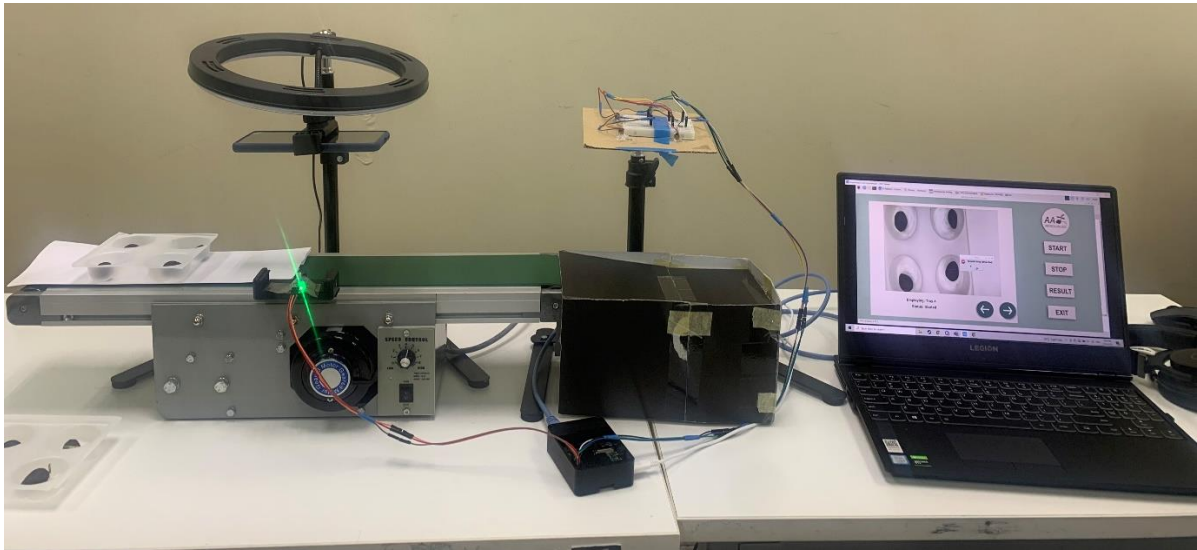


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How to Set Up the Hardware Components

1. Please set up the hardware equipment as the diagram shown below.



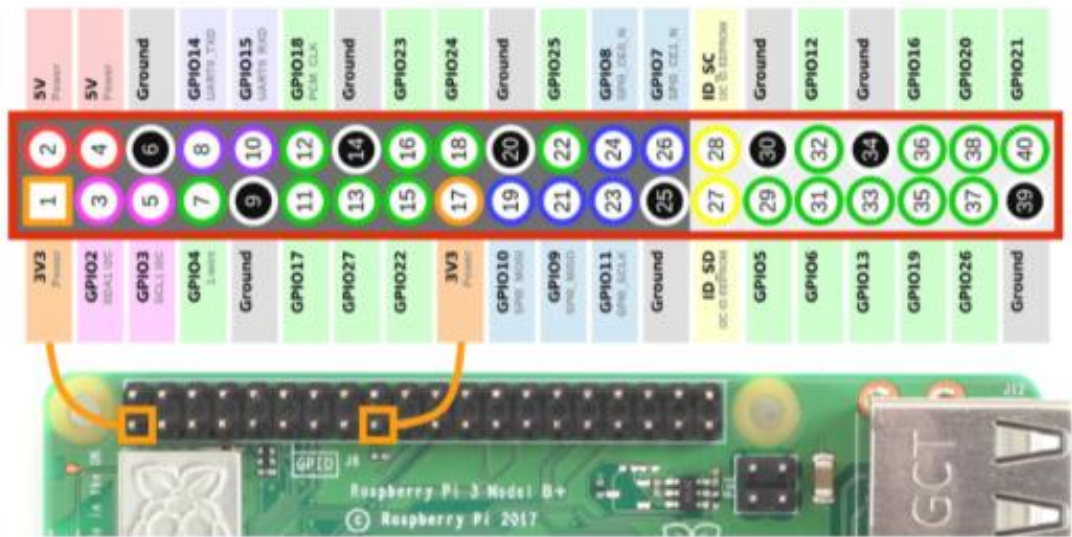
2. The tripod stand that holding the camera should be placed in the middle of the conveyor belt.

