

Turtlebot Demo Manual: Contents

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Setting up Turtlebot

The demos in this guide require either (1) setting up just the Turtlebot or (2) connecting from a remote computer. It is also assumed that you are using Max (if you use Moritz you must do extra work, described at the end).

Important: you need the password for Turtlebot and/or the desktop (ask Roland, Anita, or Martin if you don't know)

General

-Ensure that the Turtlebot cables are connected properly:

*two black USB cables connect the white ASUS

notebook to the Turtlebot base and Kinect like in Fig. 1

*the back of the Turtlebot looks like in Fig. 2

-Flick the power switch on one side of the Turtlebot base shown in Fig. 3 to "on"

The light on the other side of the base should be green like Fig. 4

-Turn on the ASUS notebook

-Next perform either option 1 or option 2, depending on which is required for the demo you wish to perform

Option 1 (just Turtlebot)

-Log in to the ASUS notebook: type "turtlebot" and return, then input the password (ask Roland, Anita, or Martin if you don't know) and return again

Option 2 (Turtlebot and desktop):

When the ASUS notebook starts up (text appears), you can close the lid

-Turn on the desktop and login with user id "user2" and the password (ask Roland, Anita, or Martin if you don't know)

-Turn on the wireless router next to the desktop (it has a pressable power button on its lower backside)

-Open an appropriate number of black windows on the desktop by pressing Ctrl-Alt-T or clicking the K button at the bottom left side, then "Terminal"

-To connect to Turtlebot, type "~/scripts/sshturtle" (you can also type "ssh turtlebot@192.168.10.101" and the password if you wish); if this does not work wait for a few seconds and try again; if it still does not work check that the router is on, the ASUS notebook is on, that the ASUS notebook is connected to the network

This red box will say if the demo requires just Turtlebot or also a remote computer



Fig. 1 Turtlebot should look like this.



Fig. 2 Back of Turtlebot.



Fig. 3 Turtlebot power button (off).

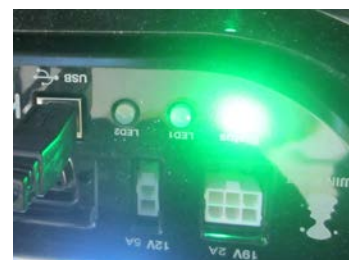


Fig. 4 Light shows battery level.

Shutting down Turtlebot

Option 1 (just Turtlebot)

-Press Ctrl-C in the notebook, then Alt-F1, then Ctrl-C again to turn off the robot's programs. You will hear a little song again.

Option 2 (Turtlebot and desktop):

-Press Ctrl-C in the black windows on the desktop in reverse order to turn off the robot's programs. You will hear a little song again.

General

If you are not going to perform any other demos, type in "sudo shutdown -P now" then the password to turn off the notebook, then turn off the robot's power, desktop and router.

Manual for Turtlebot Follow-me Demo

Requires only Turtlebot

Set-up

-Perform set-up as described at the start of the manual with Option1: just Turtlebot.

Demo:

-Type in "roslaunch turtlebot_bringup minimal.launch" on the ASUS notebook and return
After a few seconds, you should hear a little song

-Type Alt-F2 to bring up a new screen
You will again have to type in "turtlebot" + password

-In the new screen, type in
"roslaunch turtlebot_follower follower.launch" + return

-Perform the demo

Standing in front of the robot, back away slowly and the robot should follow. You can also try to slowly chase the robot.

Clean-up:

-Shut down the robot as described at the start of the manual with Option1: just Turtlebot.

Congratulations! You can now control the Turtlebot!

Manual for Turtlebot Keyboard Operation

Requires only Turtlebot

This simple demo allows you to send commands for the Turtlebot to move from a keyboard.

Set-up

-Perform set-up as described at the start of the manual with Option1: just Turtlebot.

