COMP 3980 - Assignment 3: GPS

Angus Lam & Mackenzie Craig

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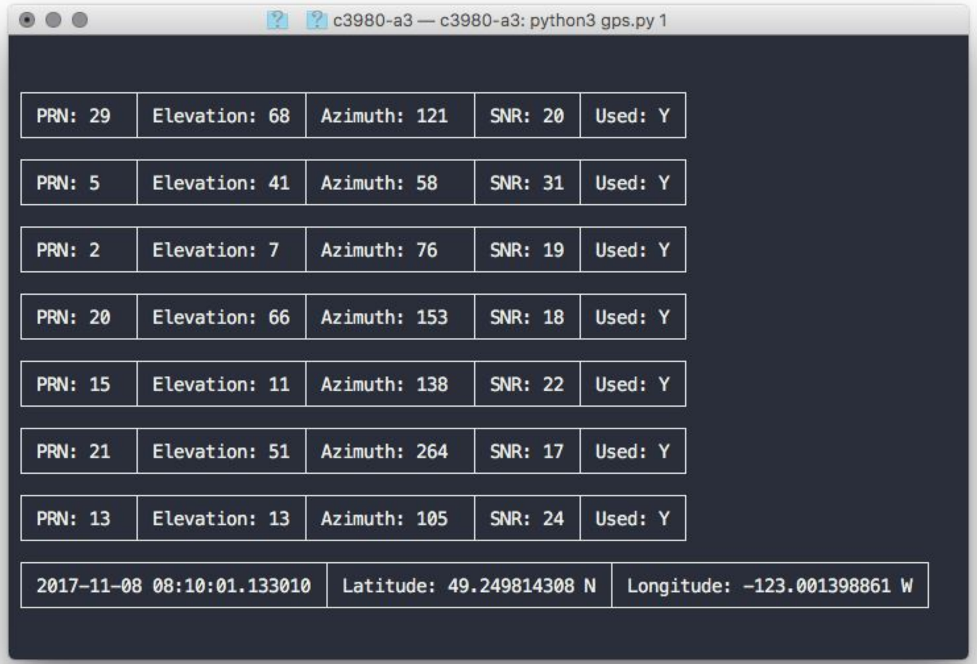
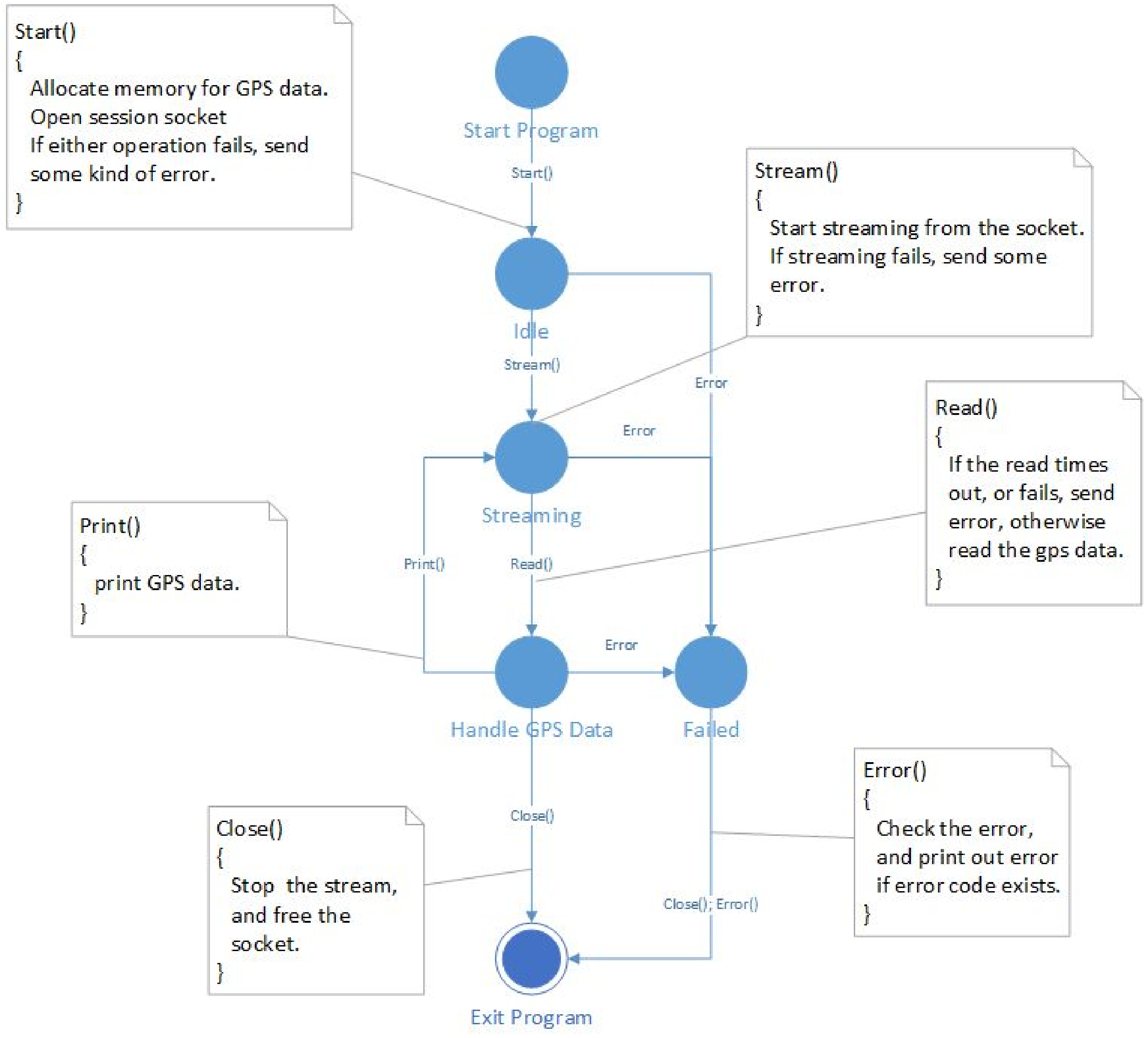


```
PRN: 29 | Elevation: 68 | Azimuth: 121 | SNR: 20 | Used: Y
PRN: 5  | Elevation: 41 | Azimuth: 58  | SNR: 31 | Used: Y
PRN: 2  | Elevation: 7  | Azimuth: 76  | SNR: 19 | Used: Y
PRN: 20 | Elevation: 66 | Azimuth: 153 | SNR: 18 | Used: Y
PRN: 15 | Elevation: 11 | Azimuth: 138 | SNR: 22 | Used: Y
PRN: 21 | Elevation: 51 | Azimuth: 264 | SNR: 17 | Used: Y
PRN: 13 | Elevation: 13 | Azimuth: 105 | SNR: 24 | Used: Y

2017-11-08 08:10:01.133010 | Latitude: 49.249814308 N | Longitude: -123.001398861 W
```

