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EN 605.715.81 Embedded Systems

## **Project 7 – Download GPS from Raspberry Pi**

### **Requirements**

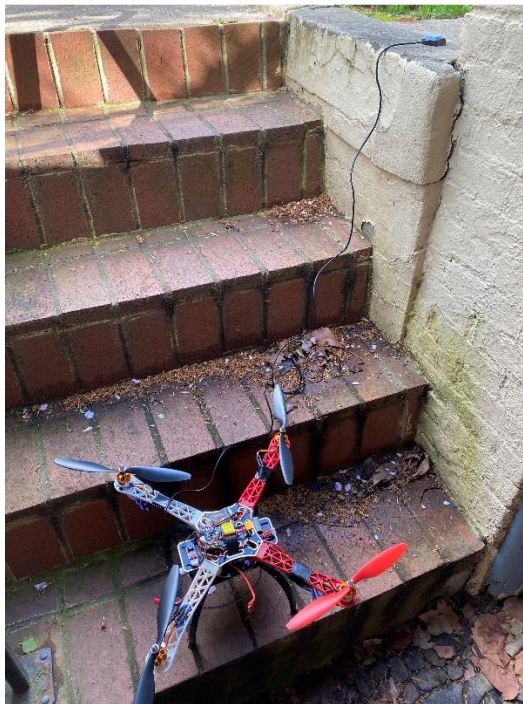
1. Connect GPS to the Raspberry Pi mounted on the Quadcopter
2. Capture GPS on the Raspberry Pi as the Quadcopter flies
3. Download the GPS via WiFi to your host
4. Display the GPS on your host

### **Design**

#### **Hardware**

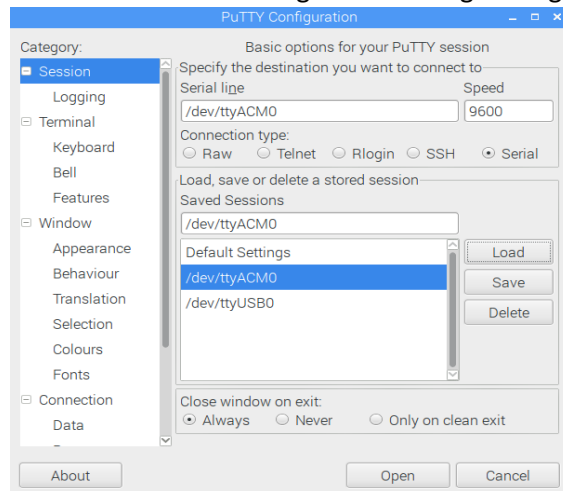
- 1 Quadcopter (built per the instructions in project 4)
- 1 G-Mouse USB GPS unit
- 1 Raspberry Pi in its case with Raspbian installed (set up per the instructions in project 6)
- 1 portable charger
- 1 USB to USB-C cable
- 1 USB-C power adapter
- 1 Laptop

Plug the GPS into the Pi and fasten the Pi (connected to its portable charger) to the drone. Below is a photo of my setup:

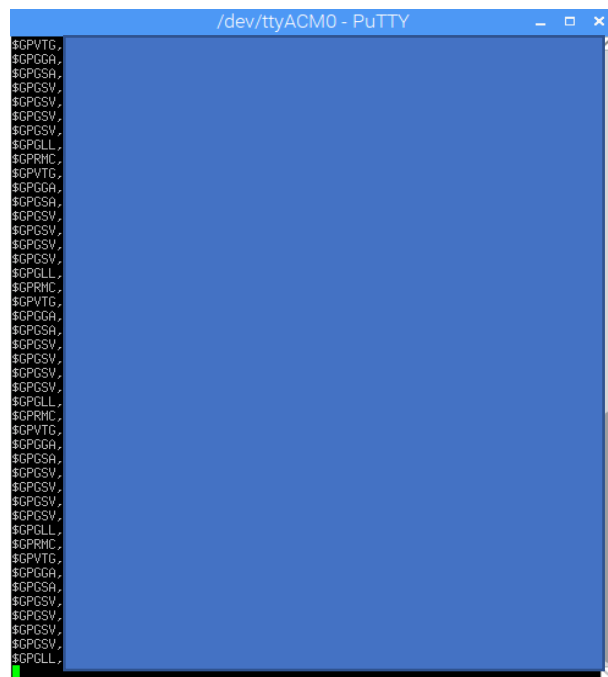


## Software

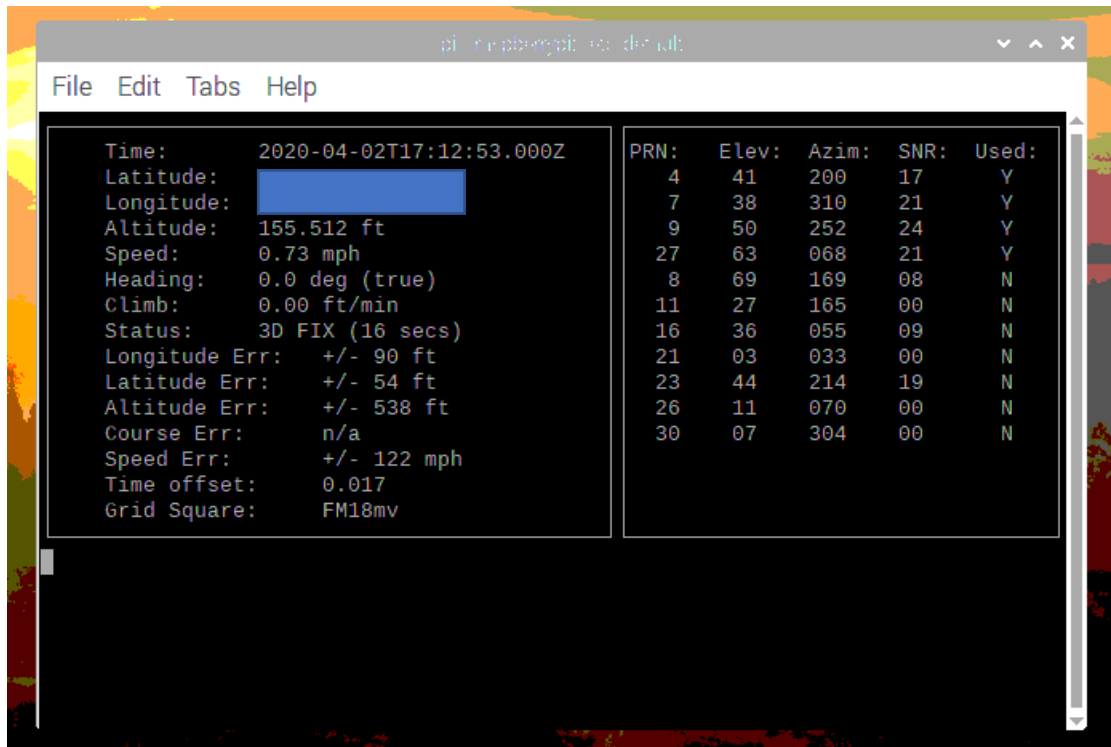
1. Setup the Raspberry Pi based on the instructions in module 6
2. VNC into the RPi and install PuTTY
  - a. “sudo apt-get install putty”
3. Make sure you have the dialout group as a user on the Pi
  - a. Run “groups” to check
  - b. If dialout isn’t listed, an easy way to get it is to run “sudo apt-get install arduino”
4. Check the tty port the GPS uses
  - a. Before you plug in your GPS, check your devices with “ls /dev/tty\*”
  - b. Plug in your GPS and run the command again to find the new entry
  - c. For reference, mine is /dev/ttyACM0
5. Make sure the tty port is set to the correct baud rate
  - a. “sudo stty -F /dev/ttyACM0 speed 9600”
6. Verify the connection using PuTTY
  - a. Connect to the GPS using the following settings:



- b. If everything is correctly connected you should see output that looks like this when you connect:



7. Install the gps viewing software
  - a. "sudo apt-get install gpsd gpsd-clients python-gps"
  - b. Stop the gpsd service with "sudo service gpsd stop"
  - c. Invoke it again with "sudo gpsd -nN /dev/ttyACM0 /var/run/gpsd.sock -G"
    - i. The -G is important if you want to read data from your host laptop
  - d. The terminal may have many error messages, minimize this terminal and open another
8. Run the test program to verify gpsd in the new terminal
  - a. Run "cgps -s". My output looked like this:

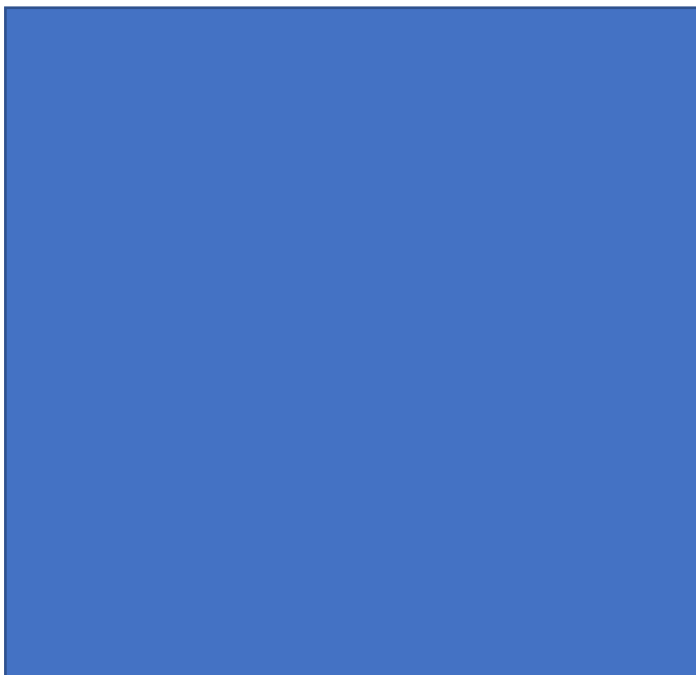


```
pi: raspberrypi: ~$ default
File Edit Tabs Help

Time:      2020-04-02T17:12:53.000Z
Latitude:  [REDACTED]
Longitude: [REDACTED]
Altitude:  155.512 ft
Speed:     0.73 mph
Heading:   0.0 deg (true)
Climb:     0.00 ft/min
Status:    3D FIX (16 secs)
Longitude Err: +/- 90 ft
Latitude Err: +/- 54 ft
Altitude Err: +/- 538 ft
Course Err: n/a
Speed Err:  +/- 122 mph
Time offset: 0.017
Grid Square: FM18mv

PRN:  Elev:  Azim:  SNR:  Used:
 4    41    200    17    Y
 7    38    310    21    Y
 9    50    252    24    Y
27    63    068    21    Y
 8    69    169    08    N
11    27    165    00    N
16    36    055    09    N
21    03    033    00    N
23    44    214    19    N
26    11    070    00    N
30    07    304    00    N
```

9. Use Google maps to verify the location is correct



10. Send GPS data to your host laptop
  - a. "pip install gps" on your laptop
  - b. Run gps\_read.py on the laptop
  - c. Pulls back lat and lon data and writes it to the screen while also printing to a log

### **Demo**

Because I live in a no-fly zone and due to COVID-19, I couldn't fly my drone outside for the demo, but when my GPS was in the house, it couldn't get an accurate reading, so for my demo I just placed it on my porch and did not fly it. In the video, I used white boxes to blur out my actual GPS data because I didn't feel comfortable posting it on YouTube since it points directly to my address, but hopefully there is enough evidence in this document and in the video to prove I had the GPS working.

Demo can be found on YouTube at <https://www.youtube.com/watch?v=aBSctm40EY>

### **References**

Source 1: <https://raspberrypi.stackexchange.com/questions/68816/how-can-i-set-up-my-g-mouse-usb-gps-for-use-with-raspbian>

Source 2: <https://ozzmaker.com/using-python-with-a-gps-receiver-on-a-raspberry-pi/>

Source 3: [https://medium.com/@DefCon\\_007/using-a-gps-module-neo-7m-with-raspberry-pi-3-45100bc0bb41](https://medium.com/@DefCon_007/using-a-gps-module-neo-7m-with-raspberry-pi-3-45100bc0bb41)

Source 4: Classmates! Thank you!