Demo:

-Type in "roslaunch turtlebot_bringup minimal.launch" and return

After a few seconds, you should hear a little song

-Type Alt-F2 to bring up a new screen

You will again have to type in "turtlebot" + return twice

-In the new screen, type in

"roslaunch turtlebot_teleop keyboard_teleop.launching" + return

This sets up the demo.

-Perform the demo

You can now control the robot to move using the keys:

u i o (backwards right, center, left)

j l (right and left)

m , . (forwards right, center, left)

Clean-up:

-Shut down the robot as described at the start of the manual with Option1: just Turtlebot.

Congratulations! You can now tele-operate the Turtlebot to do your bidding!

Manual for Turtlebot Panorama Demo

Requires Desktop

Let's take a panorama photo using the Turtlebot!

Set-up

-Perform set-up as described at the start of the manual with Option2: Turtlebot and desktop, and opening four black windows.

Input

```
"roslaunch turtlebot_panorama panorama.launch".
```

This sets up the robot to perform the demo

-In a third black window, type in "roslaunch rviz rviz" and return.

This will start up the "Rviz" program which will show you the panorama shot.

When the program starts up, click on the dropdown list to the right of "fixed frame" and set the selected option to "camera_rgb_optical_frame"

Click "Add" on the left and select "Image".

Expand the options for "Image". Click on the dropdown list for "image source" and select "/turtlebot/panorama/panorama"

You may see an exclamation mark by Image because you are not receiving data yet. This is fine.

Demo:

-In the fourth black window, input "rosservice call turtlebot_panorama/take_pano 1 360.0 30.0 0.1"

This calls for the robot to slowly turn 360 degrees, taking snapshots. *If you wish, you can bend down in front of the robot or maybe only your ankles will be photographed!*

-When the robot has finished, input "rosservice call turtlebot_panorama/take_pano 2 360.0 30.0 0.1"

This indicates that the robot has finished and the process should end.

-You should see a panorama shot in the lower left hand side of Rviz; you can enlarge this window to see better. **Congratulations! You now have a robotic cameraman!** *Why not save your accomplishment by taking a snapshot with the "PrtScn" button on the desktop?*

Clean-up:

-Shut down the robot as described at the start of the manual with Option2: Turtlebot and Desktop.

TROUBLE-SHOOTING

The Rviz program often has problems. If it does not let you select anything from a dropdown list or you do not see a panorama photo, try the following:

-Press Ctrl-C to end Rviz and restart the program.

-Open a fifth black window and input "roslaunch rqt_reconfigure rqt_reconfigure"

Select "camera" then "driver" from the drop-down menu. Try checking/unchecking the depth_registration checkbox, and waiting a few seconds, while checking Rviz.

Manual for Turtlebot Navigation Demo

Requires Desktop

This demo allows you to command the robot to go somewhere using a map!

Set-up

-Perform set-up as described at the start of the manual with Option2: Turtlebot and desktop, and opening five black windows.

-In one black window, type `"~/scripts/tb_init"`

This sends a message to start the robot

-In another black window, type in `"ssh turtlebot@192.168.10.101"`, input the password, then input `"roslaunch turtlebot_navigation gmapping_demo.launch"`.

This sets up the robot to perform the demo

-In a third black window, input

`"roslaunch turtlebot_rviz_launchers view_navigation.launch"`.

This will start up the "Rviz" program which will show you the map.

Rviz should be showing the robot's view. If not, please fiddle with settings.

-In the fourth black window, input

`"roslaunch turtlebot_teleop keyboard_teleop.launch"`

This will let you teleoperate the robot to drive around and build the map

Phew! Finally you have finished setting up the demo.

Demo:

-Drive the robot around at a medium speed, tracing all walls in the area you wish to map.

-When you are finished, in the fifth black window, input `"roslaunch map_server map_saver -f /tmp/my_map"`

This will save the map to /tmp in your root directory as two files, yaml and

You have successfully built a map using Turtlebot!

