

Robotics 311 : How to build robots and make them move

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ROB 311 – Lab 2

Materials for Today's Class – 9/7/22

Per Person

- 1x SD card
- 1x SD card reader
- 1x USB to USB Micro cable (green and white package)
- 1x USB to USB C cable (gold package)
- 1x Raspberry Pi
- 1x Battery (to be returned after lab)

Per Team

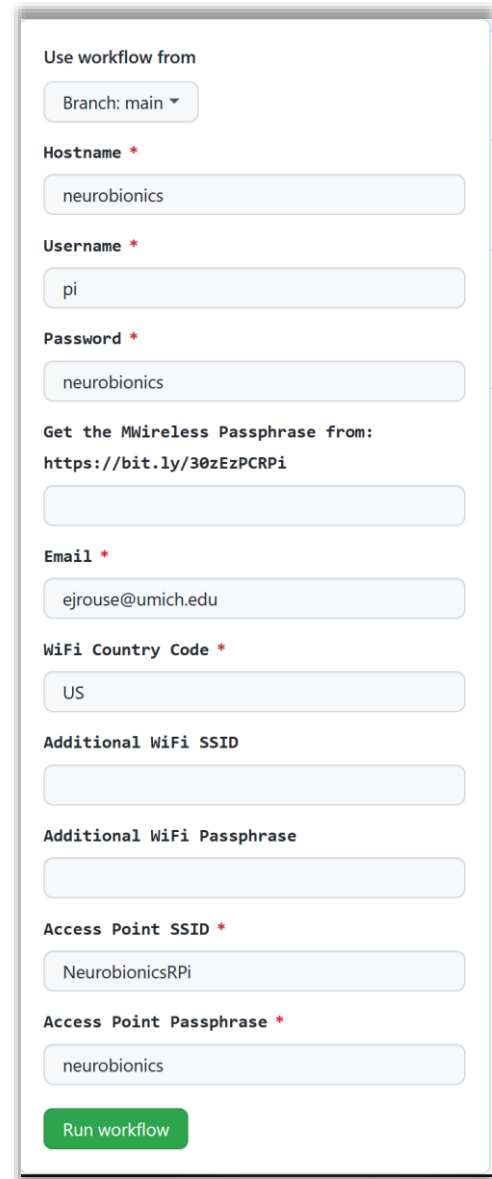
- 1x Plastic Box

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- Today we will setup of your Raspberry Pi that will run your ball-bot
- We will:
 - Setup and build your image using Github Actions
 - Download software tools (Sublime Text, Win SCP and Putty or VSCode)
 - Boot your Raspberry Pi and log in with your credentials
 - Run raspi-config and enable SPI
 - Add your team name to WiFi email script / use Linux editor
 - Review Linux / bash commands

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- Setup and build your image using Github Actions
- Search Google for Neurobionics github
- Navigate to repositories – select ROB311pi
- <https://github.com/neurobionics/rob311pi>
- This page describes the image builder tool
- Navigate to the ‘Actions’ tab, and select ‘Build’ on the left side
- Select ‘Run workflow’
- Enter your details – leave the username as ‘pi’
- Select ‘Run Workflow’ at the bottom of the form
- This takes a few minutes



Use workflow from

Branch: main ▾

Hostname *

neurobionics

Username *

pi

Password *

neurobionics

Get the MWireless Passphrase from:
<https://bit.ly/30zEzPCRpi>

Email *

ejrouse@umich.edu

WiFi Country Code *

US

Additional WiFi SSID

Additional WiFi Passphrase

Access Point SSID *

NeurobionicsRPi

Access Point Passphrase *

neurobionics

Run workflow

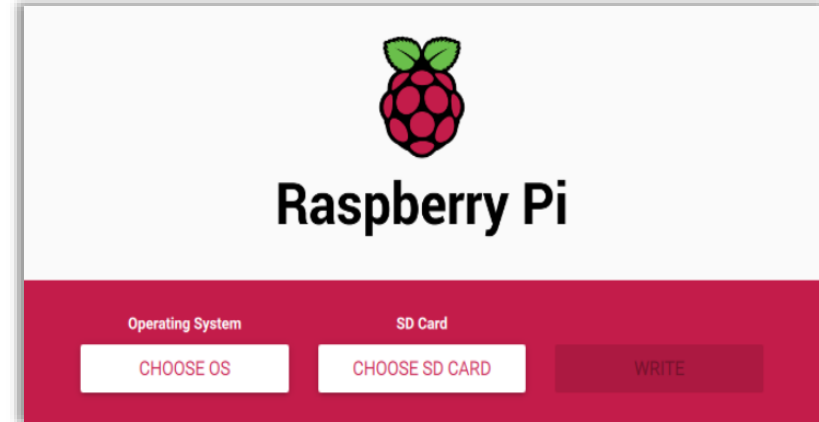
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- Install software tools
- For PC
 - Download Sublime Text
 - Download Putty
 - Download WinSCP
 - Set Sublime text as default editor in WinSCP
- For Mac
 - Download VSCode – PC users can also use VSCode



