2015

TENET TECHNETRONICS

Interfacing Potentiometer with Raspberry Pi using MCP3008

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Introduction:

Raspberry Pi is a credit card sized computer that plugs into a computer monitor or TV, and uses standard keyboard and mouse. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. Here we are going to do interface with Potentiometer with Raspberry pi by using MCP 3008(ADC)IC.

Hardware Requirements:

1. Raspberry Pi board.
2. Tenet Power supply breakout board
3. Hookup wires.
4. MCP3008 IC (ADC).
5. Tenet Potentiometer breakout board.

MCP 3008 IC:

The MCP3008 10-bit Analog-to-Digital Converter (ADC) combines high performance and low power consumption in a small package, making it ideal for embedded control applications. The MCP3008 features a successive approximation register (SAR) architecture and an industry-standard SPI serial interface. The MCP3008 features 200k samples/second, 8 input channels, low power consumption (5nA typical standby, 425µA typical active), and is available in 16-pin PDIP and SOIC packages. Applications for the MCP3008 include data acquisition, instrumentation and measurement, multi-channel data loggers, industrial PCs, motor control, robotics, industrial automation, smart sensors, portable instrumentation and home medical appliances.

Pin diagram:

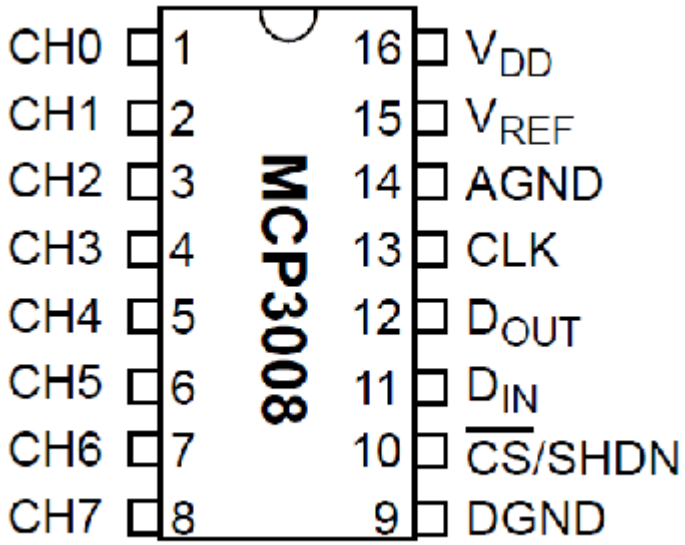


Figure 1

Tenet Potentiometer breakout board:

Adjustable potentiometer can open up many interesting user interfaces. Turn the pot and the resistance changes. Connect VCC to an outer pin, GND to the other, and the center pin will have a voltage that varies from 0 to VCC depending on the rotation of the pot. Hook the center pin to an MCP 3008 channel 0.

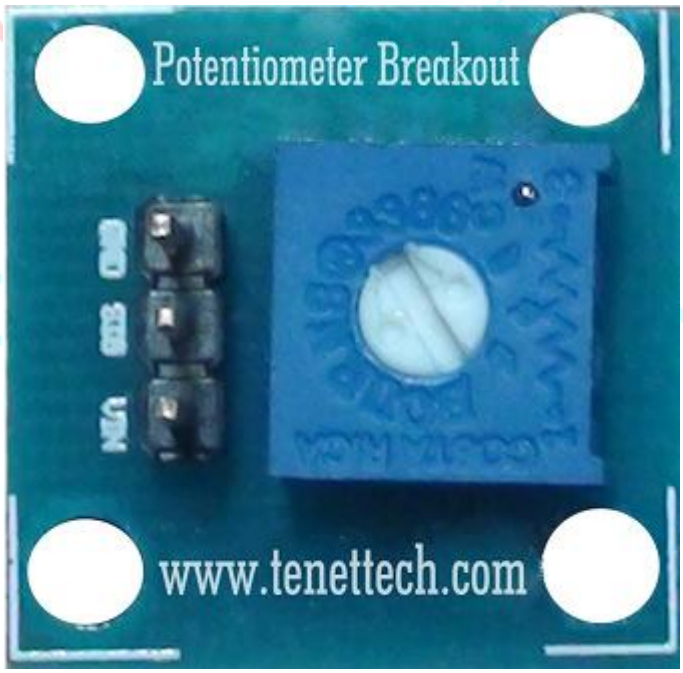


Figure 2

SPI Interface:

The Serial Peripheral Interface (SPI) bus was developed by Motorola to provide full-duplex synchronous serial communication between master and slave devices. The SPI bus is commonly used for communication with flash memory, sensors, real-time clocks (RTCs), analog-to-digital converters, and more.

