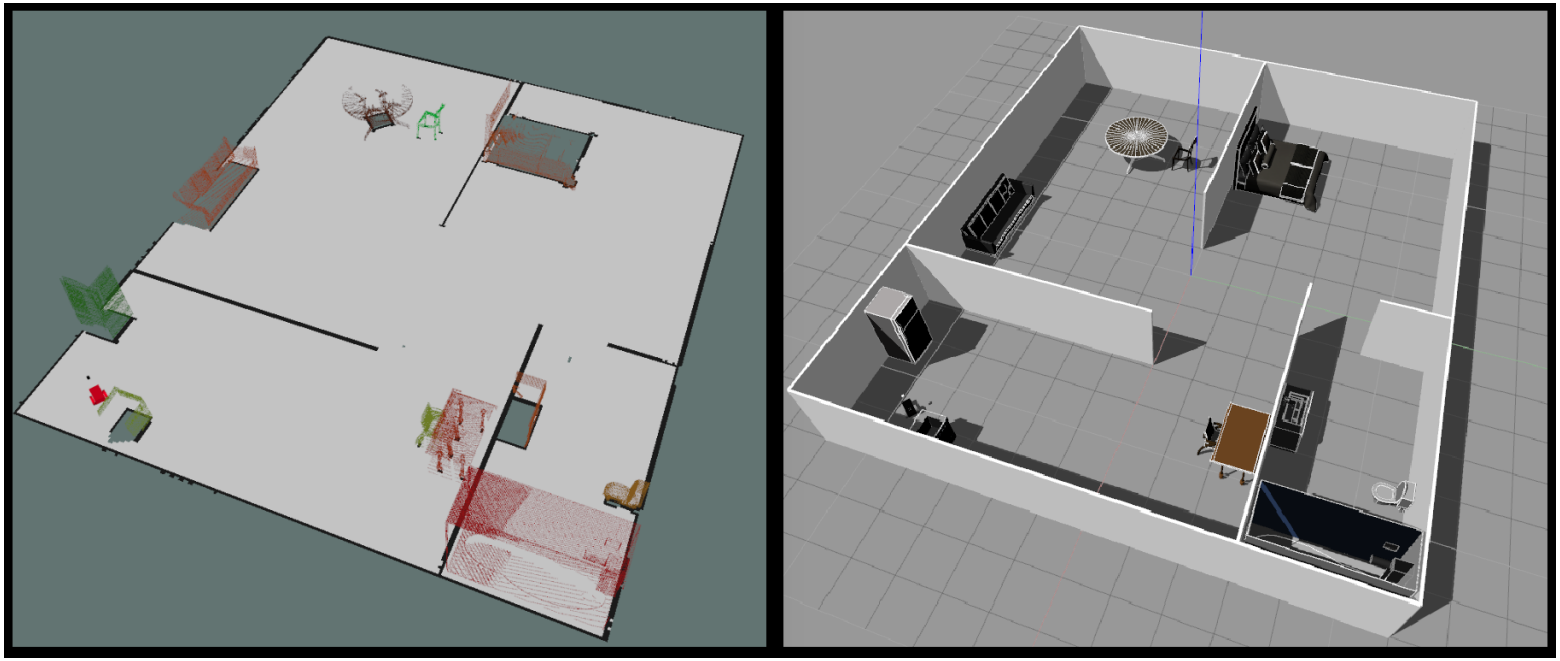
SAPIENZA
UNIVERSITÀ DI ROMA

José Vicente Jaramillo
josevicentejaramillo@gmail.com
Daniele Nardi
nardi@diag.uniroma1.it

Background:

Semantic Map

- Map that holds metric information enriched with labels, features and qualitative information of the environment.



Implementation:

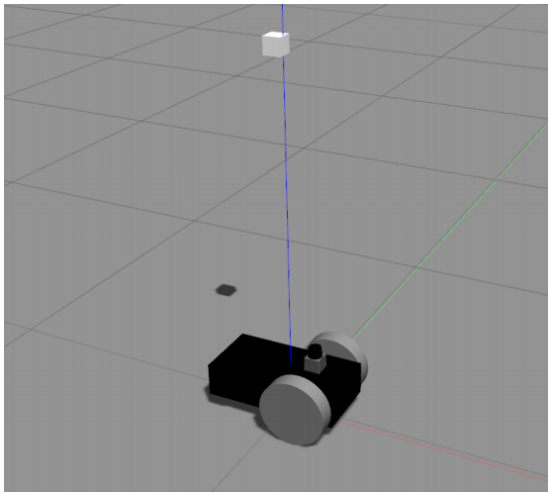
Used Tools

- Robotic Operating System (ROS)
- Gazebo

Implementation:

Robot model

- Differential drive wheeled robot.
- RGBD sensor.
- Hokuyo laser sensor.