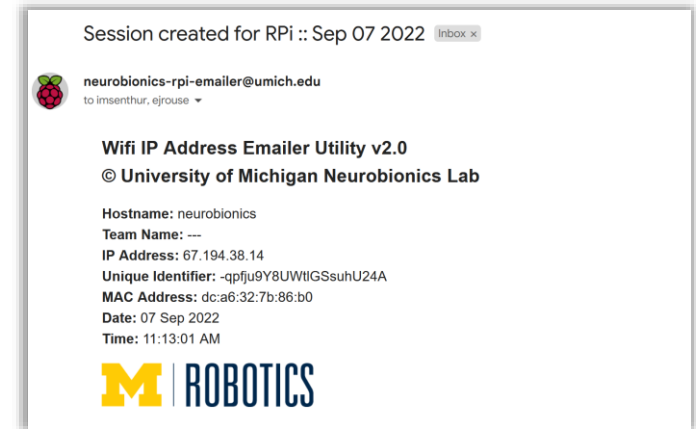
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- Flash your SD card
- Following downloading of your image, unzip and locate the file (.img)
- Download the Raspberry Pi Imager
- <https://www.raspberrypi.com/software>
- Insert your SD card into the provided card reader
- Flash the SD card using the imager tool and your built image
- This takes a few minutes



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- Boot up and log into your Raspberry Pi
- You should get an email with your IP address
- Enter the IP address as the hostname (port 22)
- Enter the credentials to log in
- Add your team name to the email sent on boot
 - **Type** `sudo nano /etc/startup_mailer.py`
 - Find where the team name is added, delete `'---'` and add your team name
 - Ctrl O to save
 - Exit
- **Type** `sudo python /etc/startup_mailer.py` and you should receive the email with your team name added



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- Test access point configuration
- If no known WiFi networks are in range, it will boot up in access point mode (like an Amazon Alexa)
- To test this, edit the WiFi network name here:

```
/etc/wpa_supplicant/wpa_supplicant-wlan0.conf
```

- Type `nano /etc/wpa_supplicant/wpa_supplicant-wlan0.conf`
- Add a spelling error to `MWireless`, so it will not connect on boot
- Save by pressing `ctrl O`
- Exit and reboot
- You should see a new WiFi network with your access point network name
- This network is not connected to the internet—its local between your computer and the RPi
- Once connected, go back and change `wpa_supplicant` to remove the edit just made. This is how you will connect if not at U-M.

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- Linux terminal commands
- Cheat sheet provided Files>Labs>Lab 2



ROB 311 - How to Build Robots and Make Them Move

Prof. Rouse - University of Michigan

This is a cheat sheet provided to assist with learning Linux when building your ball-bot. Raspberry Pi's are built on a Linux distribution (Debian), so it will support all the common commands of Linux. Like in Microsoft Windows for sensitive commands, administrative rights are needed. You can access superuser mode in Linux by entering `sudo su` in the command prompt. After entering `sudo su`, you'll see the `root@raspberrypi:/home/pi#` command prompt, and all subsequent commands will have super user privileges. This should be used sparingly, but sometimes is required if you do not have permission to run a program. Note: As under given list only have summary of the command, you can use `--help` at the end of each command to get its complete details.

NORMALLY USED COMMANDS

- `apt-get update`: Synchronizes the list of packages on your system to the list in the repositories. Use it before installing new packages to make sure you are installing the latest version.
- `apt-get upgrade`: Upgrades all of the software packages you have installed.
- `clear`: Clears previously run commands and text from the terminal screen.
- `date`: Prints the current date.
- `find / -name example.txt`: Searches the whole system for the file `example.txt` and outputs a list of all directories that contain the file.
- `nano example.txt`: Opens the file `example.txt` in the Linux text editor Nano.
- `poweroff`: To shutdown immediately.
- `raspi-config`: Opens the configuration settings menu.