3. The infrared (IR) sensor should place on the holder which show in the image above.

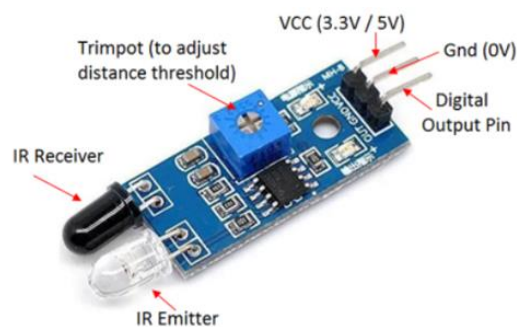
4. Place the illumination system on the other tripod holder and located at the sorting station.

5. Before turn on the conveyor belt and start the system, place a white paper under the tray everytime.

How to Connect IR Sensor and Illumination System



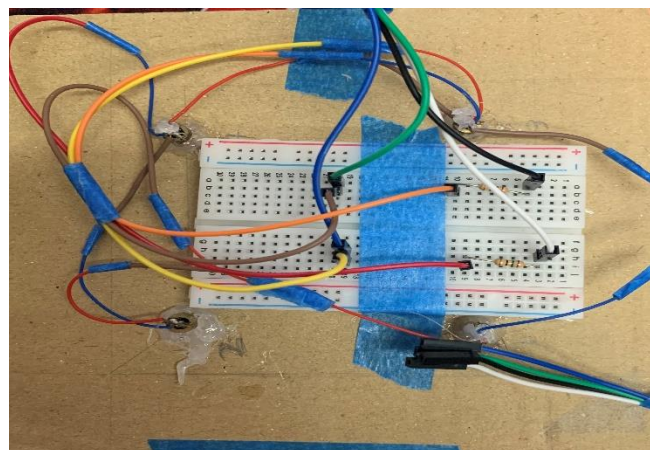
1. Above figure show the instruction of the Raspberry Pi GPIO Header.



2. Connect the three pins of IR sensor, VCC, GND and output pins to the relative pins on Raspberry Pi which are pins 3,4 and 6 with jumper wires.

3. There is a video link that could also help to understand on connecting IR sensor to Raspberry Pi:

https://www.youtube.com/watch?v=qQTQcN44UWg&t=186s&ab_channel=Lastmomenttutions



4. The laser illumination system that is build is shown at above figure.
5. There four different wire which are black, white, green and blue wires connect to it.
6. The four wires will also connect to the Raspberry Pi GPIO Headers, where black and white (anodes) connect to PIN 7 and PIN 11 and green and blue wire (cathode) connect to PIN 12 and PIN 16 based on the instruction above.
7. To have a further understanding on how we have implemented illumination system, there are several video links provided:

<https://juliushuijnk.nl/posts/2016-02-19-writing-on-a-3x3-led-matrix-on-my-raspberry-pi/>

<https://www.youtube.com/watch?v=SD5iW9PdRF8>

How to Connect Raspberry Pi to Laptop Device

1. To access the Raspberr Pi through the laptop device or others device, putty and VNC viewer application is require to download.