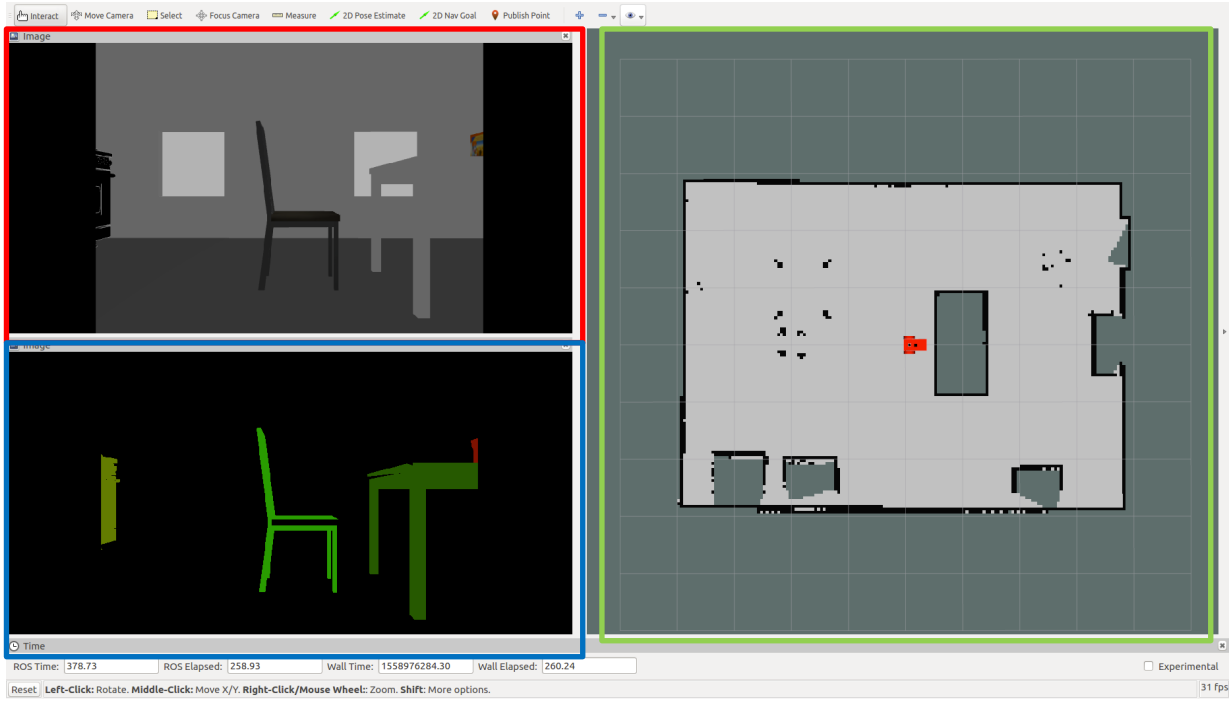


Task

- Use to keyboard to move the robot and explore the environments, use the robot's camera and map to navigate while trying to take good view(s) of the encountered objects.

Camera view

Objects encountered



Map

Installation

- Clone the simulation environments and the semantic mapper node into the src folder in the catkin workspace folder:

```
git clone https://github.com/JoseJaramillo/lucrezio_simulation_environments
git clone https://github.com/JoseJaramillo/lucrezio_semantic_mapper
```

- Clone this repository (is not catkin, do not place it in src folder, you can put it in /home)

```
git clone https://github.com/JoseJaramillo/datasets
```

Installation

- Update Gazebo to the last version to improve stability:

sudo sh -c 'echo "deb http://packages.osrfoundation.org/gazebo/ubuntu-stable `lsb_release -cs` main" > /etc/apt/sources.list.d/gazebo-stable.list'

wget http://packages.osrfoundation.org/gazebo.key -O - | sudo apt-key add -

sudo apt-get update

sudo apt-get upgrade

Installation

- Install some packages needed to execute the environments:

```
sudo apt install ros-kinetic-gazebo-ros-control
sudo apt install ros-kinetic-controller-manager
sudo apt install ros-kinetic-ros-controllers
sudo apt install ros-kinetic-ros-control
sudo apt install ros-kinetic-diff-drive-controller
sudo apt install ros-kinetic-teleop-twist-keyboard
```

Run

- After catkin_make (or build), source the workspace with:

source devel/setup.bash

- Run the environment with:

roslaunch lucrezio_simulation_environments empty_world_with_apartment_and_robot.launch environment:=**test_apartment_2**

Run

- In a new terminal, go into the environment dataset folder:

cd datasets
cd **test_apartment_2**

- Run map server (do not forget to source)

rosrun map_server map_server map.yaml

Run

- In a new terminal run the pose broadcaster (do not forget to source)

rosrun lucrezio_simulation_environments pose_broadcaster_node

- In a new terminal, go to the environment directory **(very important)** and run the semantic mapper (do not forget to source)

cd datasets/**test_apartment_2**
rosrun lucrezio_semantic_mapper semantic_mapper_node _environment:="**test_apartment_2**"

Run

- Now the entire system is working, run rviz in a new terminal go to the datasets folder:

```
cd datasets
```

- And execute rviz with:

```
rviz -d view.rviz
```

Control the robot

- To move the robot, in a new terminal run (d.n.f.t.s):

```
rosrun teleop_twist_keyboard teleop_twist_keyboard.py cmd_vel:=lucrezio/cmd_vel
```

Now you can move the robot with:

```
u    i    o
j    k    l
m    ,    .
```

Task

- Use to keyboard to move the robot and explore the following environments, use the robot's camera and map to navigate while trying to take good view(s) of the encountered objects.

test_apartment_2
apartment_2
phd_office
prof_office
rococolab

- To run this environments just change "test_apartment_2" in the execution steps.
- Avoid hitting any walls or objects,
- The dataset folder is being filled with data of your exploration,
- After you are done, Zip the **dataset** folder and email it to: josevicentejaramillo@gmail.com with the subject [SM-DS]

Thank you!!!

SAPIENZA
UNIVERSITÀ DI ROMA