As shown in Figure, standard SPI masters communicate with slaves using the serial clock (SCK), Master Out Slave In (MOSI), Master In Slave Out (MISO), and Slave Select (SS) lines. The SCK, MOSI, and MISO signals can be shared by slaves while each slave has a unique SS line.

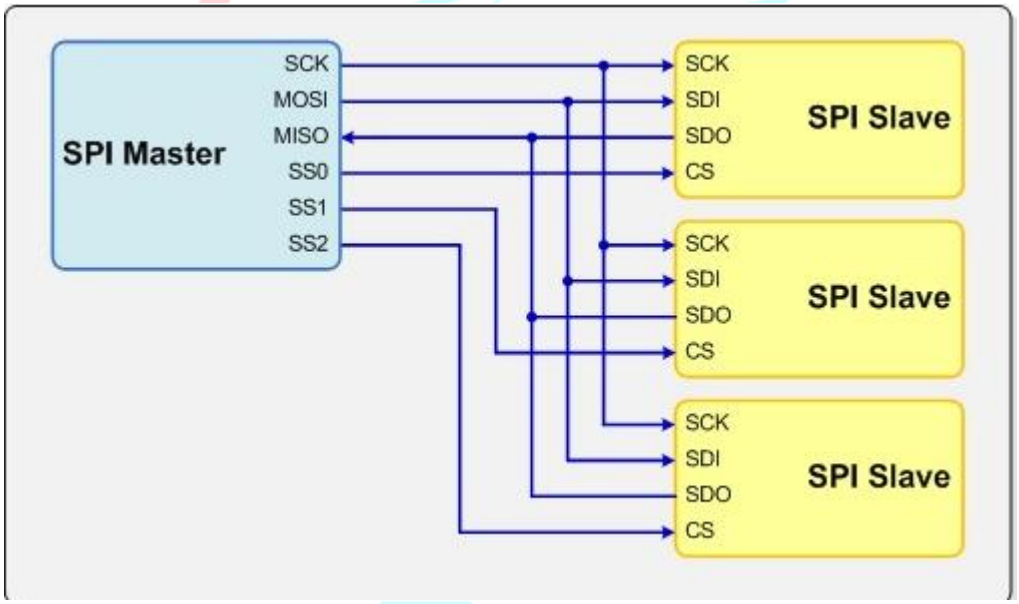


Figure 3

Enabling SPI on raspberry pi:

Step 1: Start by running the following command :

Sudo raspi-config

Step 2: This will launch the raspi-config utility. Select option 8 “Advanced Options”.

