

# Assignment 2 - Robot Simulation and Aruco Tag Detection

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## 1 Introduction

This is the second assignment in the MRT, which consisted of 3 tasks.

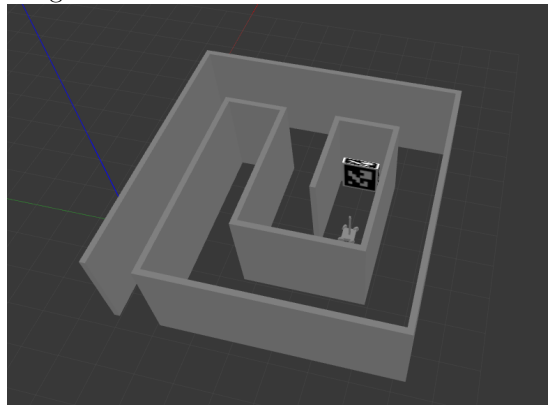
1. Task 1 - Make a virtual world in Gazebo with Aruco markers.
2. Task 2 - Make a custom robot and add a camera plugin.
3. Task 3 - Display the video feed of the rover and detect Aruco markers.

## 2 Task 1

A virtual world can be made in Gazebo - where various objects - walls, tables, buildings etc - using the building editor. For this assignment, a simple maze was made with walls as shown in the figure below.

The world can be opened again with the help of a launch file (MRT-Assignments /Assignment 2 - Gazebo/src/gazeboenvs/launch/arucolaunch.launch for this assignment)

Figure 1: Gazebo World with Aruco Marker

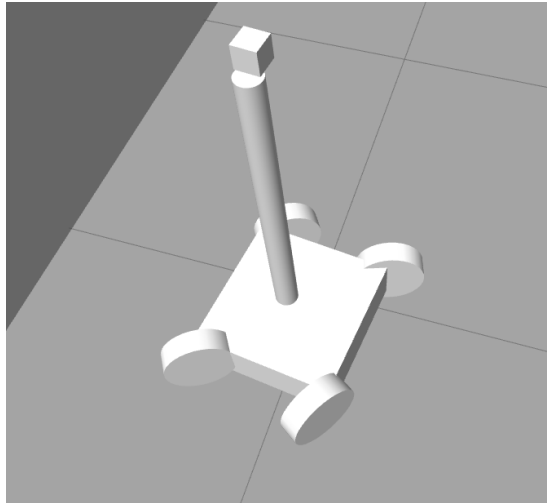


### 3 Task 2

The robot shown in the following image was created using the Model Editor in Gazebo, which was earlier used to create the world in Task 1. The folder of the model robot was saved in another package (botdescription) as an .sdf file. Using another package (pysdf) downloaded from [HERE](#) was used to convert the .sdf file into .urdf file.

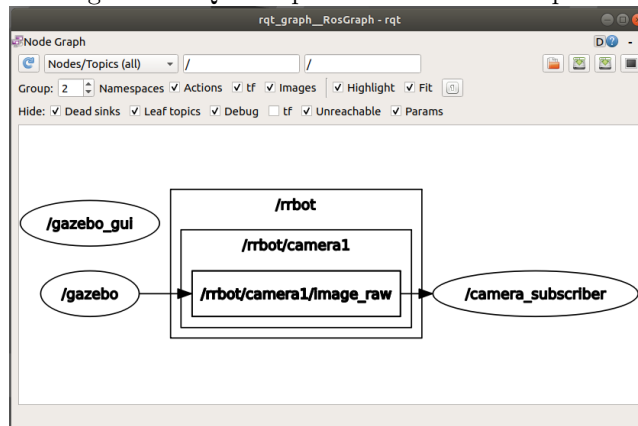
The robot was spawned into the world created in Task 1 using another launch file (MRT-Assignments/Assignment 2 - Gazebo/src/botdescription/launch/robot launch.launch)

Figure 2: Robot with Camera on top



The camera-plugin, downloaded from [HERE](#), added into the .urdf file of the robot, giving robot the ability to "see" the world around it and project the video to a topic (refer RQT graph given below).

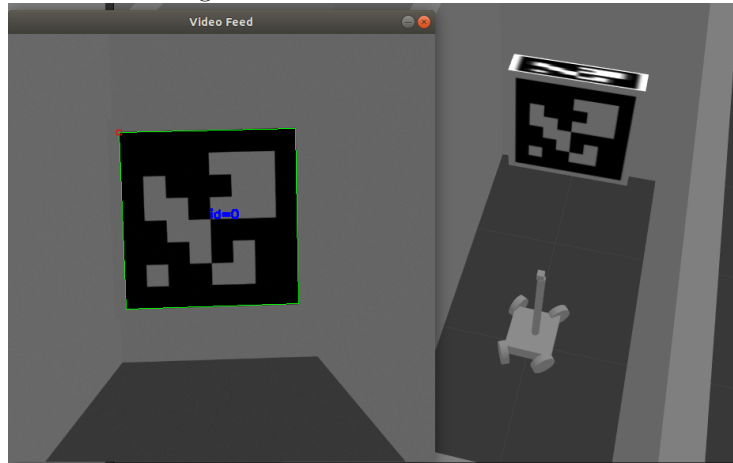
Figure 3: RQT Graph with Nodes and Topics



## 4 Task 3

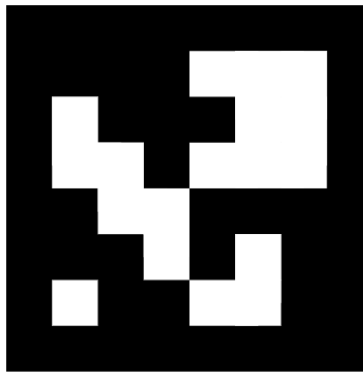
This task was accomplished by creating a subscriber python script to the topic `/rrbot/camera1/imageraw`. The video feed was displayed on a separate window (as shown in Figure: 4).

Figure 4: Video Feed of the Robot



A detection algorithm pipeline, downloaded from [HERE](#), was used in the subscriber python script to detect the 6 X 6 Aruco marker (shown in Figure 5) and draw a border around it to mark it on the Video Feed.

Figure 5: Aruco Marker Tag used in this Assignment



## 5 Link to GitHub Repository

[CLICK HERE](#)