COMP3631 - Example World for the Project

To help you with your development for the Project, we provide some files and examples to you. In this document, we describe how you can use this example.

Getting the files

Since you will work on the Project as a group, your files are stored in a git repository that is separate from the individual repository you have been using in the labs. To get the files associated with your group project, you need to clone your group git repo under your catkin_ws/src. This is how you should do this:

(Below, we are assuming your catkin_ws is under $HOME/catkin_ws. If you have previously created your catkin_ws in a different location, please change the commands accordingly.)

cd $HOME/catkin_ws/src

git clone https://gitlab.com/comp3631/groupX.git group_project

Please replace groupX with your actual group number, e.g. group1 if you are in Group 1, in the command above.

Once you have the files from git, you can go to the project directory:

cd $HOME/catkin_ws/src/group_project/project

Managing your group's git repo

When you make changes, and want to commit and push files to your project in the future, you need to do this by going under this directory: catkin_ws/src/group_project/project

cd $HOME/catkin_ws/src/group_project/project

git add <files-to-be-added>

git commit -m 'Your message here'

git push

This is very important! You need to push your program to this repository for it to be evaluated as your project submission. Therefore please remember to go under $HOME/catkin_ws/src/group_project/project and git add, commit and push your solution files.

Similarly, since your other group members might have made changes to your group files, please pull changes to your group project directory frequently. You need to do this from under catkin_ws/src/group_project/project:

cd $HOME/catkin_ws/src/group_project/project

git pull

Cluedo Images

Under the project directory, you will see two directories. The first one is the "cluedo_images" directory. If you look into this directory, you will see the image files for the four Cluedo characters. As part of your project, your robot will need to find one of these posters, and identify the character. Please refer to the Project Description document for a more detailed description.

Using the example world

The second directory under the project directory is called "example". Under this directory, we provide an example world to test your project program. **This example world is only an example.** The world we will test your actual program in may be different from this one, in terms of the exact shape of the world, the position of the Cluedo character, and the identity of the Cluedo character. Please refer to the Project Description document for a detailed description of the project tasks.

Below is what you need to do, so that you can load this example world in Gazebo.

Setup

First, you need to copy the models under $HOME/catkin_ws/src/group_project/project/example/models to your local Gazebo directory:

cd $HOME/catkin_ws/src/group_project/project/example/models

cp -r * $HOME/.gazebo/models/

You need to do the above only once. In other words, once you have copied these files once, they should stay there in your account, and you should **not** need to copy them again.

Loading the example Gazebo world

The example Gazebo world file is $HOME/catkin_ws/src/group_project/project/example/project.world We explained how to load a Gazebo world file in lab3.pdf. To repeat here, you need to set the environment variable TURTLEBOT_GAZEBO_WORLD_FILE to point to the Gazebo world file you want to use. In this case, you should do:

export TURTLEBOT_GAZEBO_WORLD_FILE=$HOME/catkin_ws/src/group_project/project/example/project.world

After that, you can run Gazebo as usual:

vglrun roslaunch turtlebot_gazebo turtlebot_world.launch

Alternatively, if you are physically in Dec-10:

roslaunch turtlebot_gazebo turtlebot_world.launch

In other words, exclude the "vglrun" at the beginning of the command.

and it should start with the example world.

Feel free to explore around the world to see there are two rooms, one with a red and one with a green circle at the entrance. You will also see that there is a Cluedo character, Scarlet, on the wall in the green room.

Localising the robot in the world

In lab4.pdf, you learn about localisation; i.e. how to create a map for localisation, and then about how to localise within that map.

We have already built a map of the example world for you, so you can directly use it. The map files are under $HOME/catkin_ws/src/group_project/project/example/map .

You might need to edit the "image" field in the project_map.yaml file, to make it point to the pgm image file using the absolute path, as in lab4.

When we run your project implementation in a new world during the demo in the last week, we will again provide you with the map of the environment. In other words, you will **not** need to map the environment.

Input points

As we describe in the Project Description, we will provide you with the (x,y) coordinates of four points: the centre and entrance points of the two rooms. For the example world, you will find such coordinates in the input_points.yaml file. Please open this file in a text editor to see inside the point names and the coordinates. During the actual demo of your project, we will again provide the points in such a yaml file.

Loading a yaml file in python is easy:

```
import yaml

with open("input_points.yaml", 'r') as stream:
    points = yaml.safe_load(stream)
```

Then, points['room1_centre_xy'][0] will give you the x-coordinate of the centre point of one of the rooms. points['room1_centre_xy'][1] will give you the y-coordinate. Similarly for the other points.

Changing the example world

As we explain above, the world we test your final program in will not be exactly like the example world we provide. You should make your program general enough such that it works when the world is different. To test your program, therefore, you might want to create different Gazebo world files. Below we describe how you can modify the example world file to create different world files for testing.

Changing the Cluedo character

In the example world, the Cluedo character is Scarlet. In the cluedo_images directory, we provided multiple different character images. You might want to change the character in the world to a different character, e.g. Mustard, and test. To do this, simply overwrite the image file

$HOME/.gazebo/models/cluedo_character/materials/textures/Cluedo_character.png

with the image file of the character you want to use. Please keep the name same though, i.e. “Cluedo_character.png”.

Changing the shape of the environment

You might want to change the structure/shape of the world, to create new worlds to test in.

To do this, once you load the example world file in Gazebo, you can hold and drag/rotate the walls, to create a new structure for your world. Once you are satisfied, from Gazebo menu, select File->Save World As. Then you can save the new world in a new world file with a different name. You can later load this new world file, using the TURTLEBOT_GAZEBO_WORLD_FILE variable as above.

Remember that you would need to map the new environment as well. Lab4.pdf describes how to map an environment.

Changing the position of the Cluedo character, or the red/green circles

Finally, when you create new worlds for testing, you might also want to change the position of the Cluedo character, or the red/green circles. To do this:

- Open the world file, e.g. the project.world file, in a text editor.
- Find the 'model' tag. For example <model name='red_image'> (There may be multiple such ‘model’ tags. You need the one with the ‘visual’ tag inside it)
- Under the 'model' tag, you'll find the 'visual' tag. For example <visual name='visual'>
- Under the 'visual' tag, you'll find the 'pose' tag. For example <pose>-6.48 4.6 0.4 1.57 4.33681e-19 3.14</pose>
- The first three numbers represent the xyz position of the image and the remaining 3 numbers represent the rotation of the image. Change them accordingly
- Save the world file and reload to see your changes.

Please let us know in one of the lab sessions if you have any questions!