Creating grid map using IRobot-Create equipped with laser scanner

Welcome

Lab 9

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Today's Objectives

- A robot is in unknown environment for the first time, what to do next?
- One of the most fundamental problems in mobile robotics is map building of an unknown environment
- At the moment two most commonly used SLAM implementations in 2D are GMapping/OpenSLAM and Hector SLAM
- In this class we will build a map of an environment with the GMapping algorithm using both real hardware and Gazebo simulation.

Introduction to GMapping

- GMapping uses particle filter, Rao-Blackwellized, to solve SLAM problem.
- Each particle carries an individual map of the environment
- The approach takes raw laser range data and odometry
- **This version is optimized for long-range laser scanners like SICK LMS or PLS scanner. Short range lasers like Hokuyo scanner will not work that well with the standard parameter settings**

Gmapping requirements

- Hardware
  - Odometry data
  - 2D laser range scanner data
- Subscribed topics
  - tf (to relate laser, odometry and base frame)
  - scan (2d laser range scan to create map)
- Published topics
  - Map (resultant grid map)

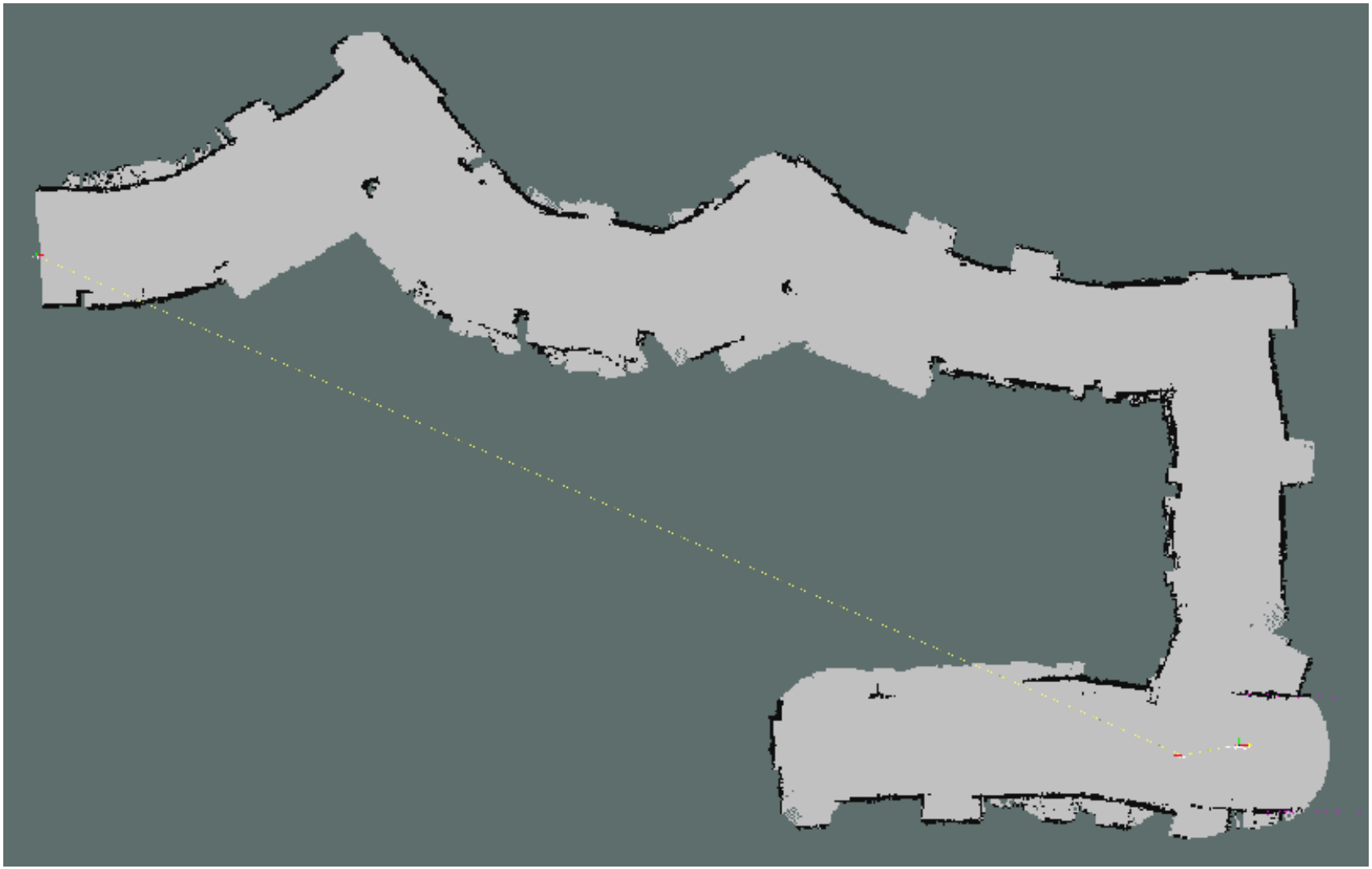
Important Parameters

- **base_frame**: The frame attached to the robot plateform
- **odom_frame**: The frame attached to the odometry system
- **maxUrange**: The maximum laser range
- **xmin, ymin, xmax, ymax**: initial map size
- **linearUpdate**: update map after linear dist.
- **angularUpdate**: update map after angular dist.

Gmapping Setup

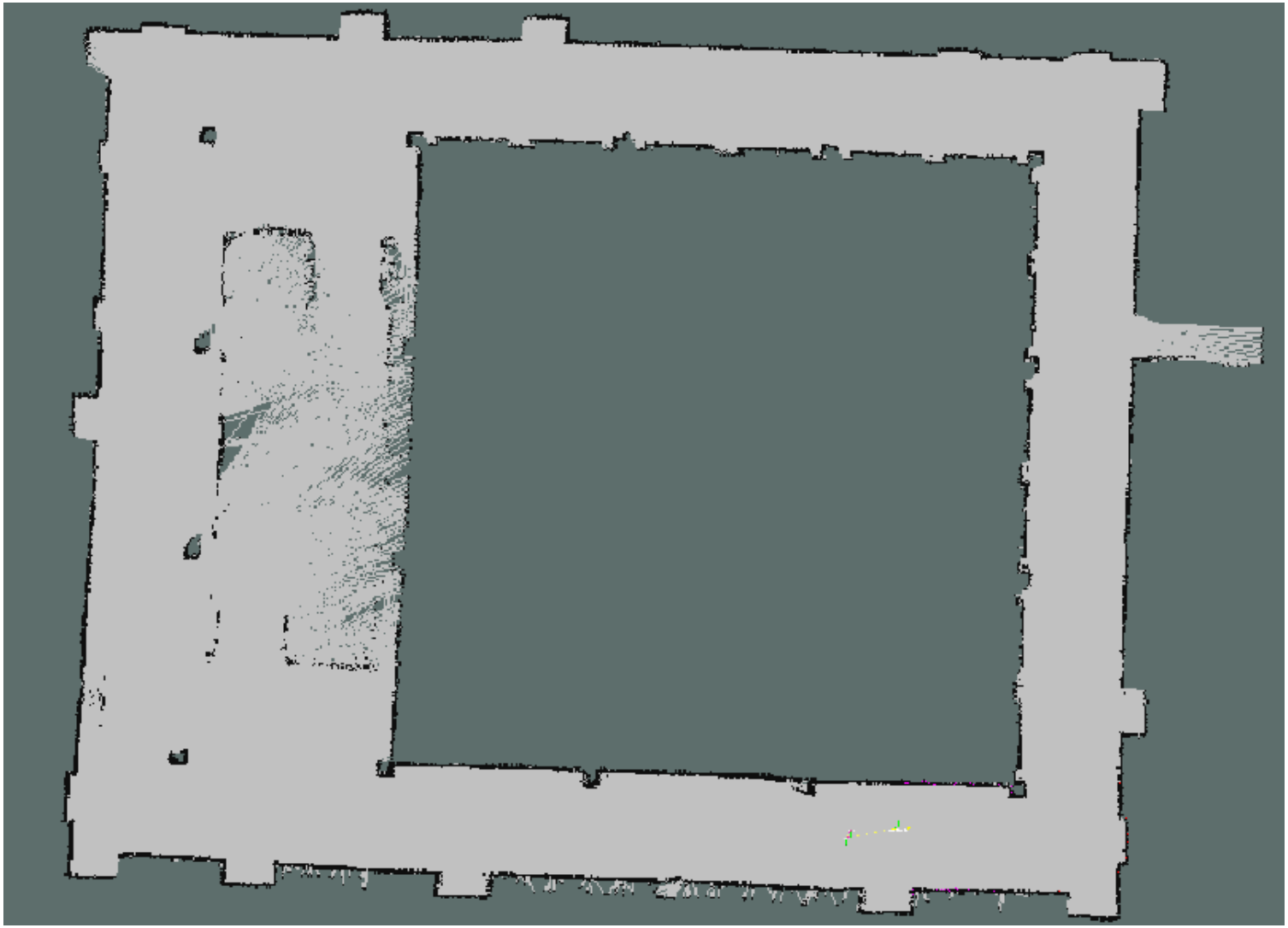
```
<?xml version="1.0"?>
<launch>
 <param name="/use_sim_time" value="true" />

 <node pkg="rosbag" type="play" name="Recording“ args=“/home/ahmad/2013-06-02-19-17-00.bag"/>

 <node pkg=“gmapping" type=“slam_gmapping" name=“SLAM“>
  <remap from="scan" to="/base_scan"/>
  <param name="maxUrange" value=“80.0"/>
  <param name="linearUpdate" value="0.1"/>
  <param name="angularUpdate" value="0.05"/>
  <param name="xmin" value="-25.0"/>
  <param name="ymin" value="-25.0"/>
  <param name="xmax" value="25.0"/>
  <param name="ymax" value="25.0"/>
</node>

 <node pkg="rviz" type="rviz" name="rviz" output="screen" args="-d /home/ahmad/rviz.rviz" />
</launch>
```

