Practical - 3

Aim: Displaying Different LED Patterns with Raspberry Pi

Hardware Requirements:

1. **Breadboard-** A breadboard is a tool used in electronics to prototype circuits without soldering. It has a grid of interconnected holes for components, power rails, and is reusable for experimenting with circuit designs.
2. **LED-Light-emitting diode :-** An LED is a small, energy-efficient semiconductor device that emits light when an electric current passes through it. It's used in lighting, displays, indicators, and various electronic applications.
3. **Resistor :-** A resistor is an electrical component that limits the flow of electric current in a circuit, typically used to control voltage levels, current flow, and adjust signal levels in electronics.
4. **Jumper Wire:-** A jumper wire is a short, flexible electrical wire used to establish connections between different points on a breadboard or electronic circuit, allowing for easy and temporary wiring during prototyping and testing.
5. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
6. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
7. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.

8. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)
9. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.
10. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device
11. **Male to female Jumper Wire:-** A male-to-female jumper wire is a type of electrical cable with a male connector on one end and a female connector on the other, commonly used for connecting components or devices on a breadboard or in electronics projects.

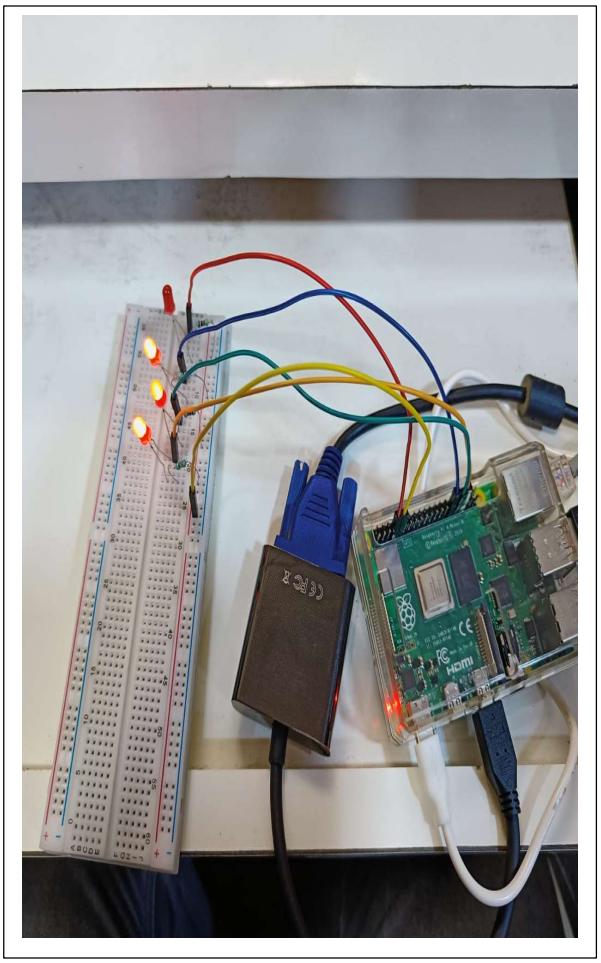
STEPS :-

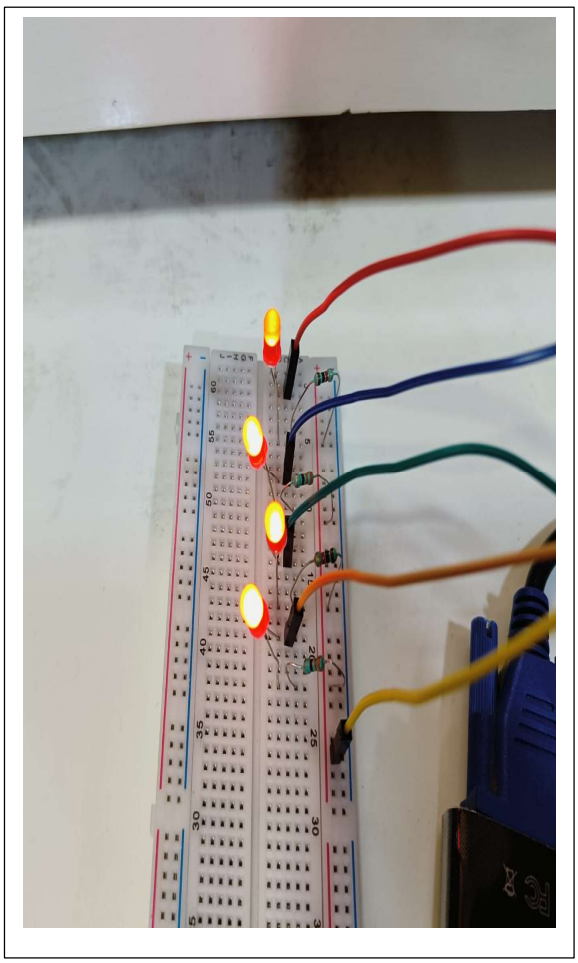
1) Connect the LED to the breadboard.
2) LED had 2 terminals (One is the longer terminal that is positive, second is the shorter terminal that is negative).
3) Connect one side for the jumper wire below the LED positive side on the breadboard connect the jumper wire below the LED longer terminal.
4) Connect one end of the resistor on the breadboard right below the LED negative side.
5) The other end of the resistor connects it anywhere on the breadboard. Now connect another jumper wire right above the second end of the resistor.
6) Connect the positive side of the jumper wire on PIN 7, 29, 31, 33 and the negative side on PIN 9 of the raspberry pi
    i. Longer terminal = Positive (Raspberry Pi Pin7)
    ii. Shorter terminal = Negative (Raspberry Pi Pin 9)