An example of the program running with a fix, and 7 satellites seen.

Diagram:


Start()
{
Allocate memory for GPS data.
Open session socket
If either operation fails, send some kind of error.
}
Start Program
Start()
Stream()
{
Start streaming from the socket.
If streaming fails, send some error.
}
Idle
Stream()
Error
Error
Read()
{
If the read times out, or fails, send error, otherwise read the gps data.
}
Streaming
Print()
{
print GPS data.
}
Print()
Read()
Error
Handle GPS Data
Failed
Error()
{
Check the error, and print out error if error code exists.
}
Close()
Close()
{
Stop the stream, and free the socket.
}
Close(); Error()
Exit Program

Start Program:
Where the user executes the program.

Idle:
Memory for the gps data is allocated, and the socket is opened for streaming.

Streaming:
The socket is streaming gps data.

Handle GPS Data:
The data stream is being parsed.

Failed:

When the program throws an error.

Exit Program:
The point where the program ends.

User Guide:
The following section documents installing and running gps.py.

Installing:
Note: this program is developed to be ran with python3. At the time of writing this, the current version of python is 3.6.3.

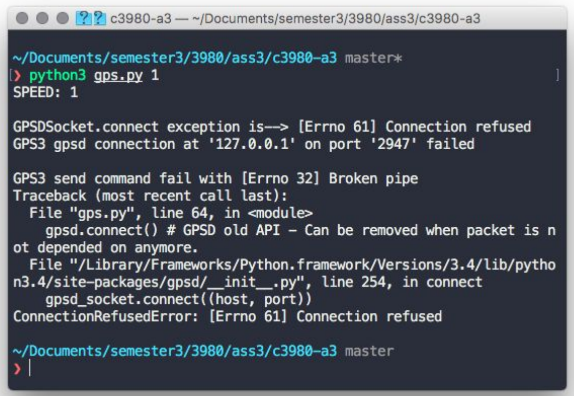
- Assure that you have pip installed (You can check this by running ‘pip3 -V’). If you do not have the pip3 command available, you likely do not have a working installation of python3, and should attempt a fresh install.
- Run the installation command for the three dependencies that gps.py requires. At the shell type or copy: ‘pip3 install gps3 gpsd-py3 terminaltables’.
- Install the gpsd daemon, which is a required dependency. On any linux based system, run ‘dnf install gpsd’ to install the daemon.

Running:
Note: this program is meant be ran from the command line.

- Insert your USB GPS device to the machine that you plan to run gps.py on.
- Start the gpsd daemon. Run the following command: ‘gpsd /dev/cu.usbserial’, and replace cu.usbserial with the path on your system to your USB GPS device.
- Open up your terminal of choice. Any terminal that has python3 in its path will be sufficient. Run the following command to start the program from the location that gps.py is located: ‘python3 gps.py [speed]’ where speed is the number of seconds between gps refreshes.
  For example, if you want the program to refresh every 3 seconds, run the following command at the terminal prompt: ‘python3 gps.py 3’.

Test Documentation:
We ran a number of tests to assure that the program ran as desired. These are documented below.

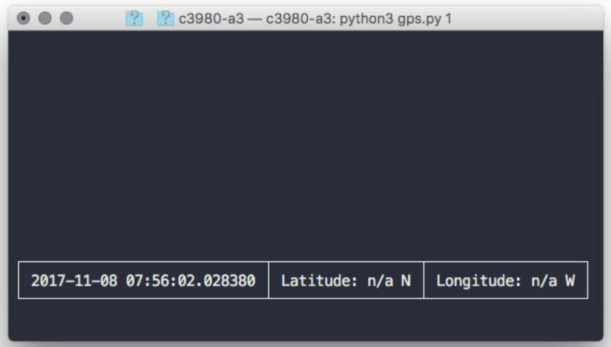
Running with no gpsd instance open


c3980-a3 — ~/Documents/semester3/3980/ass3/c3980-a3

```
~/Documents/semester3/3980/ass3/c3980-a3 master*
❯ python3 gps.py 1
SPEED: 1

GPSDSocket.connect exception is--> [Errno 61] Connection refused
GPS3 gpsd connection at '127.0.0.1' on port '2947' failed

GPS3 send command fail with [Errno 32] Broken pipe
Traceback (most recent call last):
  File "gps.py", line 64, in <module>
    gpsd.connect() # GPSD old API - Can be removed when packet is n
ot depended on anymore.
  File "/Library/Frameworks/Python.framework/Versions/3.4/lib/pytho
n3.4/site-packages/gpsd/__init__.py", line 254, in connect
    gpsd_socket.connect((host, port))
ConnectionRefusedError: [Errno 61] Connection refused

~/Documents/semester3/3980/ass3/c3980-a3 master
❯ |
```

Doing this will return an error from GPS3 explaining that there is no gpsd socket connection. If this error occurs, start a gpsd instance (see: running) and try running gps.py again.

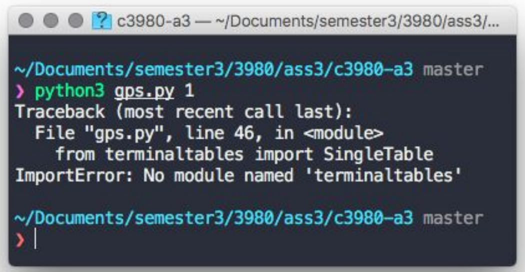
Running with no satellite connection


c3980-a3 — c3980-a3: python3 gps.py 1

```
| 2017-11-08 07:56:02.028380 | Latitude: n/a N | Longitude: n/a W |
```

Doing this will simply not display any satellites above the bottom bar. The time and latitude and longitude will still be displayed, but latitude and longitude will be displayed at “N/A” since they can not be calculated.

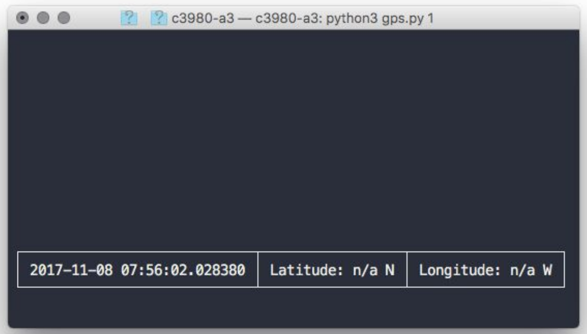
Running without dependencies installed



```
~/Documents/semester3/3980/ass3/c3980-a3 master
❯ python3 gps.py 1
Traceback (most recent call last):
  File "gps.py", line 46, in <module>
    from terminaltables import SingleTable
ImportError: No module named 'terminaltables'

~/Documents/semester3/3980/ass3/c3980-a3 master
❯ |
```

Doing this will print a default python error message, because the program can not run without these dependencies. This case can not be covered by the program, but the error message is sufficiently informative.

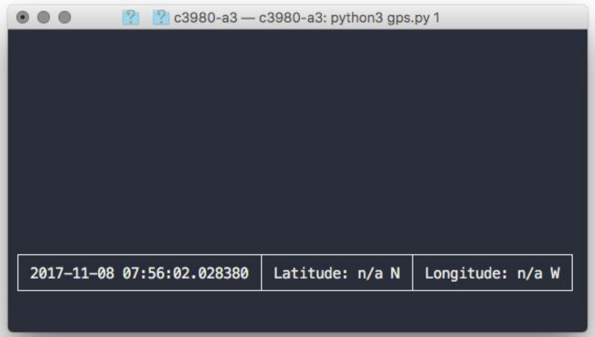
Running with no satellites available



```
┌────────────────────────────┬───────────────────┬────────────────────┐
│ 2017-11-08 07:56:02.028380 │ Latitude: n/a N   │ Longitude: n/a W   │
└────────────────────────────┴───────────────────┴────────────────────┘
```

Doing so will not display an error message, because no error has occurred. This will still display the time and display lat/lon as “N/A”, since they can not be calculated when the app is in this state.

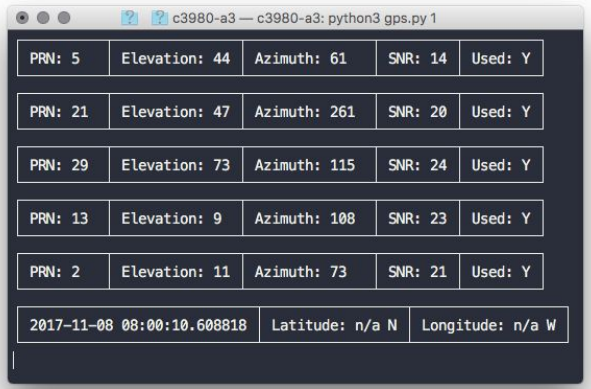
Running with not enough satellites to create any fix



```
c3980-a3 — c3980-a3: python3 gps.py 1

2017-11-08 07:56:02.028380 | Latitude: n/a N | Longitude: n/a W
```

Doing this will also not generate any errors, since again, it is not an error. It will simply display the satellites that are detected, and the information about them (including ID).

Running with not enough satellites to create a 3d fix (2d fix only)



```
c3980-a3 — c3980-a3: python3 gps.py 1
PRN: 5  | Elevation: 44 | Azimuth: 61  | SNR: 14 | Used: Y
PRN: 21 | Elevation: 47 | Azimuth: 261 | SNR: 20 | Used: Y
PRN: 29 | Elevation: 73 | Azimuth: 115 | SNR: 24 | Used: Y
PRN: 13 | Elevation: 9  | Azimuth: 108 | SNR: 23 | Used: Y
PRN: 2  | Elevation: 11 | Azimuth: 73  | SNR: 21 | Used: Y
2017-11-08 08:00:10.608818 | Latitude: n/a N | Longitude: n/a W
```

Doing so will create a 2d fix, which provides limited information to be displayed in the GUI.