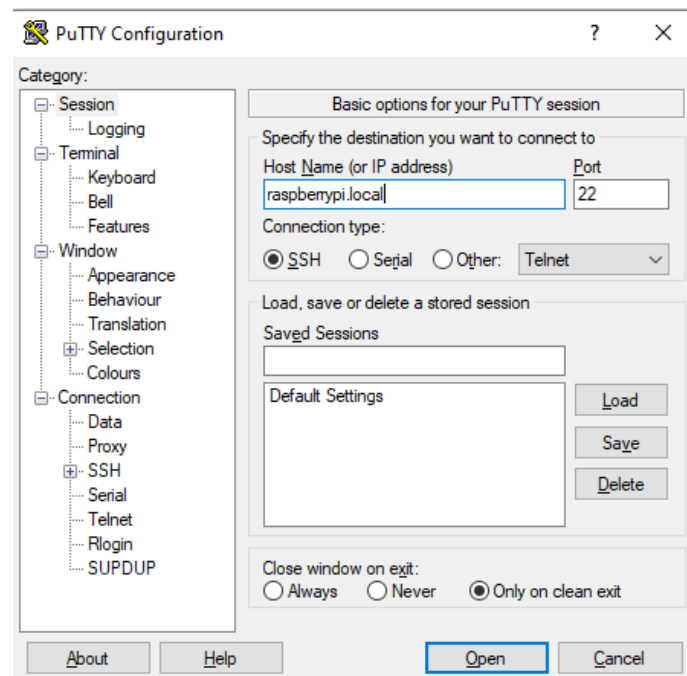
2. Two of the application are able to download through these links:

<https://www.putty.org/>

<https://www.realvnc.com/en/connect/download/viewer/>

3. While downloading these application, connect the Raspberry Pi with laptop device with ethernet cable and turn on the power supply.

4. After download finish, open the putty as figure below and enter the raspberrypi.local as IP address and press Open.



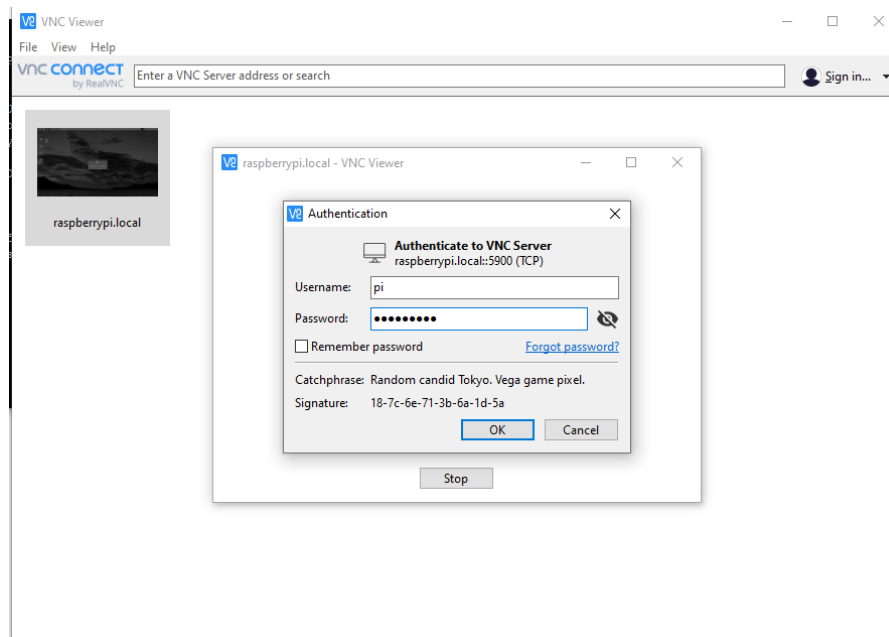
5. A terminal will pop out and ask the user to enter the name and password.