Effect of range scan (2m)

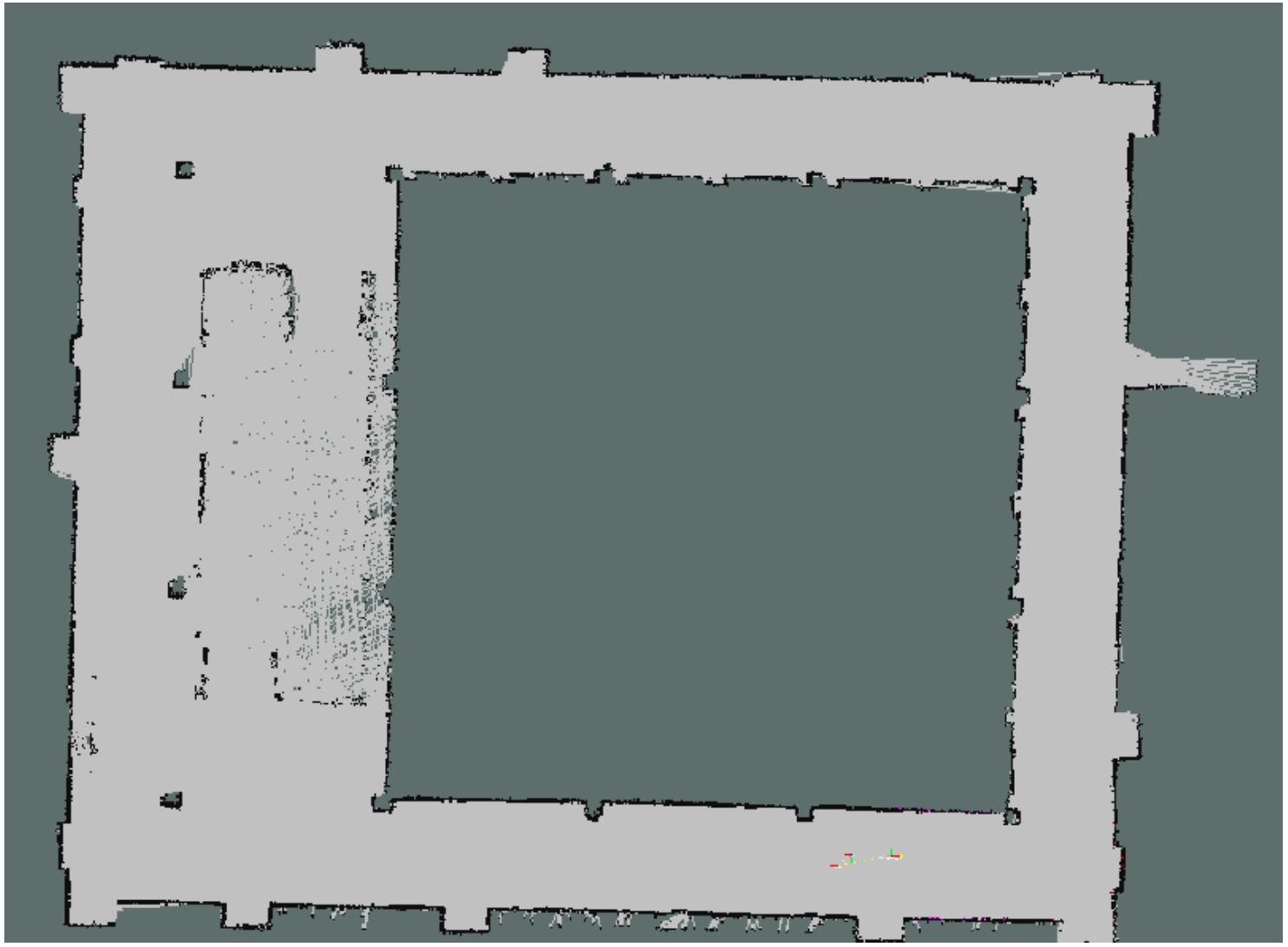


Effect of range scan (4m)