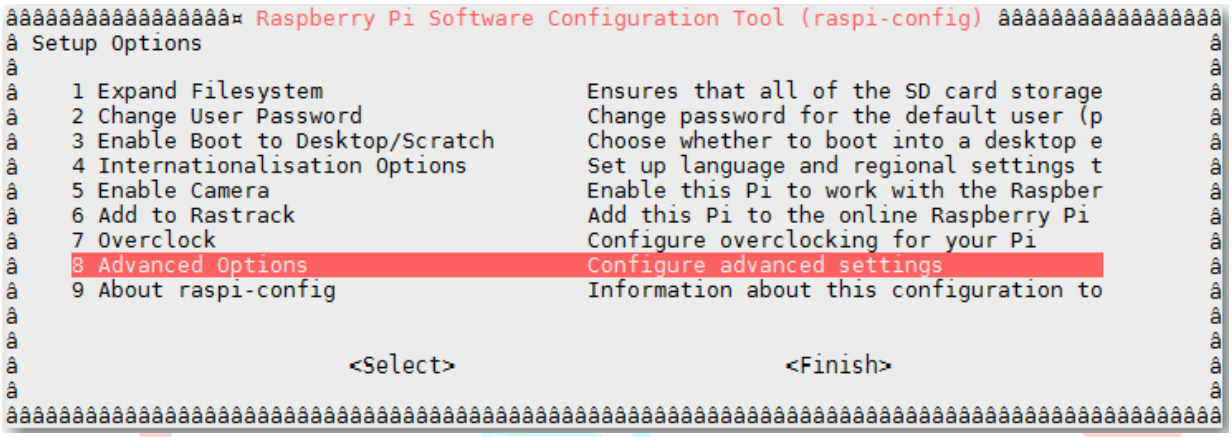


Figure 4

Step 3: Select the “SPI” option.

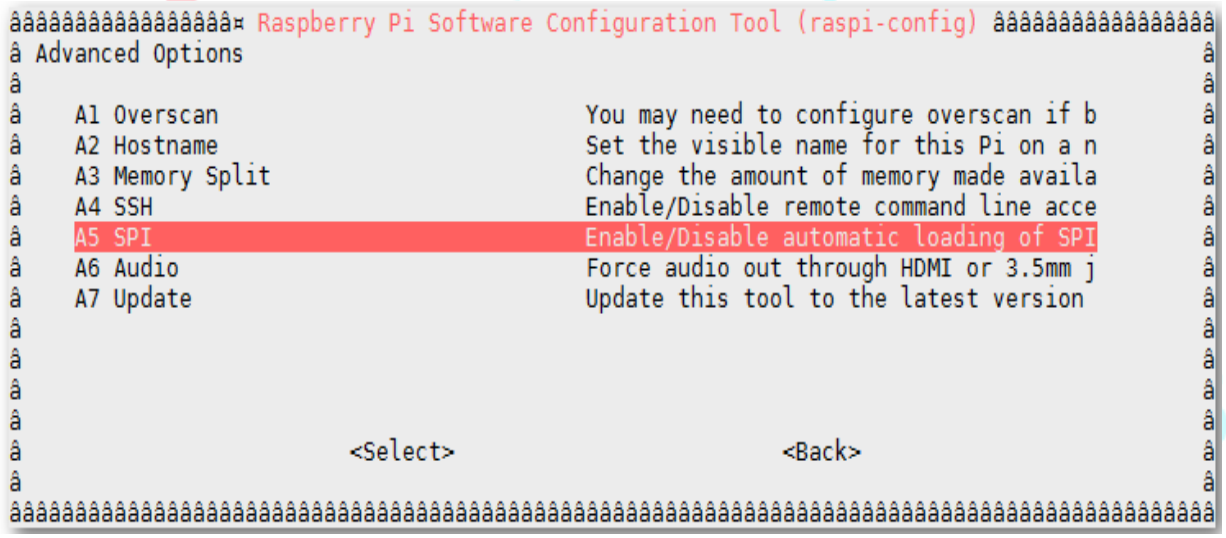


Figure 5

Step 4: Set the option to “Yes”.

