GPIO: Program the 8x8 LED Grid Module

In this lesson, we will be interfacing 8x8 LED matrix Module with raspberry pi. Since you are now familiar with the GPIO pins, it will be a fun to know more about the python coding and installing libraries to do more advance things.

Hardware Guide:

For completing this lesson, you will require the following things along with your initial raspberry pi setup

1. 8x8 LED matrix module
2. 7219 driver board
3. Connecting wires

8x8 LED matrix Module:

A LED-Matrix Display is a display device which contains light emitting diodes aligned in the form of matrix. This LED matrix displays are used in applications where Symbol, Graphic, Characters, Alphabets, Numerals are needed to be displayed together in static as well as Scrolling motion. LED Matrix Display is manufactured in various dimensions like 5x7,8x8,16x8,128x16, 128x32 and 128x64 where the numbers represent LED's in rows and columns, respectively. Also, these displays come in different colours such as Red, Green, Yellow, Blue, Orange, White.

In LED matrix display, multiple LED's are wired together in rows and columns, to minimize the number of pins required to drive them. The matrix pattern is made either in row anode-column cathode or row cathode-column anode pattern. In row anode-column cathode pattern, the entire row is anode while all columns serve as cathode which is shown below and it is vice-versa in row cathode-column anode pattern.


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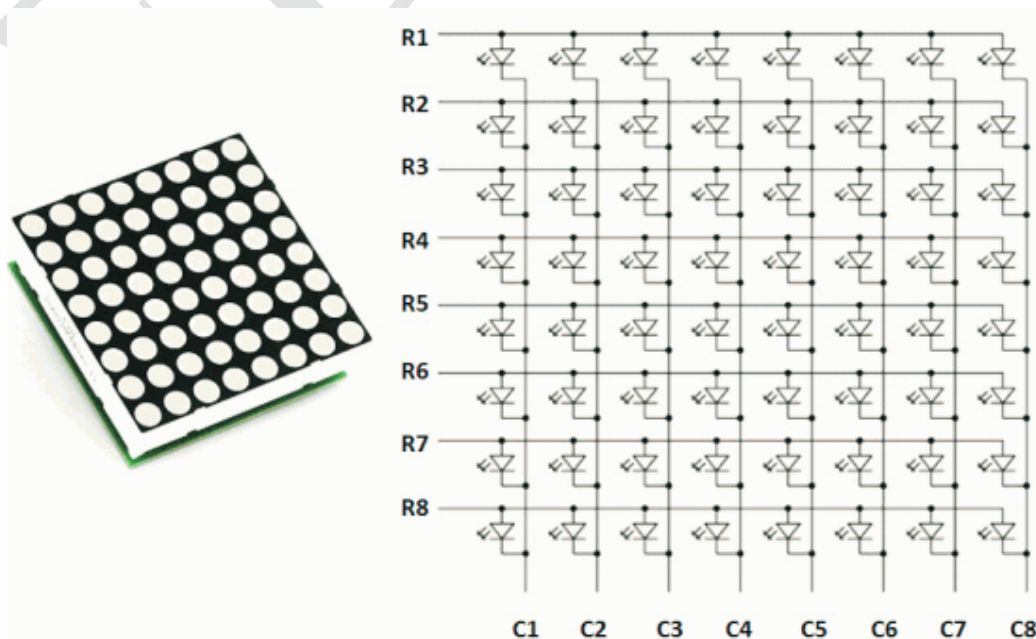
7219 Driver board:

Before interfacing LED matrix with raspberry pi, we need to connect the Max7219 IC which is an Led driver to the LED matrix display. The reason behind using this led driver is that it drives the 64 Led's simultaneously which in turn reduces the number of wires so that the user will find it easy to connect the display to the raspberry pi.

The MAX7219 has four wire SPI interface (we need only these four wires to interface it to the raspberry pi):

1. Din - MOSI - Master Output Serial Input.
2. Chip select - Load (CS) - active low Chip select.
3. Clock – SCK
4. Ground.

And off course VCC (5V) is required.
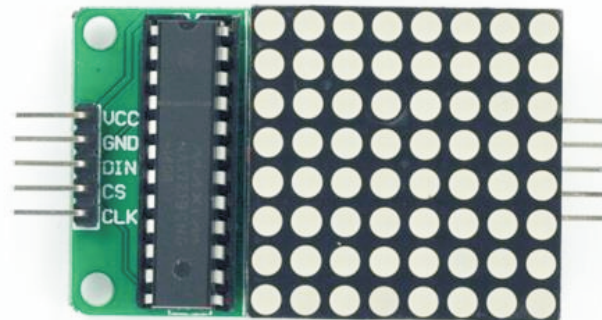
Software Guide:

Here we will be writing our code I python. But before writing our code we need to enable SPI and we need to install the library for driving the LED Matrix Module using our raspberry pi.