Code:-

```
import RPi.GPIO as GPIO
import time
GPIO.setmode(GPIO.BOARD)
GPIO.setwarnings(False)
GPIO.setup(7,GPIO.OUT)
GPIO.setup(29,GPIO.OUT)
GPIO.setup(31,GPIO.OUT)
GPIO.setup(33,GPIO.OUT)
while(1):
GPIO.output(7,False)
print("LED 1 IS OFF")
time.sleep(1)
GPIO.output(29,False)
print("LED 2 IS OFF")
time.sleep(1.5)
GPIO.output(31,False)

print("LED 3 IS OFF")
time.sleep(2)
GPIO.output(33,False)
print("LED 4 IS OFF")
time.sleep(2.5)

GPIO.output(7,True)
print("LED 1 IS FINALLY ON")
time.sleep(3.5)
GPIO.output(29,True)
print("LED 2 IS FINALLY ON")
time.sleep(4)
GPIO.output(31,True)
print("LED 3 IS FINALLY ON")
time.sleep(4.5)
GPIO.output(33,True)
print("LED 4 IS FINALLY ON")
time.sleep(5)

GPIO.output(7,False)
print("LED 1 IS OFF")
time.sleep(1)
GPIO.output(29,False)
print("LED 2 IS OFF")
time.sleep(1.5)
GPIO.output(31,False)
print("LED 3 IS OFF")
time.sleep(2)
GPIO.output(33,False)
print("LED 4 IS OFF")
time.sleep(2.5)
print("PROGRAM
COMPLETE!")
GPIO.cleanup()
```

Output :-





Practical - 5

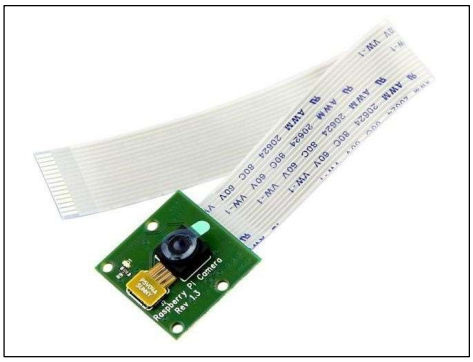
Aim: Click image and video using Raspberry Pi

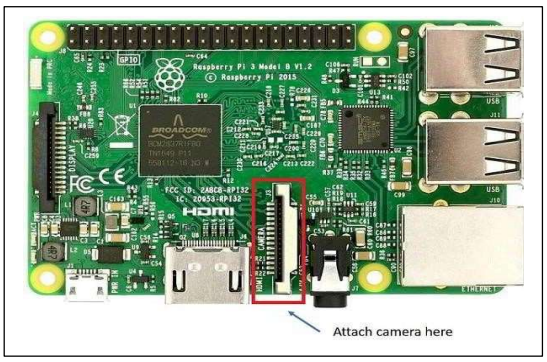
Hardware Requirements:

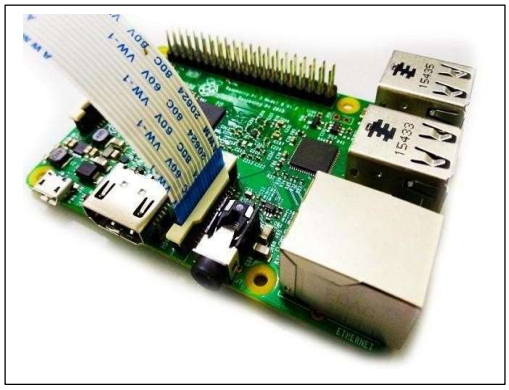
1. **Camera-** It will automatically record, monitor and alert the user.
2. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
3. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
4. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.
5. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)
6. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.
7. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

Steps:-

1. Connect Pi Camera to CSI interface of Raspberry Pi board as shown below :







2. Now, we can use Pi Camera for capturing images and videos using Raspberry Pi.
3. Now turn on your Raspberry pi.
4. Before using Pi Camera, we need to enable camera for its working
5. For enabling camera in Raspberry Pi, open raspberry pi configuration using following command :

Terminal Command:-

Sudo raspi-config

6. Then go to interface option, click on camera and enable it.

Code:-

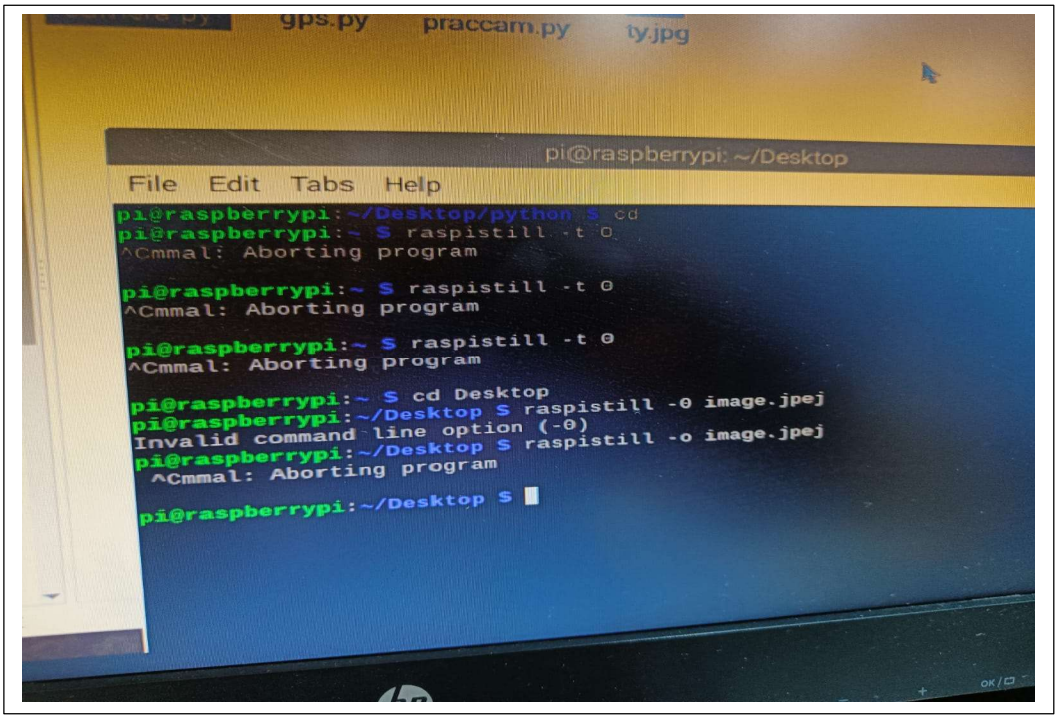
Video1.py

```
import time
from picamera import PiCamera
camera=PiCamera()
camera.start_preview()
camera.start_recording('home/pi/Desktop/video1.h264')
camera.wait_recording(5)
camera.stop_recording()
print("finished Recording")
```