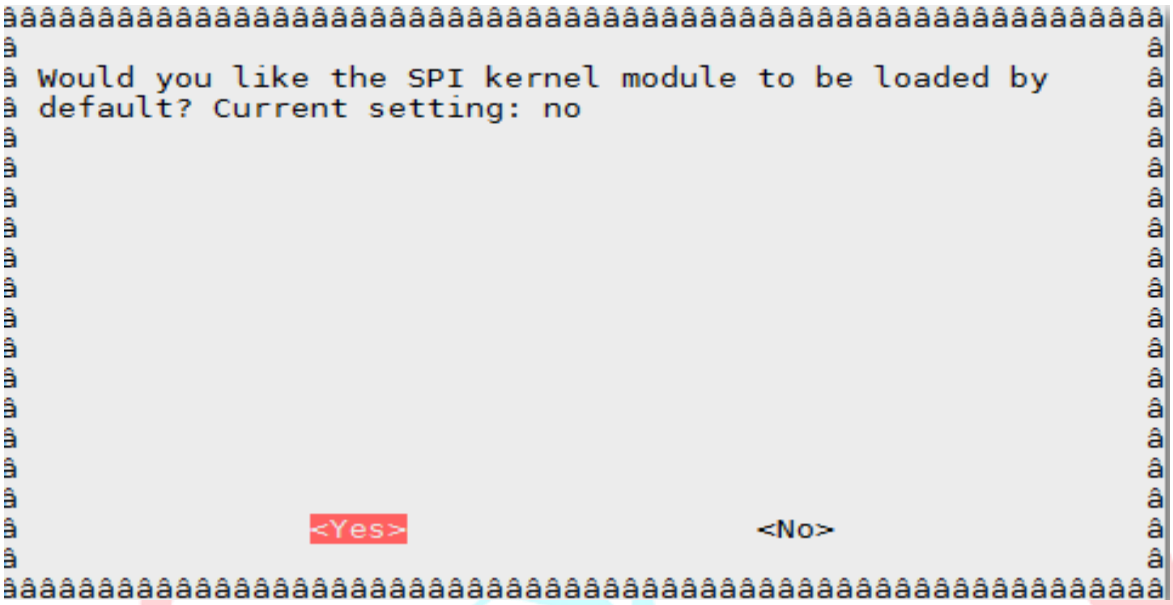


Figure 6

Step 5: Select “OK”.

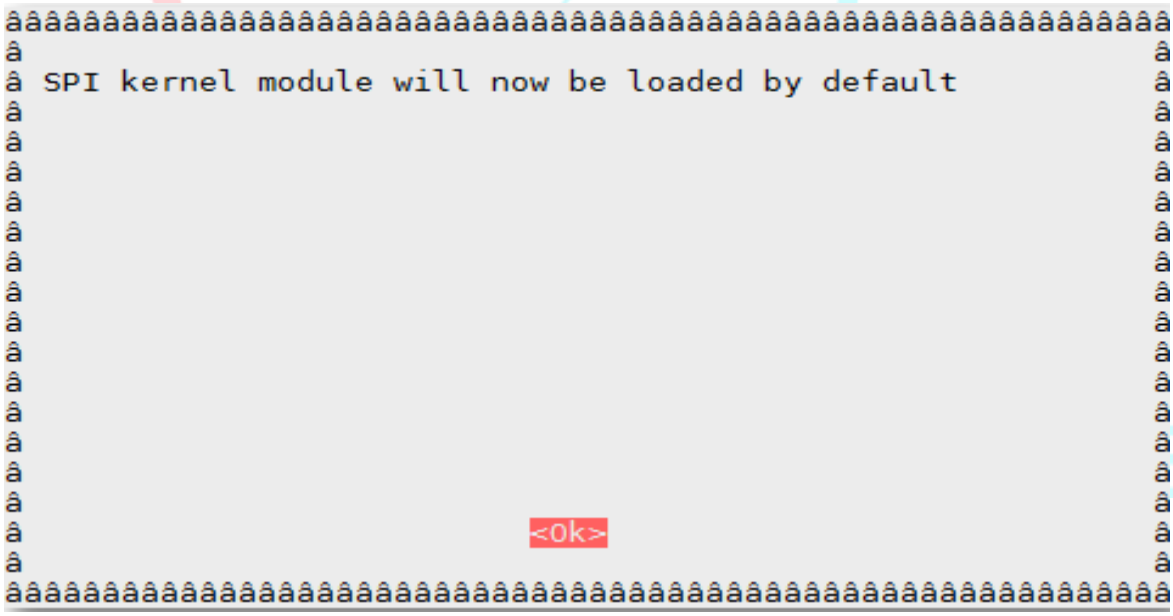


Figure 7

Step 6: Select “Finish”

