

ssh pi@raspberrypi.local

Usually people use NOOBS, which is an installer that Raspberry Pi runs and recommends. Decided against it, because:

- No monitor, keyboard, and mouse to control Pi with - thus, we need to set up with SSH.
- Want to make sure that we can get stuff we want on it (ROS, OpenCV)

Started following this tutorial for setting up a Pi Zero W with SSH:

<https://www.losant.com/blog/getting-started-with-the-raspberry-pi-zero-w-without-a-monitor>

Happened to find a Raspbian Stretch Lite image with ROS Kinetic and OpenCV already installed, linked here:

<https://discourse.ros.org/t/raspbian-stretch-lite-ros-opencv-raspberry-pi-disk-image/4294>

Imaged it onto a 32GB MicroSD card, and continued following the tutorial to enable SSH

When creating wpa_supplicant.conf, changed a few key things:

- country from US to CAN (ISO code)
- WiFi network to my home wifi SSID and password
 - This could be annoying later when doing UoFT wifi - might want to hotspot for milestones or something

More info on wpa_supplicant.conf can be found here:

https://www.raspberrypi-spy.co.uk/2017/04/manually-setting-up-pi-wifi-using-wpa_supplicant-conf/

Notable issue - because we were using the image from ROSbots, the password to SSH into the Pi was no longer "raspberry" as is the default - it was instead "rosbots!"

Once I got into the Pi, I stopped following the old tutorial and started following this one, specific to this image: https://github.com/ROSbots/rosbots_setup_tools#use-our-existing-rosbots-raspbianrosopencv-image-after-youve-downloaded-it

I changed the UNIX password on our Pi to "M19"

At this point I decided it would be a good idea to pull out the plug for the Pi - this is a bad idea. Every time you turn it off, you need to run:

```
sudo shutdown -h now
```

Plugged back in to check everything is okay. Got this error:

```
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@    WARNING: POSSIBLE DNS SPOOFING DETECTED!    @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
```

The ECDSA host key for raspberrypi.local has changed,

and the key for the corresponding IP address 192.168.0.24 is unknown. This could either mean that DNS SPOOFING is happening or the IP address for the host and its host key have changed at the same time.

```
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
```

```
@  WARNING: REMOTE HOST IDENTIFICATION HAS CHANGED!  @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
```

IT IS POSSIBLE THAT SOMEONE IS DOING SOMETHING NASTY!
Someone could be eavesdropping on you right now (man-in-the-middle attack)!
It is also possible that a host key has just been changed.
The fingerprint for the ECDSA key sent by the remote host is
SHA256:tSo0taYd+ODfsEIJray7eqDhH9jRNc4re+3TgvqWc7o.
Please contact your system administrator.
Add correct host key in C:\\Users\\bluey/.ssh/known_hosts to get rid of this message

Probably because we changed the device settings earlier - to amend this, I went to C:\\Users\\bluey/.ssh/known_hosts and deleted all known hosts, to try again.

After doing so, I was able to SSH in as normal, with password "M19"