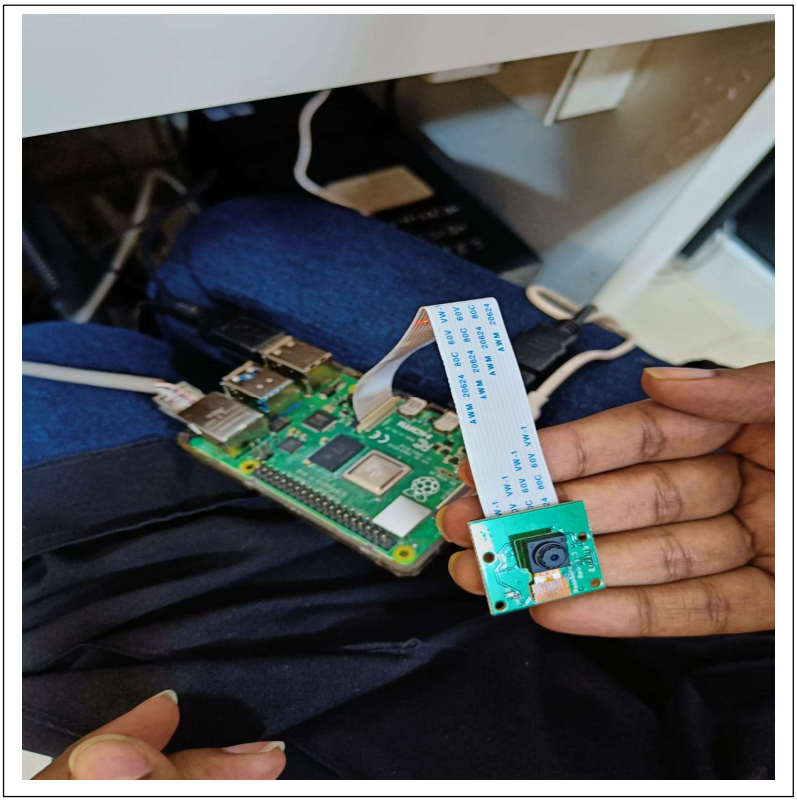
picam.py

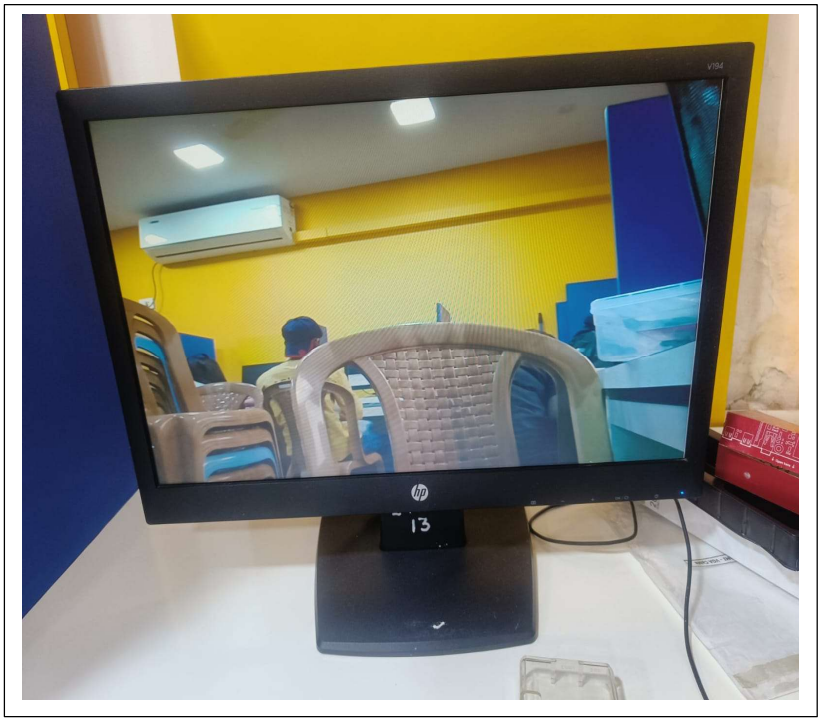
```
import time
from picamera import PiCamera
camera=PiCamera()
camera.resolution=(1280,720)
camera.start_preview()
time.sleep(5)
camera.capture('home/pi/Desktop/ty2.jpg')
camera.stop_preview()
```

- **Note:-** You can also directly run the camera by using this command :-



Output:-





Practical - 6

Aim: Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.

Hardware Requirements:

1. **Digit Display:-** In IoT, a digit display is a visual interface that shows numerical data from connected devices or sensors, aiding users in monitoring and interacting with real-time information.
2. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
3. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
4. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.
5. **HDMI Cable :-** HDMI (High-Definition Multimedia Interface) cables are digital cables used to transmit high-quality audio and video signals between devices, such as TVs, monitors, projectors, and multimedia sources (like laptops, game consoles, or streaming devices)
6. **Ethernet Cable:-** Ethernet cable is used to connect devices in a wired network, enabling data communication, and it comes in different categories for various performance levels.
7. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

8. **Female to Female Jumper Wire:-** A female-to-female jumper wire in IoT is a connector cable with female connectors on both ends, used to link components or sensors with female pins or headers.