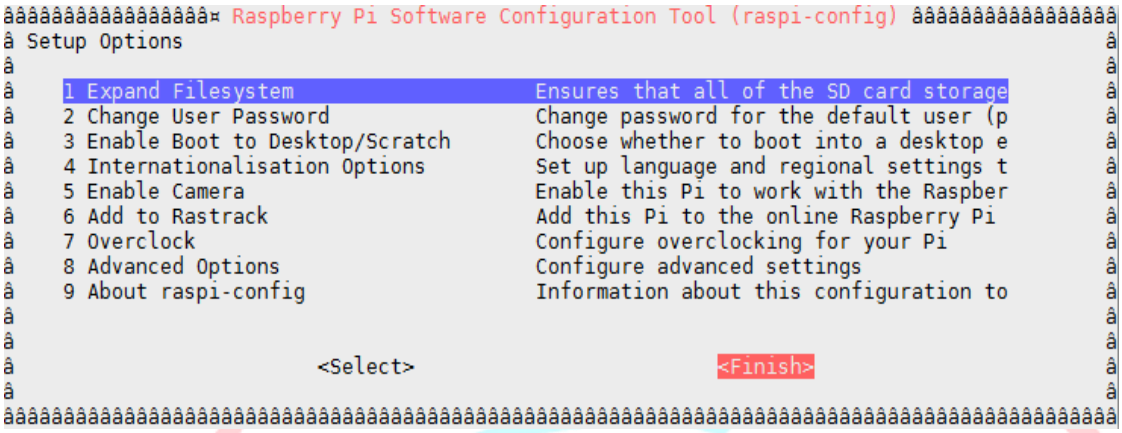


Figure 8

Step 7: Reboot for the changes to take effect .

Sudo reboot

- SPI is now enabled.

Step 8: In order to read data from the SPI bus in Python we can install a library called ‘py-spidev’. To install it we first need to install ‘python-dev’ .

Sudo apt-get install python2.7-dev

Step 9: Then to finish we can download ‘py-spidev’ and compile it ready for use .

wget https://github.com/Gadgetoid/py-spidev/archive/master.zip

unzip master.zip

rm master.zip

cd py-spidev-master

sudo python setup.py install

cd ..

Coding:

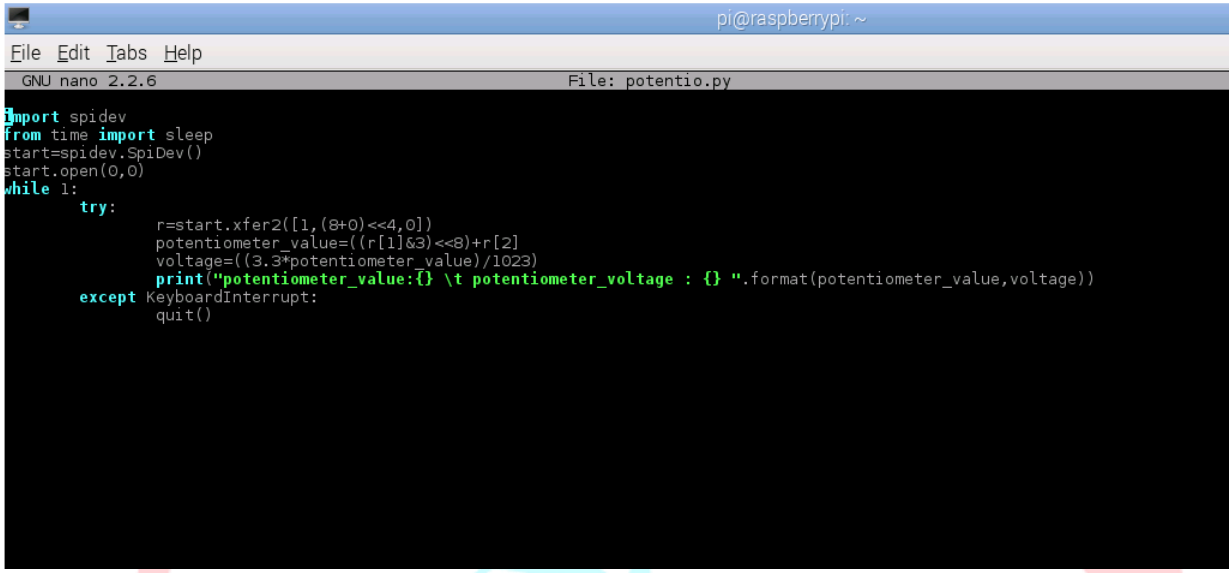


Figure 9

Import spidev **//Importing spidev to access SPI**

From time import sleep **//import sleep for giving delay**

Start=spidev.SpiDev() **//creating object with name start**

Start.open(0,0) **//(BUS,channel) since one channel and Bus**

While 1:

try: **//creating function**

r=start.xfer2([1,(8+0)<<4,0]) //enabling SPI and 3 bytes of data stored in r

potentiometer_value=((r[1]&3)<<8)+r[2] //Retrieving last 10 bit

voltage=((3.3*potentiometer_value)/1023) //Converting to Voltage

print("potentiometer_value:{}\tpotentiometer_voltage : {}".format(potentiometer_value,voltage)) //printing values

excepy KeyboardInterrupt: //when CTRL+C is pressed terminate it

GPIO.cleanup()

quit()

Circuit diagram:

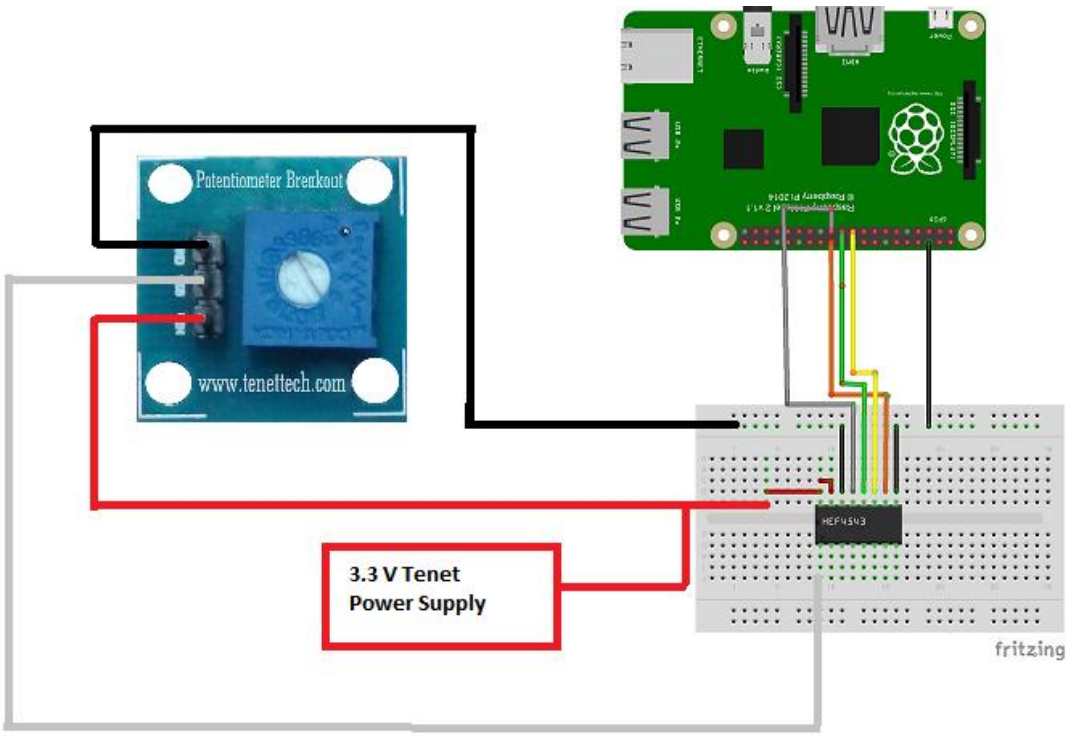
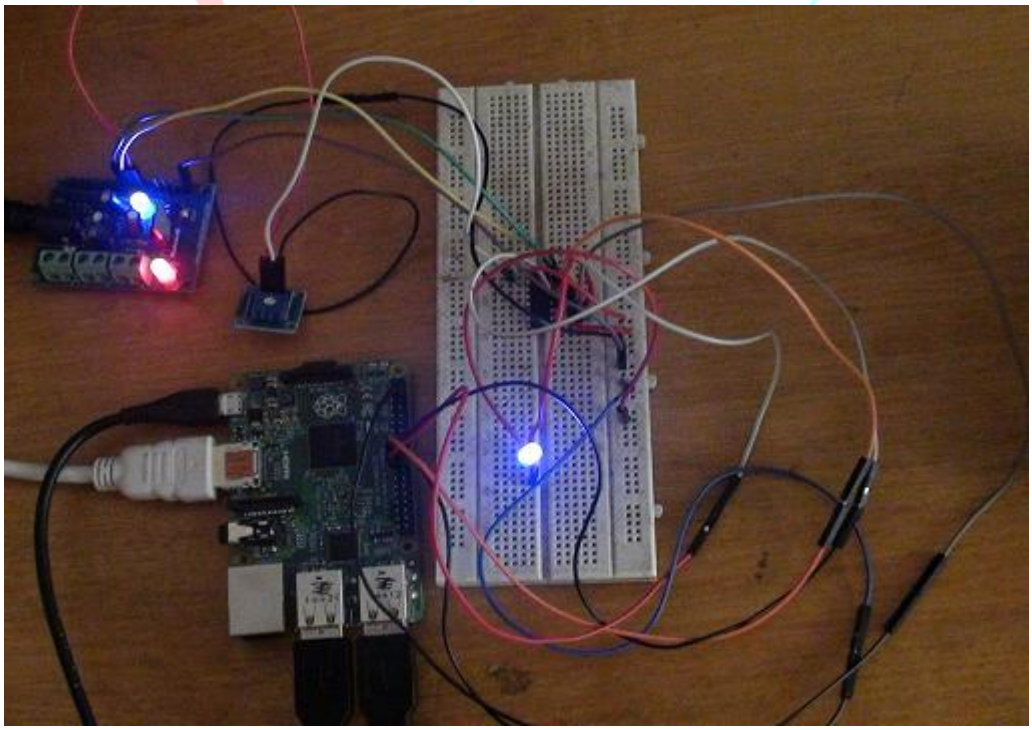