Writing Motor GPIO code for the Pi

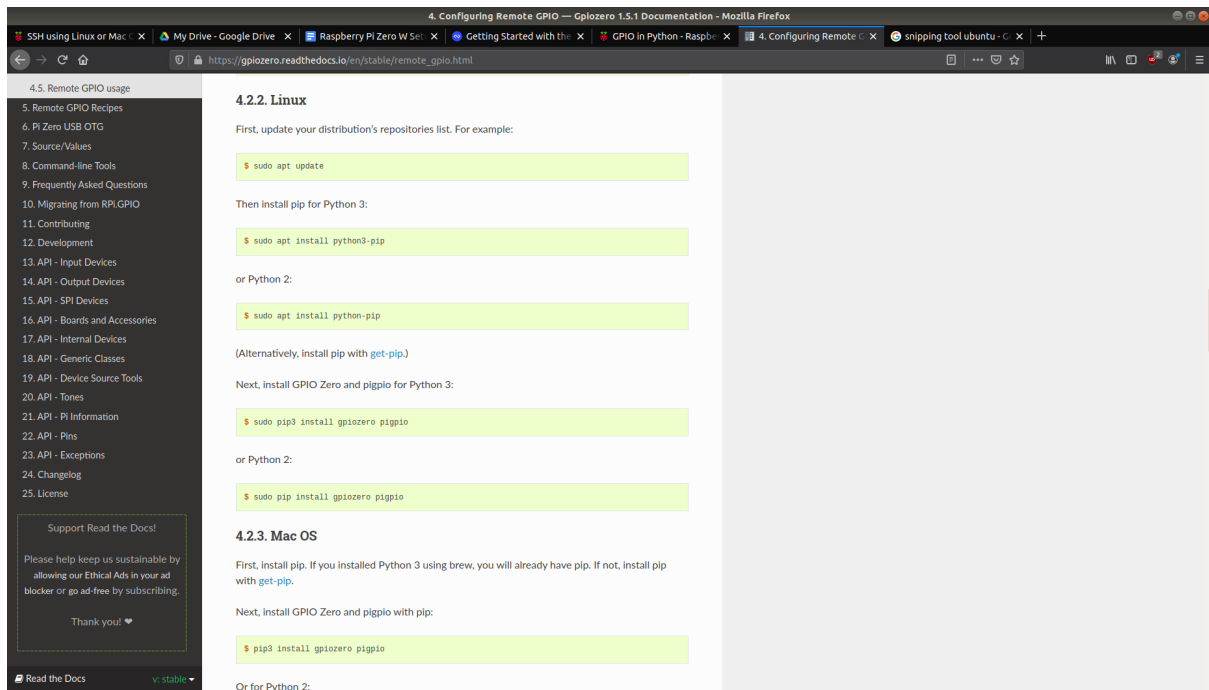
Using this tutorial:

<https://www.raspberrypi.org/documentation/usage/gpio/python/README.md>

Made a directory, ~/robot, that we'll put all our future code into

We want to control the GPIO pins from our computer, so we'll install the GPIO Zero library on Rocco's computer and use the Remote GPIO feature.

Accidentally sudo apt updated the Pi and command killed it right after. Hopefully didnt break anything. If anything, run sudo apt update on Pi maybe? Or re-flash



We:

- Installed pigpio and gpiozero on my laptop
- Installed pigpio on the pi

We then realized that we would have to set a static IP address on the Pi if we wanted to be able to set the environment variable without checking for the IP of the Pi every single time

But I got scared so we'll do that later as a stretch goal

Okay - we're gonna have to make the motor GPIO code in a catkin_ws so we can mess with it later

So I created and built a ROS package called M19 using this tutorial

<http://wiki.ros.org/ROS/Tutorials/CreatingPackage>

And I need to write a manual controller (publisher), and something that does remote GPIO to the Pi (subscriber)

NOTE: If we ever try to use roslaunch, note that the subscriber with gpiozero has to be run with a command that also initializes an environment variable with the IP of the Pi, as noted above

For publisher:

- using code from this forum <https://ubuntuforums.org/showthread.php?t=2394609> to read keypresses
 - can't read multiple keypresses at once this way - could fix this using pygame

At the end of Friday, February 14th:

- publisher runs and publishes, but does not respond to button presses

- subscriber untested, probably wont run because of variables out of scope
 - subscriber uses spinOnce(), which is a cool thing
 - and uses a while loop while modding a timer to control the driver pulses
 - cool!
- please work

February 16, 2020

- Took the Pi to Markham home, tried to do the wpa_supplicant.conf file thing to change the settings
 - turns out you can only do it with an SD card that has never been booted
 - so if I want to do it again I need to re-flash the SD card
 - hmm
 - so far, all I've done is change some settings to enable camera and Remote GPIO
 - re-flashing should be okay - I plan to be home for a couple days so may as well
 - https://www.daemon-systems.org/man/wpa_supplicant.conf.5.html (wpa_supplicant params)
 - not working - going to reflash again

March 2nd

- Got Pi to work on my own hotspot
 - RPZW doesnt work on 5GHz
 - New password - orangecheesecake
 - Check wireshark (sudo wireshark) for Pi IP (10.42.0.209)
 - Re ran through rosbots setup, re-enabled remote gpio