The login name: pi

The password: raspberry

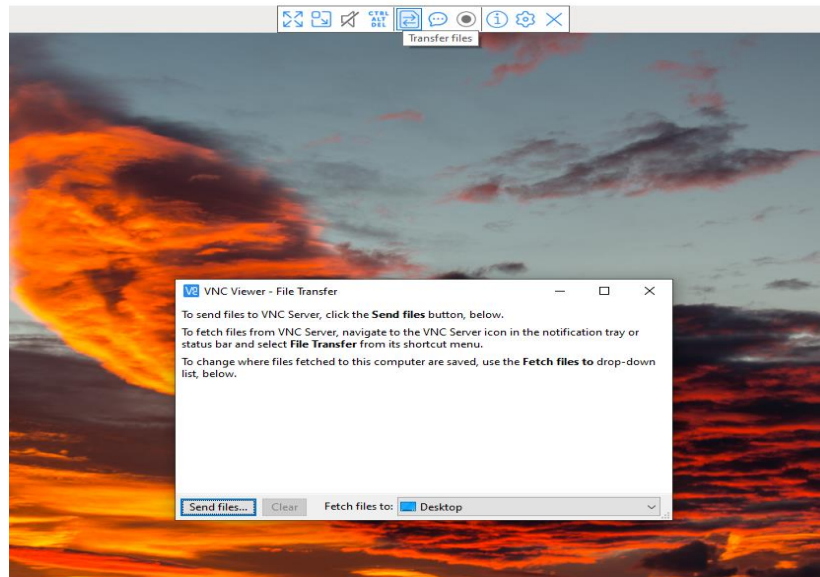
```
pi@raspberrypi: ~  
login as: pi  
pi@raspberrypi.local's password:  
Linux raspberrypi 5.15.27-v8+ #1531 SMP PREEMPT Wed Mar 9 11:36:50 GMT 2022 aarch64  
  
The programs included with the Debian GNU/Linux system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent  
permitted by applicable law.  
Last login: Wed Apr 27 10:20:54 2022  
  
SSH is enabled and the default password for the 'pi' user has not been changed.  
This is a security risk - please login as the 'pi' user and type 'passwd' to set  
a new password.  
  
pi@raspberrypi:~$
```

6. After connect successfully, open VNC Viewer downloaded and enter raspberrypi.local as IP address. The Username and Password is same as above.



7. Finally, the home page of Raspberry Pi OS will shown.

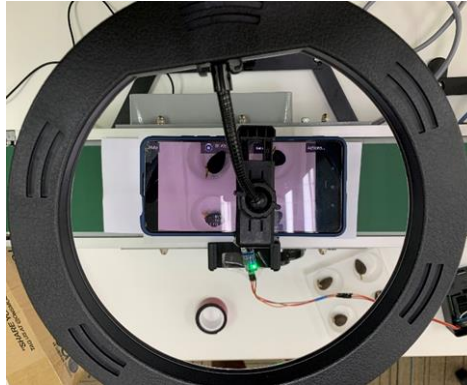
How to Transfer File to Raspberry Pi



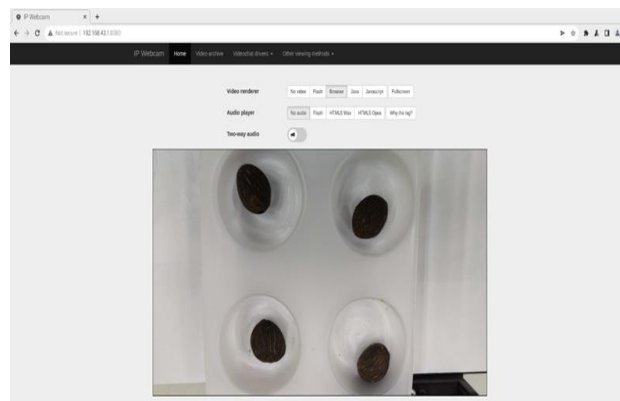
1. To transfer file from own device to Raspberry Pi connected, VNC viewer has such function for it.
2. Click on the toolbar located at top and select transfer file.
3. A window will pop out and user able to select files to transport from devices to Raspberry Pi.

How to Set Up IP Camera

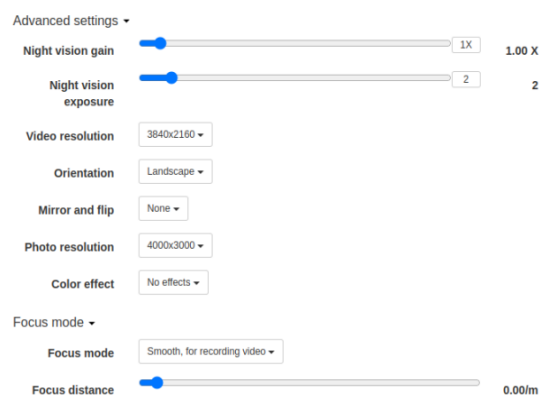
1. Before setting up the IP camera, and app called “IP Webcam” is required to download.
2. After that, open it and hold the phone camera with tripod stand.