Figure10

Output:



Output on the screen:

```
Cpi@raspberrypi ~ $ sudo python potentio.py
otentiometer_value:1023         potentiometer_voltage : 3.3
otentiometer_value:1023         potentiometer_voltage : 3.3
otentiometer_value:1023         potentiometer_voltage : 3.3
otentiometer_value:1023         potentiometer_voltage : 3.3
otentiometer_value:1023         potentiometer_voltage : 3.3
otentiometer_value:1020         potentiometer_voltage : 3.29032258065
otentiometer_value:1016         potentiometer_voltage : 3.27741935484
otentiometer_value:1023         potentiometer_voltage : 3.3
otentiometer_value:1023         potentiometer_voltage : 3.3
otentiometer_value:963          potentiometer_voltage : 3.1064516129
otentiometer_value:872          potentiometer_voltage : 2.81290322581
otentiometer_value:872          potentiometer_voltage : 2.81290322581
otentiometer_value:873          potentiometer_voltage : 2.81612903226
otentiometer_value:868          potentiometer_voltage : 2.8
otentiometer_value:868          potentiometer_voltage : 2.8
otentiometer_value:867          potentiometer_voltage : 2.79677419355
otentiometer_value:870          potentiometer_voltage : 2.8064516129
otentiometer_value:755          potentiometer_voltage : 2.43548387097
otentiometer_value:762          potentiometer_voltage : 2.45806451613
otentiometer_value:733          potentiometer_voltage : 2.36451612903
otentiometer_value:736          potentiometer_voltage : 2.37419354839
otentiometer_value:736          potentiometer_voltage : 2.37419354839
otentiometer_value:735          potentiometer_voltage : 2.37096774194
```

Figure 12

For product link:

1. http://tenettech.com/product/7021/raspberry-pi-2-model-b-basic-kit-tt-sp-19022015
2. http://www.tenettech.com/product/6068/power-supply-breakout-board.
3. http://www.tenettech.com/product/2985/mcp3008-8-channel-10-bit-adc-with-spi-interface
4. http://www.tenettech.com/product/5094/breadboard-trim-potentiometer

For more information please visit: www.tenettech.com

For technical query please send an e-mail: info@tenettech.com