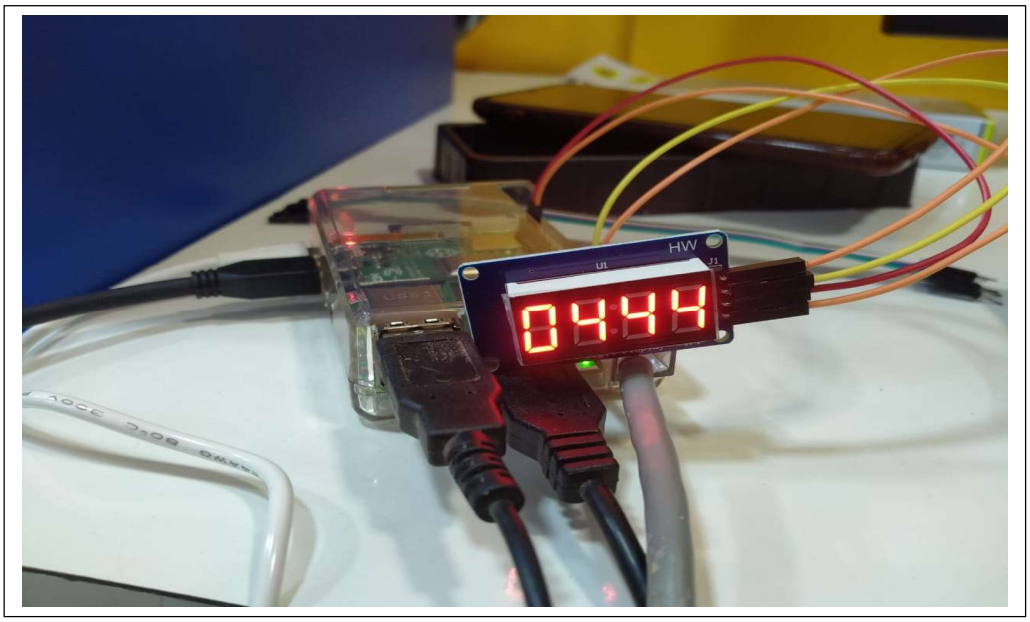
Steps:-

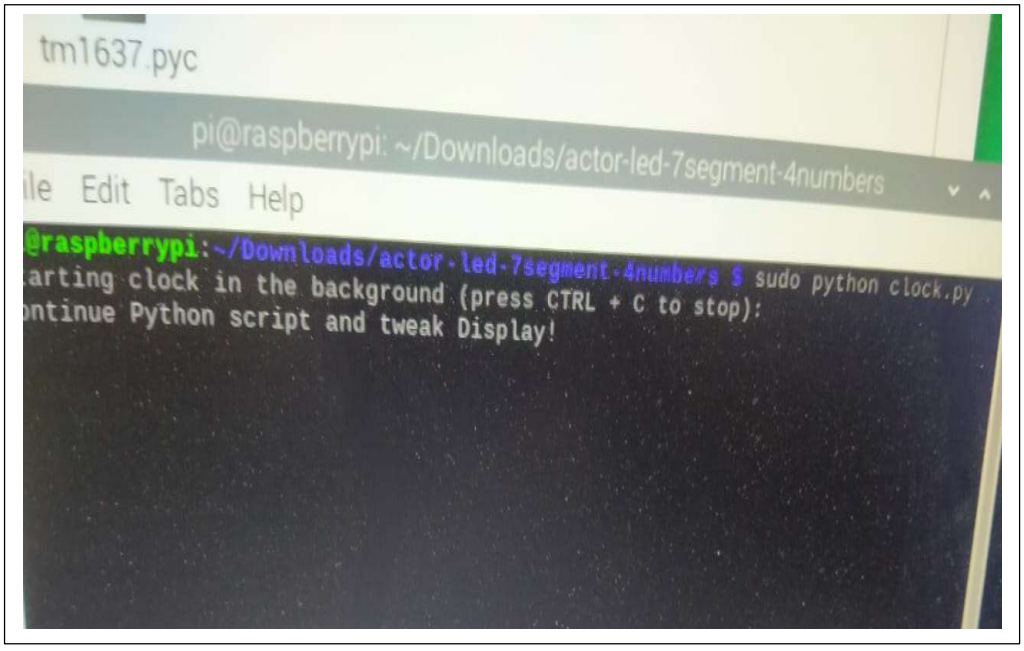
1. Open the web browser and go to the link:
   https://github.com/timwaizenegger/raspberrypi-examples/tree/master/actor-led-7segment-4numbers
2. Click on the actor–>led-7segment-4numbers.zip folder and download the zip file.
3. Go to the File Manager→ Downloads→ unzip the actor led-7 segment- 4 numbers.zip file → documents folder →python projects.
4. Make the connections as follows:
   a. Connect Pin2 (5V) of RPI to VCC PIN of 7 segment module.
   b. Connect Pin6 (Ground) of RPI to Ground pin of 7 Segment Module.
   c. Connect Pin 38 of RPI to DIO pin of 7 Segment Module.
   d. Connect Pin 40 of RPI to CLK of the 7 Segment Module.
5. Go to location where you have downloaded seven segment file, copy the location of that file.
6. Open the terminal and paste your location as “cd location”.
7. After entering location we have to give the command to run seven segment as “sudo python clock.py”

Terminal Commands:-

cd (file location)
sudo python clock.py

Output:-


0444


tm1637.pyc
pi@raspberrypi: ~/Downloads/actor-led-7segment-4numbers
le Edit Tabs Help
@raspberrypi:~/Downloads/actor-led-7segment-4numbers $ sudo python clock.py
arting clock in the background (press CTRL + C to stop):
ntinue Python script and tweak Display!

Practical - 7

Aim: Interfacing Raspberry Pi with RFID

Hardware Requirements:

1. **RFID Tag:-** RFID tags are a type of tracking system that uses radio frequency to search, identify, track, and communicate with items and people. Essentially, RFID tags are smart labels that can store a range of information from serial numbers, to a short description, and even pages of data. .
2. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
3. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
4. **Mouse :-** A mouse is a pointing device used to control the movement of a cursor or pointer on a computer screen. It typically has buttons that allow users to interact with graphical user interfaces, select items, and perform actions by clicking or dragging the cursor.
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7. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

8. **Female to Female Jumper Wire:-** A female-to-female jumper wire in IoT is a connector cable with female connectors on both ends, used to link components or sensors with female pins or headers.