3. Ensure that the Raspberry Pi and phone are connect to the same internet connection.
4. Open the browser in Raspberry Pi, and enter the internet IP address that connect and it will access to a webpages of the IP webcam.

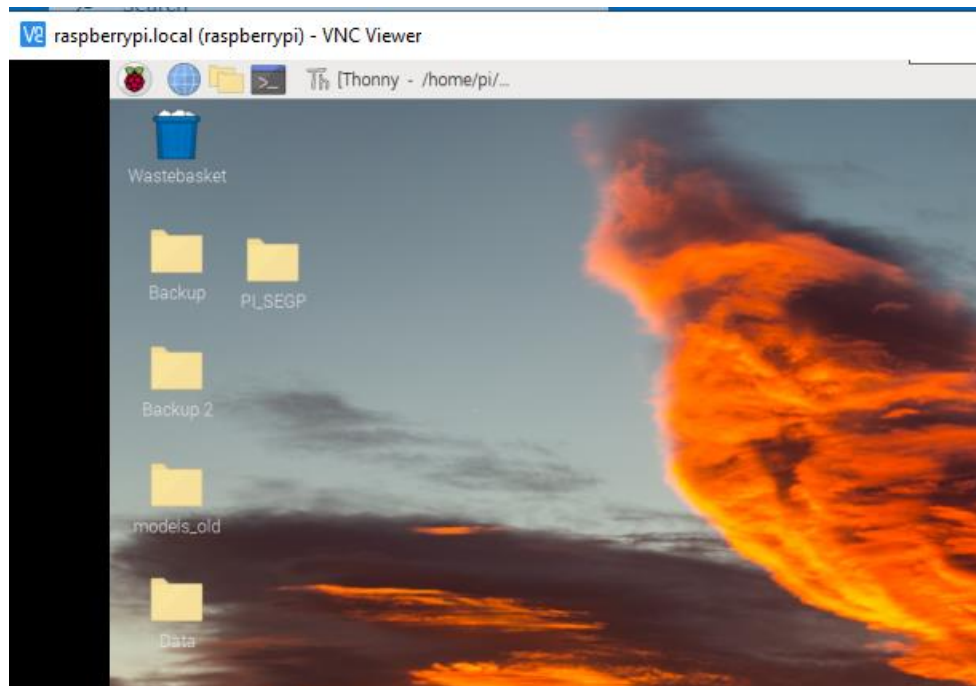


5. In this website, the user could adjust the resolution of the live streaming and image captured.

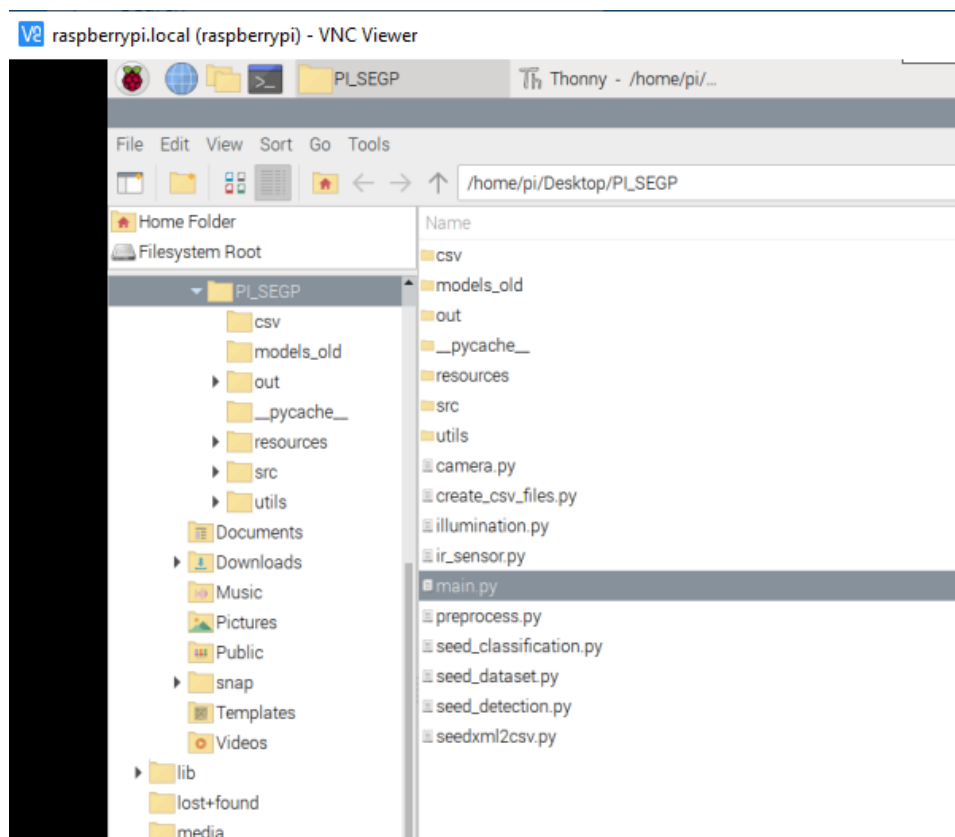