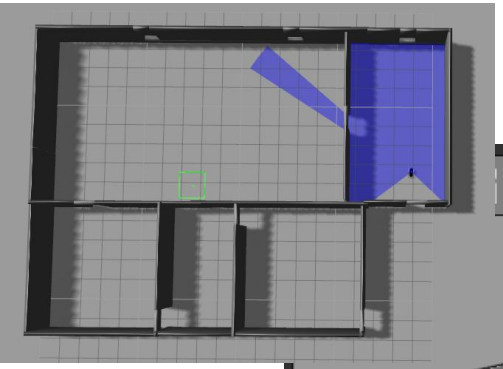
Effect of range scan (8m)

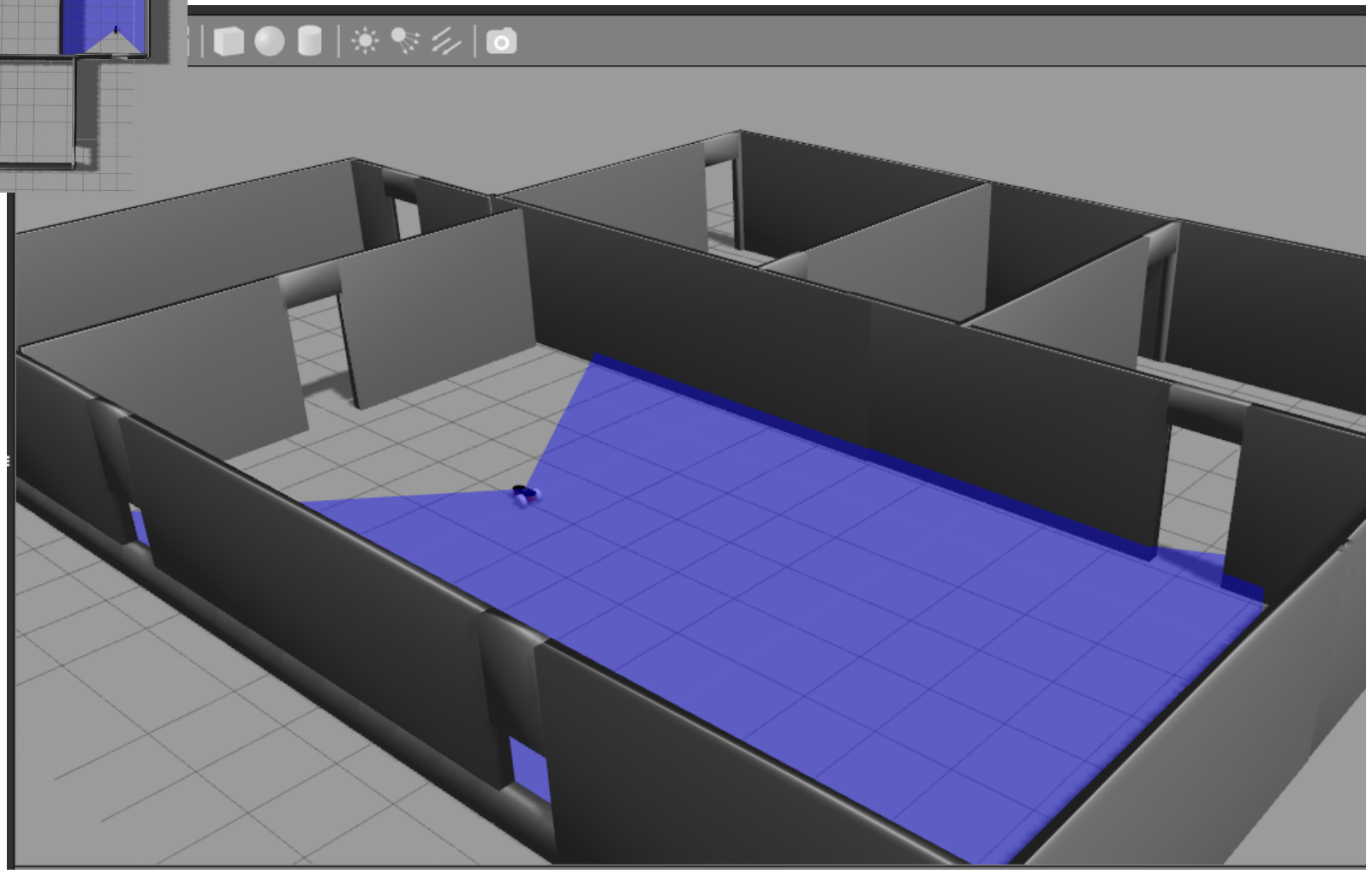


Effect of range scan (80m)

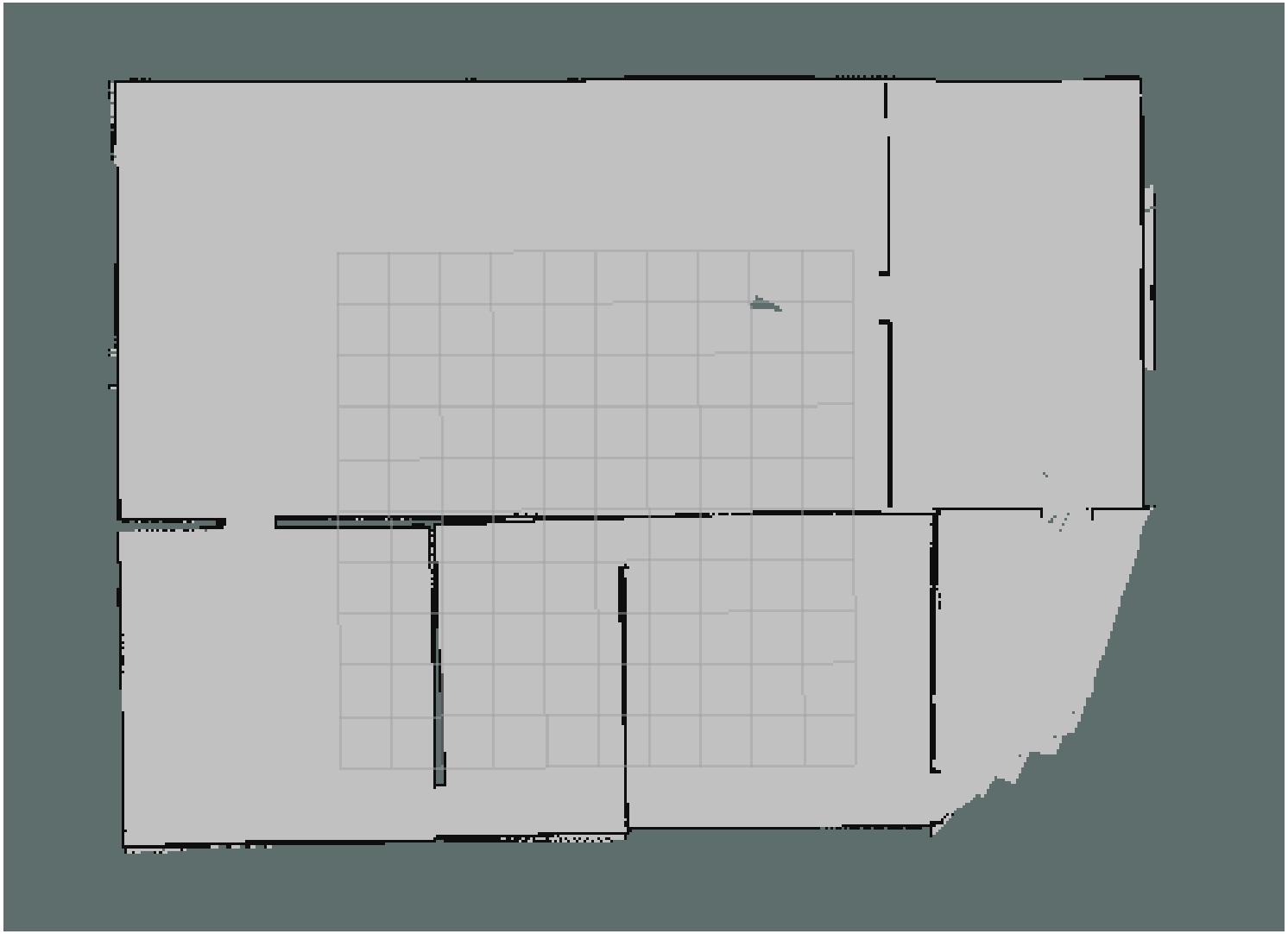


Using GMapping with Gazebo Simulation





Resultant Simulated Environment Map



Questions