March 4th

- Pi is being powered via GPIO - just dont use the pi to output power
- Having issues with pi connecting to my computer, but not to the internet
 - <https://docs.ubuntu.com/core/en/stacks/network/wifi-ap/docs/simultaneous-sta-ap-mode> following this tutorial to change my wifi configurations to get it to work
 - tried to also create a virtual environment to swap between python 2 and 3 with this <https://stackoverflow.com/questions/42214414/this-package-should-not-be-accessible-on-python-3-when-running-python3>
 - source env/bin/activate to activate python3 mode
 - made an alias: python3mode
 - deactivate to leave
 - python --version to check which one you're on
- <https://unix.stackexchange.com/questions/84440/hotspot-and-internet-access-together-why-not> ACTUAL tutorial for wifi hotspot setup
 - uses create-ap package from github
 - made an alias on my computer - just type "hotspot" for hotspot
- For my weird python path problem, this is why:
 - <https://answers.ros.org/question/310401/ros-changed-the-python-path/>

- ROS Melodic automagically changes my python path to 2.7 upon calling setup.bash. So I shouldn't do this automatically on startup - instead I'll make an alias that does it
- Made the alias - called rossetup

March 8th

- When my laptop hotspot opens, it closes connection with UofT wifi (no internet)
 - Workaround - create a virtual access point (with create_ap)
 - Problem - virtual access point is at 5GHz
- Mobile hotspot works, but has WPA2/AES protocol
 - Need the following lines in wpa_supplicant:
 - proto=RSN
 - key_mgmt=WPA-PSK
 - pairwise=CCMP
 - auth_alg=OPEN
- installing tmux onto Pi for screen splitting
- installed

March 10th

- Camera responds to command ***raspistill -o image.jpg*** for taking pictures
- image saved as image.jpg on my current working directory
- sudo apt-get update returning an error about missing pub_key
- image successfully moved to desktop and opened
 - pretty nice pic
 - needed to install openssh <https://www.cyberciti.biz/faq/ubuntu-linux-install-openssh-server/>
 - and run 2 commands - ill probably add em to my bashrc
 - the commands enabled and started my computer's SSH
- took 7-8 secs to take a pic
 - could probably be cut down with settings at the expense of quality
 - could also take video - raspistill supports it
- installing sshping on my computer to try to diagnose latency of ssh connection
 - its really slow typing in commands
- tool i've been using: Nmap
 - type nmap -sn (network interface name - for example, wlp2s0) (ip address, but with the last set of numbers replaced with a star)
- okay - installed sshping, ran it with the pi (ON MY HOME WIFI)
 - these are the results
 - ssh-Login-Time: 5347254262 ns
 - Minimum-Latency: 4023370 ns
 - Median-Latency: 4785313 ns
 - Average-Latency: 6181728 ns
 - Average-Deviation: 13950283 ns
 - Maximum-Latency: 234363761 ns
 - Echo-Count: 1000 B
 - Upload-Size: 8000000 B
 - Upload-Rate: 2269879 B/s
 - Download-Size: 8000000 B

- Download-Rate: 1644790 B/s
 - that looks good! around 4 ping
 - maximum ping 234 ms
 - why is it so slow typing stuff >.>
 - upload rate 2.2 MBps, download rate 1.6 MBps
 - my image was 2.5 MB, o that's 1.5625 seconds to send an image
- Grace meeting notes
 - How to get pictures?
 - Either OpenCV will run on Pi or on laptop
 - If on Pi, run shell command to take pics regularly, and OpenCV will take the newest pic every time
 - If on laptop, same thing, but Rocco will have to write a shell script to get everything over via SCP on a regular basis
 - Should OpenCV and controls be separate?
 - Currently, it doesn't matter, because OpenCV is the only feedback to our loop, so motors only need to be updated every time OpenCV finishes a picture
 - Later, we might decide to add other sensors that need to be polled faster. If so, controls should run separately. Look into multithreading/multiprocessing if necessary, but ROS should make this okeydoke
 - Example/ we have a button and OpenCV coords
 - we'll ros spinOnce every time we poll the button and so we'll get updated camera stuff if its there
 - Conclusion: yes we will make them separate
 - How does delay in image transfer affect delays in controls response?
 - We don't know :(((read stuff i guess
- To do (Rocco):
 - Run sshping on hotspot
 - Compile and test motor code
 - Find min and max motor values
 - Remember to adjust VREF if you change VDD
 - Try to run OpenCV code on Pi, and time it
 - Decide whether to run on Pi or laptop
 - If laptop:
 - Write shell script for SCP to laptop
 - Figure out how to get ROS messages from OpenCV/control node on laptop to control/motor node on Pi
 - Separate OpenCV and control code
 - Eventually, write an alias that will start everything at once