Pre-requisites:

By default, the SPI kernel driver is NOT enabled on the Raspberry Pi Raspian image. Enable the SPI as follows:

1. Open terminal and type sudo raspi-config and press Enter.
2. Use the down arrow to select 5 Interfacing options
3. Arrow down to P4 SPI.
4. Select yes when it asks you to enable SPI,
5. Also select yes when it asks about automatically loading the kernel module.
6. Use the right arrow to select the <Finish> button.
7. Select yes when it asks to reboot.
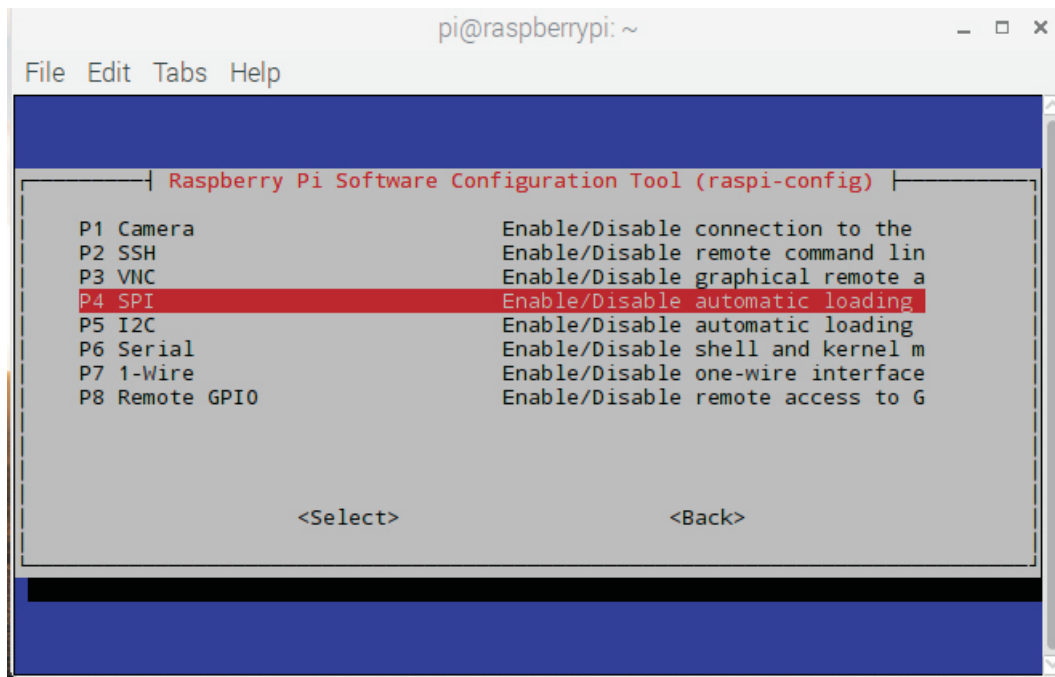
Alternatively using GUI, you can also follow the following steps to enable SPI :

1. Select <u>Preference</u> from the raspberry pi application menu.
2. From Preference select <u>Raspberry Pi Configuration</u>.
3. Now form the Raspberry Pi Configuration window, navigate to <u>Interfaces</u> option.
4. Select the <u>enabled</u> radio button in front of SPI to enable it and click on <u>OK</u>.
5. Finally, do not forget to reboot your raspberry pi after changing this setting.

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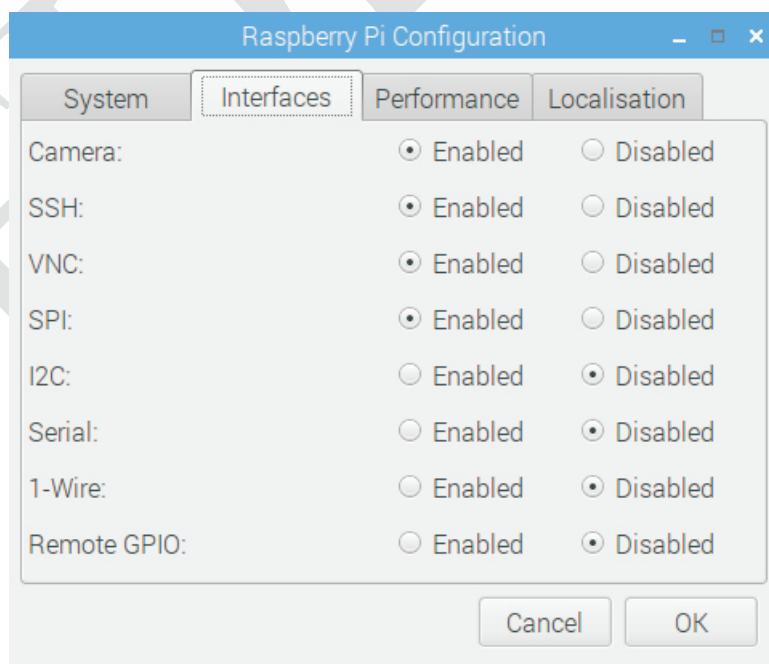
Installing the Library:

Before installing the library make sure Raspberry pi is connected to Internet.