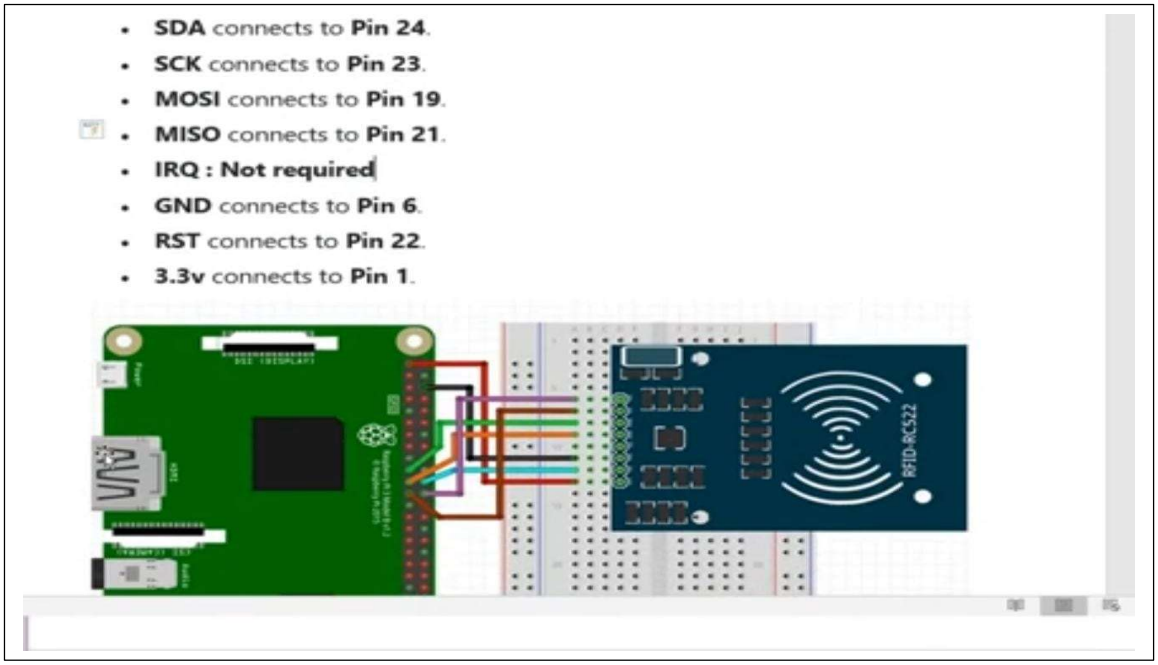
Code:-

Read.py

```
import RP1.GPIO as GPIO
from mfrc522 import
SimpleMFRC522
reader = SimpleMFRC522()
 try:
        print("place your card:")
        id, text = reader.read()
        print(id)
        print(text)
finally:
        GPIO.cleanup()
```

Write.py

```
import RPi.GPIO as GPIO
from mfrc522 import
SimpleMFRC522
reader = SimpleMFRC522()
try:
        text = input('New data:')
        print("Now place your tag
        to write")
        reader.write(text)
        print("written")
finally:
        GPIO.cleanup()
```



Terminal Commands:-

sudo nano writetest.py

- Copy and paste the write.py code
- Ctrl+O + Enter -> to save the code
- Ctrl + x -> to exit

sudo pip3 install mfrc522

sudo raspi-config

- After that go to interfacing option and enable the SPI and finish

sudo nano read.py

- Copy and paste the read.py
- Ctrl+O + Enter -> to save the code
- Ctrl + x -> to exit