How to Run Program In Raspberry Pi

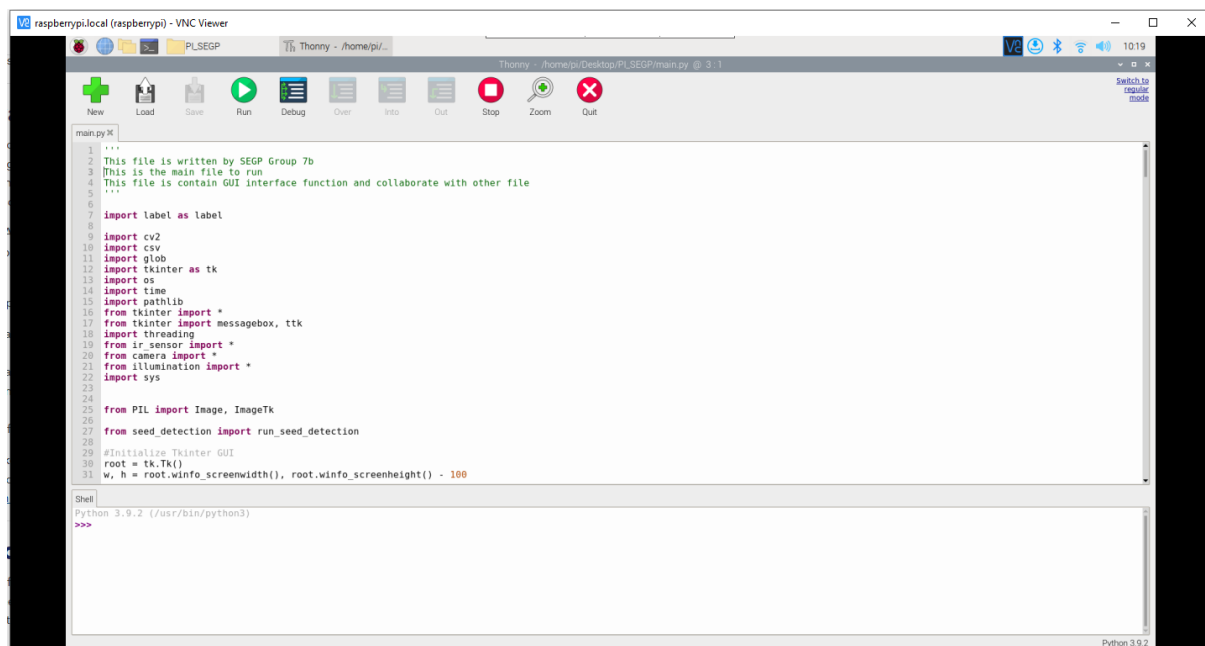
1. After everything is set up, open the folder named PI_SEGP.



2. Open the main.py file which is the main file of the system implemented.



3. It will show the file in Thonny IDE which is a pre-installed IDE in Raspberry Pi OS.



4. After that click Run button on the IDE,

5. The GUI interface will show as the image below.