Clone the code from github:
$ **git clone https://github.com/freedomwebtech/max7219voicecontrol**

Now change directory to max7219voicecontrol-main
$ pi@raspberrypi:~ $ **cd max7219voicecontrol-main**

Run ls command
$ pi@raspberrypi:~/max7219voicecontrol-main $ **ls**

buttons.py install.sh ledmatrix.py __pycache__

Run following command
pi@raspberrypi:~/max7219voicecontrol-main $ **sudo chmod 775 install.sh**

For installation run the following command
$ pi@raspberrypi:~/max7219voicecontrol-main $ sudo ./install.sh

Now it is the time to write our code. Open Python3, navigate to files and open a new file and write the code given below

Code:

```
from luma.led_matrix.device import max7219
from luma.core.interface.serial import spi, noop
from luma.core.render import canvas
from luma.core.virtual import viewport
from luma.core.legacy import text, show_message
from luma.core.legacy.font import proportional, CP437_FONT, TINY_FONT, SINCLAIR_FONT, LCD_FONT
from datetime import datetime
import time


serial = spi(port=0, device=0, gpio=noop())
device = max7219(serial, cascaded=1, block_orientation=-90, blocks_arranged_in_reverse_order=True)
device.contrast(16)


def test():
  now = datetime.now()
#  dt1_string = now.strftime("%H:%M:%S")
  dt1_string = now.strftime("%I:%M:%S")

  with canvas(device) as draw:
      text(draw, (3, 1), dt1_string, fill="white", font=proportional(TINY_FONT))
#      show_message(device, "Hello EDKITS", fill="red",font=(CP437_FONT),scroll_delay=0.08)


while True:
    test()
```

IMPORTANT:

There is some change is main code please change the code in ledmatrix.py as shown below

Comment this line in ledmatrix.py file

\#   text(draw, (3, 1), dt1_string, fill="white", font=proportional(TINY_FONT))

and uncomment this line in ledmatrix.py file

   show_message(device, "Hello EDKITS", fill="red",font=(CP437_FONT),scroll_delay=0.08)

save the file. then run the command after conneting LEDmatrix module to Raspberry pi.

Wiring up your Circuit:

We are using SPI protocol for wiring LED matrix module to raspberry pi, since it reduces the number pins required for wiring the circuit. You can follow the diagram given below while wiring your circuit.

1. Connect the VCC pin of 7219 driver board to Pin2 of raspberry pi.
2. Connect the Gnd pin of 7219 driver board to Pin6 of raspberry pi.
3. Connect the DIN pin of 7219 driver board to Pin19 of raspberry pi.
4. Connect the CS pin of 7219 driver board to Pin24 of raspberry pi.
5. Lastly, connect the CLK Pin of 7219 driver board to Pin23 of raspberry pi.

Circuit Diagram:
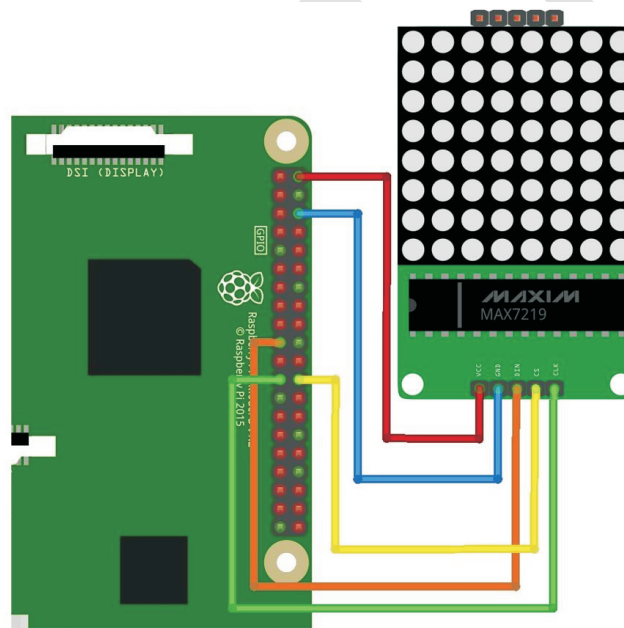
After ensuring that the connections are done properly, power on your raspberry pi. Now open Python3 and run the code that you have written for this lesson.
So now you have learned how to interface 8x8 LED matrix module with your raspberry pi, how to install libraries and how to enable SPI.
Next lesson will bring new things and new fun, so stay tuned!

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