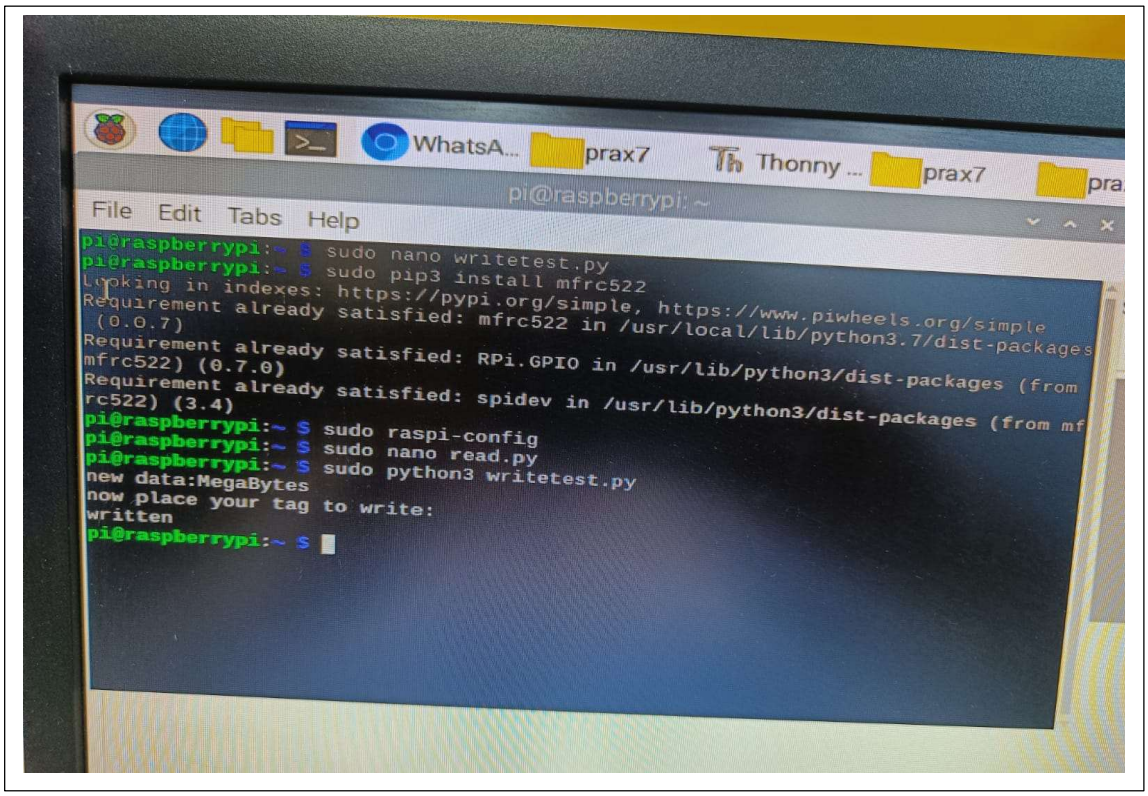
sudo python3 writetest.py

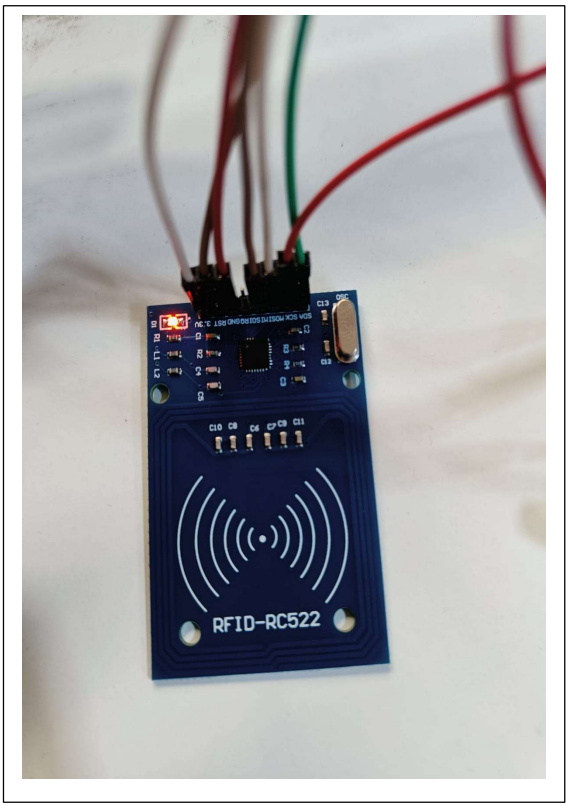
new data**MegaBytes**

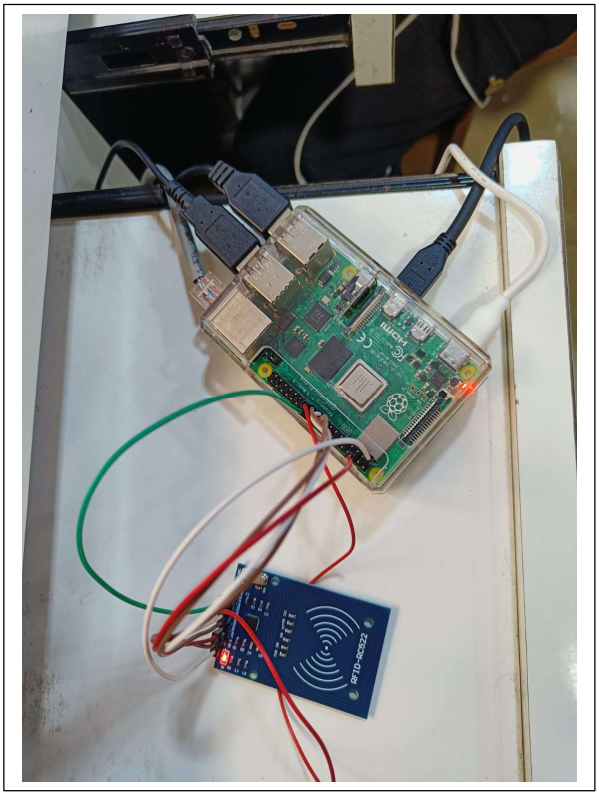
Place your tag and card to read

- **Now place your card or tag on the sensor for output**

Output:-


WhatsA...
prax7
Thonny ...
prax7
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo nano writetest.py
pi@raspberrypi:~ $ sudo pip3 install mfrc522
Looking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
Requirement already satisfied: mfrc522 in /usr/local/lib/python3.7/dist-packages
(0.0.7)
Requirement already satisfied: RPi.GPIO in /usr/lib/python3/dist-packages (from
mfrc522) (0.7.0)
Requirement already satisfied: spidev in /usr/lib/python3/dist-packages (from mf
rc522) (3.4)
pi@raspberrypi:~ $ sudo raspi-config
pi@raspberrypi:~ $ sudo nano read.py
pi@raspberrypi:~ $ sudo python3 writetest.py
new data:MegaBytes
now place your tag to write:
written
pi@raspberrypi:~ $


RFID-RC522



Practical - 8

Aim: Raspberry Pi GPS Module Interfacing

Hardware Requirements:

1. **GPS:-** GPS (Global Positioning System) is a satellite-based navigation system that provides accurate location and time information to users anywhere on Earth..
2. **Raspberry Pi :-** A Raspberry Pi is a small, affordable, single-board computer that's widely used for various DIY projects, education, and prototyping. It can run a variety of operating systems and is popular for programming, learning about computing, and building innovative electronics projects.
3. **Keyboard :-** A keyboard is an input device used to type or enter text and commands into a computer or other digital devices by pressing individual keys, each representing a specific character or function.
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7. **Power Supply:-** A power supply converts incoming electrical energy into the right form to power electronic device.

8. **Female to Female Jumper Wire:-** A female-to-female jumper wire in IoT is a connector cable with female connectors on both ends, used to link components or sensors with female pins or headers.

Steps:-

1. Connect the Pins of the GPS to raspberry Pi by using female to female jumper wire.
    - Follow the ports:-
        VCC- Pin 4
        GND- Pin 6
        RX - Pin 8
        TX- Pin 10

Terminal Commands:-

Sudo raspi-config

- Then go to interface option and enable serial port and finish.
- Install gpsd and the gpsd-client:

sudo apt-get install gpsd gpsd-clients

- Once the installation is done, verify that you can receive data from the GPS module. To do that, output the data that it sends over the serial port:

cat /dev/serial0

- If it goes in loop so do Ctrl+C
- Note that you should be able to run this command without being a superuser. If you can't, add the pi-user to the dialout group:

sudo adduser pi dialout

- Now it's finally time to determine the position of the Raspberry Pi. Type the following command to stop the gpsd service that got started automatically when you installed gpsd earlier. You have to do this because the default options aren't correct for the Pi:

sudo systemctl stop gpsd.socket

- Note that you'll have to type this command every time you boot up the system. Alternatively, you can also disable it entirely:

sudo systemctl disable gpsd.socket

- Start a new gpsd instance that redirects the data of the correct serial port to a socket:

sudo gpsd /dev/serial0 -F /var/run/gpsd.sock

- And then you can run either of the following two commands to display the GPS data:

