

EGN 4060C Lab 1: Introduction to the Robot

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This week you're going to assemble your robot, connect it to the network, and learn how the software is used to control the robot. There is no writeup but you'll be required to demonstrate that you can do three things:

- compile and execute a basic obstacle avoidance program (CreateMove.java)
- take pictures from the robot's camera;
- execute one of the Create demos to run the robot in a figure-eight pattern.

Your robot is composed of two parts: 1) a Linux-based controller board called the Qwerk and 2) the iRobot Create robot. The Qwerk board controls the Create via a serial connector. Using the Java software, you'll be able to connect to the Qwerk board over the network and execute commands on the Create robot.

1 Assemble the Robot

As soon as possible, plug your robot in and start charging it. Follow the instructions given to assemble your robot.

In the lab, you will be following the instructions for soldering cables. If available you can use one of the already soldered cables. Those of you using new robots should add the extra wheel (included in the plastic bag with the Create) to the back of the Create and screw the side wheels into the retracted positions for increased stability.

2 Connect to the Robot

The robot's IP Address is already set to 10.0.0.10. and in order for you to connect you need to make the following changes on your laptop.

1. Go to your laptop's Control Panel > Network > Network and Sharing Center > Change adapter settings
2. Find "Local Area Connection" ("Ethernet" on Windows 8), right click and select "Properties"
3. Click "Properties" while the "Internet Protocol Version 4 (TCP/IPv4)" is selected
4. Select "Use the following IP address" and enter the following:
IP Address: 10.0.0.1
Subnet Mask: 255.0.0.0
Default gateway: 10.0.0.1
5. Hit OK and quit network settings
6. Connect your robot directly to your laptop with a cable

7. Your robot is now accessible directly from your laptop with the IP Address: 10.0.0.10

After you make the changes on your laptop, go to 10.0.0.10 from a browser. You will see the configuration page for the robot. Make sure the “Direct-Connect” is opted in General Configuration. Now your robot is ready for a test drive.

3 Compile the Software

1. Download the source code from:
`http://ial.eecs.ucf.edu/terk_eclipse.zip`.
2. Open Eclipse and select File > Import
3. Next select General > Existing Projects into Workspace and click “Next”.
4. Choose “Select root directory” and browse for the folder `terk_eclipse`.
5. Check the option “Copy projects into workspace” and click “Finish”.
6. Right-click on JRE System Library under the **terk** project and select Build Path > Configure Build Path... from the context menu.
7. Click “Edit” while `terk.jar` is selected. Browse to the location where `terk.jar` is located within the **terk** project.
8. Click OK.

4 Modify the Software

Make the following changes in the source code of `CreateMove` to get the program to execute correctly.

1. Comment out the line `myRobot.dockRobot()` at the end of `CreateMove.java`.
2. Build the project again.

Run the `CreateMove` demo by right-clicking `CreateMove.java` and selecting *Run As→Java Application* from the context menu. Note that if you execute the command for the project you will be presented a list from which you can choose the appropriate demo.

5 Run the Robot

1. Turn on the Create and the Qwerk.
2. Connect to your Qwerk using the Direct-Connect option and the IP address of your robot.
3. Try taking a photo using the interface.
4. Press play to run the `CreateMove` demo. The robot should wander around and demonstrate simple obstacle avoidance behaviors when the bumpers are pressed.

6 Adding the Figure-Eight Demo

The Create also has some built-in behaviors that can be executed on command.

1. Uncomment the line `myRobot.dockRobot()` at the end of the `CreateMove` program.
2. Modify the code in the `dockRobot` routine in `CreateClient.java` as follows.
3. Select demo 4 by replacing the line `data[1] = (byte)1` with `data[1] = (byte)4;`
4. Now when you press the stop button on the GUI your robot should execute figure eights until powered off.

7 Show your Demo

Show your demo to the TA so we can make sure that you've managed to get everything to work.

8 Label and Pack Robot

1. Pick a name for your robot and fill out the top part of the check list.
2. Use the labeling machine to label your Qwerk, the robot, and a ziploc bag with your robot's name.
3. Put the smaller parts into the ziploc bag.
4. Bring your robot to the TA so he can verify all the parts are there.

9 Tips

- Make sure that the robot battery is well charged.
- The Qwerk runs a webserver on board which can be accessed by going to the Qwerk's IP address.
- The docking behavior won't work since we don't have any iRobot docks in the room.