But watch out! Files in the /tmp directory can be automatically deleted.

If you wish, you can save your map in a different directory, and view it at any time with an image viewer.

Now, let's see how you can use your map to let the robot navigate!

-input `"roslaunch turtlebot_navigation amcl_demo.launch map_file:=/tmp/my_map.yaml"`

Change the last part if you have saved your map in a different directory

-In the "Rviz" program, click "2D Pose Estimate" at the top.

Click on the map where the TurtleBot approximately is and drag in the direction the TurtleBot is pointing.

-Click the "2D Nav Goal" button

Click on the map where you want the TurtleBot to drive and drag in the direction the TurtleBot should be pointing at the end.

Now the Turtlebot should now move according to your command!

Be careful to avoid having the Turtlebot run against an obstacle, which can damage it.

Clean-up:

-Shut down the robot as described at the start of the manual with Option2: Turtlebot and Desktop.

TROUBLE-SHOOTING

The Rviz program often has problems. If it does not let you select anything from a dropdown list or you do not see a panorama photo, try the following:

-Press Ctrl-C to end Rviz and restart the program.

-Open a fifth black window and input `"roslaunch rqt_reconfigure rqt_reconfigure"`

Select "camera" then "driver" from the drop-down menu. Try checking/unchecking the `depth_registration` checkbox, and waiting a few seconds, while checking Rviz.

Desktop Version

Manual for Turtlebot Follow-me Demo

Set-up

-Perform set-up as described at the start of the manual with Option2: Turtlebot and desktop, and opening two black windows.

-In one black window, type "~/scripts/tb_init"

This sends a message to start the robot

You will hear a little song

-In the other black window, type "~/scripts/tb_follow"

This sends a message to start the demo

Demo:

-Perform the demo

Standing in front of the robot, back away slowly and the robot should follow. You can also try to slowly chase the robot.

Clean-up:

-Shut down the robot as described at the start of the manual with Option2: Turtlebot and Desktop.

Congratulations! You can now control the Turtlebot!

Manual for Turtlebot Keyboard Operation

Desktop Version

This simple demo allows you to send commands for the Turtlebot to move from a keyboard.

Set-up

-Perform set-up as described at the start of the manual with Option2: Turtlebot and desktop, and opening two black windows.

-In one black window, type "`~/scripts/tb_init`"

This sends a message to start the robot

You will hear a little song

Demo:

-In the new screen, type in

"`roslaunch turtlebot_teleop keyboard_teleop.launching`" + return

This sets up the demo.

-Perform the demo

You can now control the robot to move using the keys:

u i o (backwards right, center, left)

j l (right and left)

m , . (forwards right, center, left)

Clean-up:

-Shut down the robot as described at the start of the manual with Option2: Turtlebot and Desktop.

Congratulations! You can now tele-operate the Turtlebot to do your bidding!

GENERAL TROUBLE-SHOOTING

Batteries: if the light on the robot's base is not green (e.g., yellow) or the Asus notebook screen is black and unresponsive:

Try recharging

Network: if you see an error message saying: **computer cannot talk to ROS master:**

The problem is likely the address of the Asus notebook

type "sudo vi ~/.bashrc" and the password if prompted

scroll to the end of the file

press "I" to go into insert mode

add a "#" before the two lines saying the address should be 192.168.10.101

delete the "#" before the two lines saying the address should be 192.168.20....

type ESC, ":wq!" to save and exit

try to restart the turtlebot

Viewing: the Rviz program often has problems. **If it does not let you select anything from a dropdown list or you do not see a panorama photo**, try the following:

-Press Ctrl-C to end Rviz and restart the program.

-Open a fifth black window and input "roslaunch rqt_reconfigure rqt_reconfigure"

Select "camera" then "driver" from the drop-down menu. Try checking/unchecking the depth_registration checkbox, and waiting a few seconds, while checking Rviz.