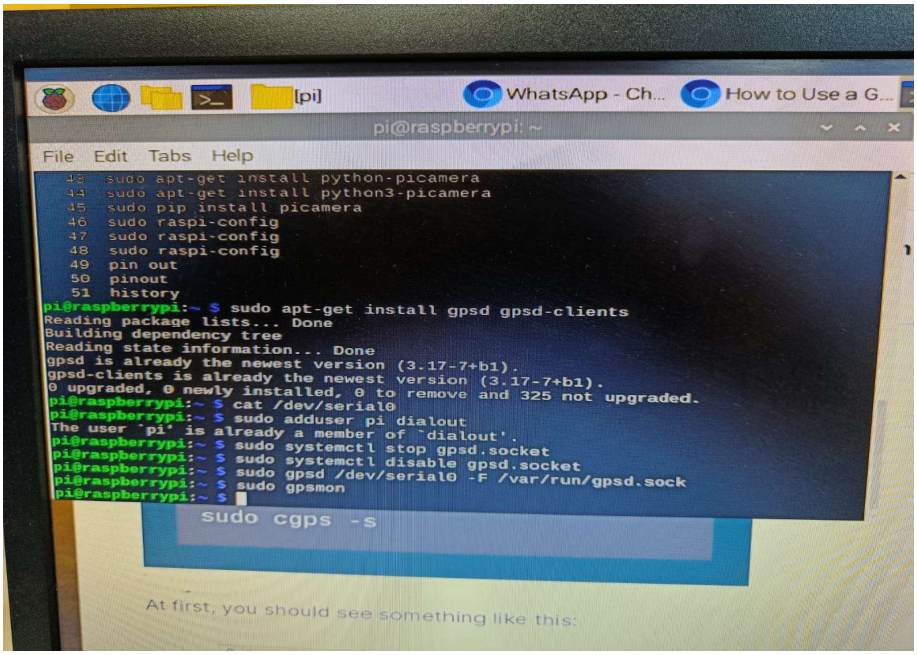
sudo gpsmon

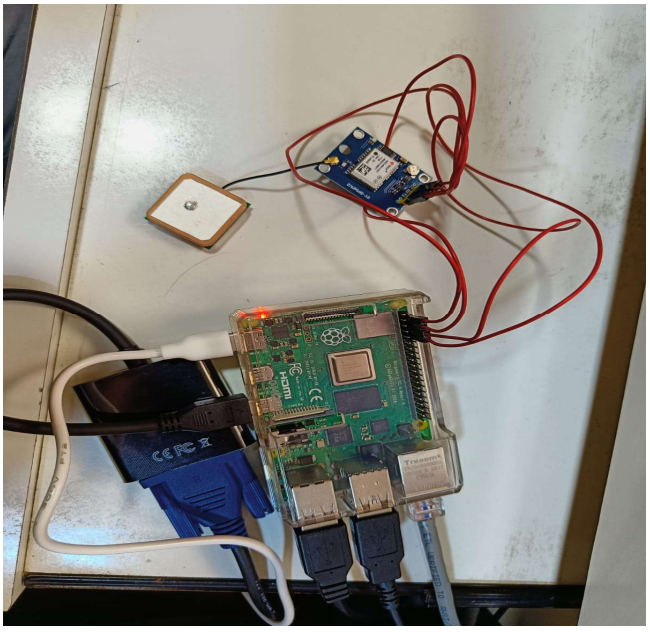
or

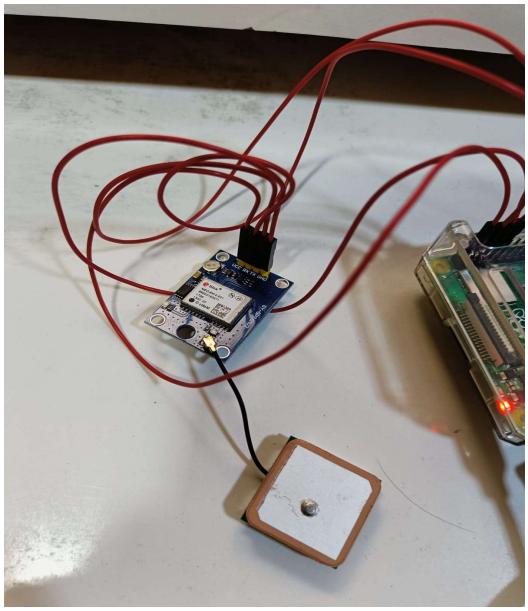
sudo cgps -s

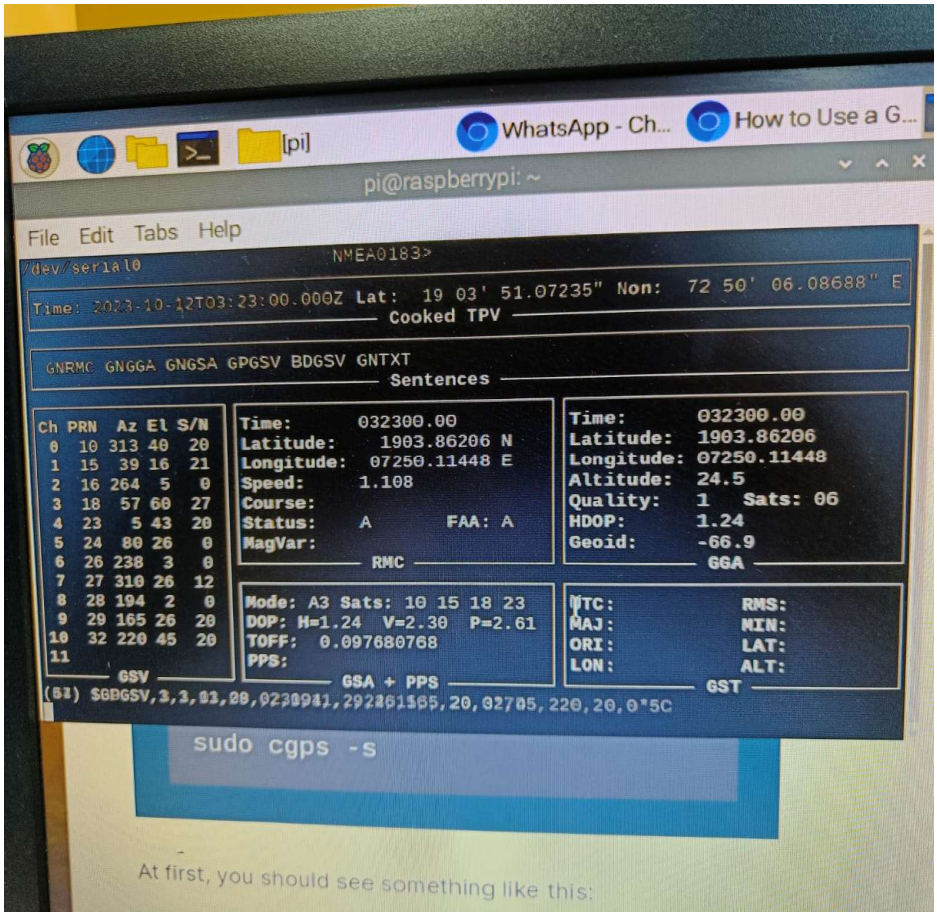
2. Now it will show your latitude and longitude of your current locations on the screen.

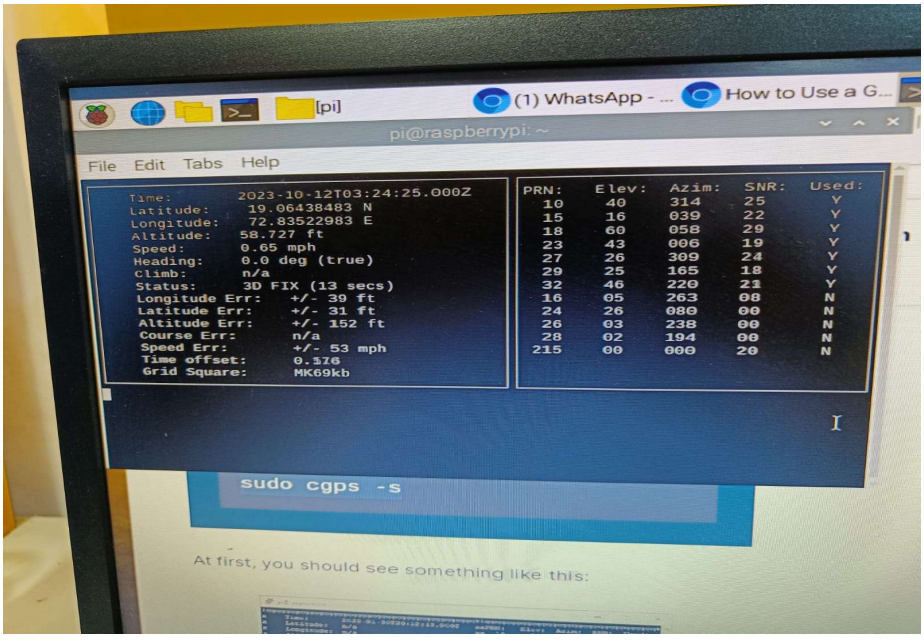
Output:-








[pi]
WhatsApp - Ch...
How to Use a G...
pi@raspberrypi: ~
File Edit Tabs Help
/dev/serial0 NMEA0183>
Time: 2023-10-12T03:23:00.000Z Lat: 19 03' 51.07235" Non: 72 50' 06.08688" E
Cooked TPV
GNRMC GNGGA GNGSA GPGSV BDGSV GNTXT
Sentences
Ch PRN Az El S/N
0 10 313 40 20
1 15 39 16 21
2 16 264 5 0
3 18 57 60 27
4 23 5 43 20
5 24 80 26 0
6 26 238 3 0
7 27 310 26 12
8 28 194 2 0
9 29 165 26 20
10 32 220 45 20
11
GSV
Time: 032300.00
Latitude: 1903.86206 N
Longitude: 07250.11448 E
Speed: 1.108
Course:
Status: A FAA: A
MagVar:
RMC
Time: 032300.00
Latitude: 1903.86206
Longitude: 07250.11448
Altitude: 24.5
Quality: 1 Sats: 06
