

# SLAM PROJECT

WenTao Wu

## Abstract

RTAB-Map is the best solution for SLAM to develop robots that can map the 3D environment. The rtabmap\_ros package subscribes to RGB-D cameras, radar sensors, and robot driven data, and eventually releases map information. Based on the localization project, the RGB-D camera is added to the robot and the information of the depth information is converted to the radar sensor. To write the necessary startup files for all kinds of nodes in the project, start the robot and map the surrounding environment.

## Introduction

RTAB-Map is the best solution for SLAM robots that can map the 3D environment. When a car is located in an unknown environment, in order to correctly map the environment and reduce memory storage, RTAB-Map uses memory management technology to limit the number of candidate locations during closed loop detection. The personal software package is interacted with the rtabmap\_ros package. Change the car of localization project, add a RGB-D camera, and transform the depth information of RGB-D camera to the information of radar sensor, so that it can interact with RTAB-Map to get map information of the robot. Finally, the appropriate boot file is generated to start the robot and map its surrounding environment. Familiar with gazebo for map modeling, a new private map, and before the private development software packages were tested on a new map.

## Background

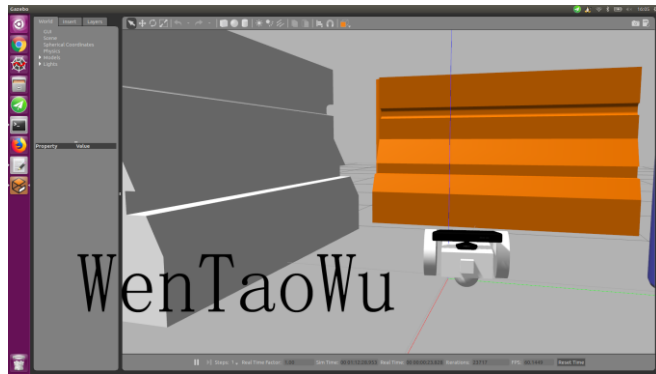
In resource constrained systems, it can be very computationally expensive to build and 3D maps. The construction of 2D maps in limited resources can still solve problems. 3D representations are even more costly.

But, robots live in the 3D world, and we want to represent that world and the 3D structures within it as accurately and reliably as possible. 3D mapping would give us the most reliable collision avoidance, and motion and path planning, especially for flying robots or mobile robots with manipulators.

## Scene and robot configuration

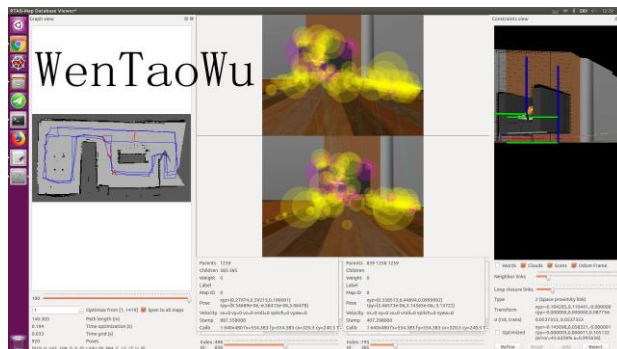
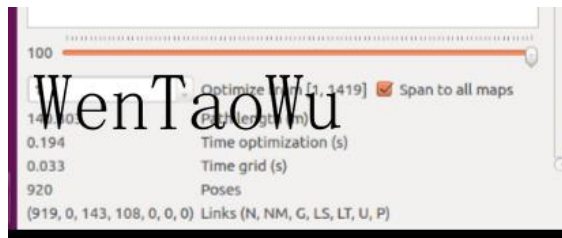
In gazebo, the scene can be created by selecting the Insert option bar, and the left side can pull the scene that we want. First, a small movable space for robot activity is made by pulling the railing, and several objects are prevented as obstacles to make the whole scene not too dull.

For the robot, the RGB-D camera is placed at the top of the robot to get a better angle of view, and the radar is deleted because the radar is not used.



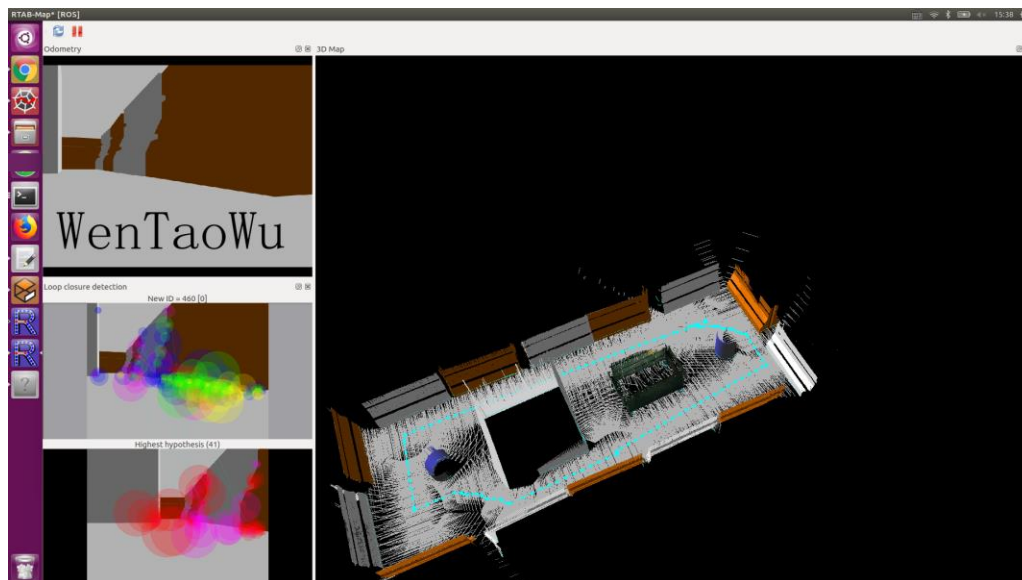
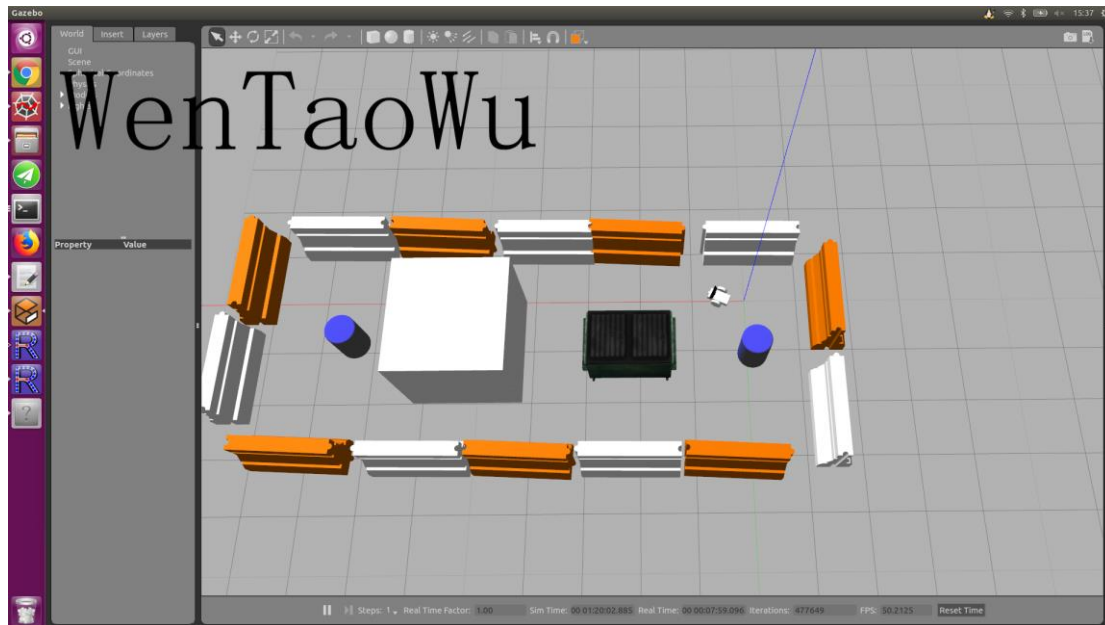
## Results

The robot under the RTAB-Map navigation performs well in two maps:  
For the provided map:



A map of personal production:





## Discussion

In a different world, the RTAB-Map algorithm is often confused by similar objects. For example, a labyrinth of the same object, or a long, identical corridor. Robots often fail to locate and misplace their positions, resulting in the relative position errors between objects and the superposition and coincidence of objects. In a simple world, the map information collected by the robot under the RTAB-Map algorithm is often very good.

## Future Work

In the present environment, the RTAB-Map algorithm can be applied to the sweeping robot. Sweeping robot working environment due to unable to determine whether changes occur, the application of the algorithm in the sweeping robot, can help the robot to navigate, or robots with the same family upload map information to the home robot map information sharing network, to help better complete other work robot.