HDOP: 1.24
Geoid: -66.9
GGA
Mode: A3 Sats: 10 15 18 23
DOP: H=1.24 V=2.30 P=2.61
TOFF: 0.097680768
PPS:
GSA + PPS
UTC: RMS:
MAJ: MIN:
ORI: LAT:
LON: ALT:
GST
(82) $GPGSV,3,3,01,29,023941,292361165,20,02705,220,20,0*5C
sudo cgps -s
At first, you should see something like this:


[pi]
(1) WhatsApp - ...
How to Use a G...
pi@raspberrypi: ~
File Edit Tabs Help
Time: 2023-10-12T03:24:25.000Z
Latitude: 19.06438483 N
Longitude: 72.83522983 E
Altitude: 58.727 ft
Speed: 0.65 mph
Heading: 0.0 deg (true)
Climb: n/a
Status: 3D FIX (13 secs)
Longitude Err: +/- 39 ft
Latitude Err: +/- 31 ft
Altitude Err: +/- 152 ft
Course Err: n/a
Speed Err: +/- 53 mph
Time offset: 0.376
Grid Square: MK69kb
PRN: Elev: Azim: SNR: Used:
10 40 314 25 Y
15 16 039 22 Y
18 60 058 29 Y
23 43 006 19 Y
27 26 309 24 Y
29 25 165 18 Y
32 46 220 21 Y
16 05 263 00 N
24 26 080 00 N
26 03 238 00 N
28 02 194 00 N
215 00 000 20 N
sudo cgps -s
At first, you should see something like this: