Shalaka Foundation's
Keystone School of Engineering, Pune
T.E. (COMPUTER ENGINEERING)
INTERNET OF THINGS
SEM-I

EXPERIMENT NO. III

Title:
Understanding the connectivity of Raspberry Pi board with camera. Writing an application to capture and store the image.

Aim/Objectives:

- To understand the working of Raspberry Pi Camera
- To interface Raspberry Pi Camera with Raspberry Pi model
- To program the Raspberry Pi model to control the Raspberry Pi Camera Preview
- To program the Raspberry Pi model to capture still images from the Raspberry Pi Camera

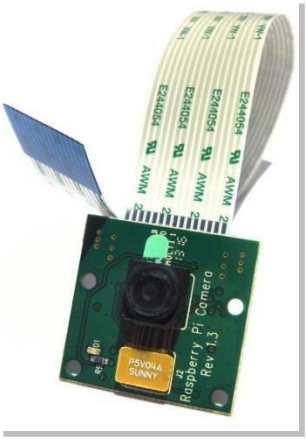
Software:

- Raspbian OS
- IDLE IDE

Hardware Modules:

- Raspberry Pi Board module
- Pi-Camera module
- Monitor

Theory:



- The Raspberry Pi Camera Board plugs directly into the CSI connector of the Raspberry Pi.
- It is able to deliver a crystal clear 5MP resolution image or 1080p HD video at the recording speed of 30 fps.
- This camera is designed and manufactured by the Raspberry Pi Foundation in the UK.
- The Raspberry Pi Camera Board features a 5MP (2592×1944 pixels) Omni vision 5647 sensor in a fixed focus module.

- This module is attached to Raspberry Pi, by way of a 15 Pin Ribbon Cable, to the dedicated 15-pin MIPI Camera Serial Interface (CSI), which was designed especially for interfacing to cameras.
- The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to the BCM2835 processor.
- The board itself is tiny, at around 25mm x 20mm x 9mm, and weighs just over 3g, making it perfect for mobile or other applications where size and weight are important.
- The sensor itself has a native resolution of 5 megapixels, and has a fixed focus lens onboard.
- In terms of still images, the camera is capable of 2592 x 1944 pixel static images, and also supports 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 video recording.
- The camera is supported in the latest version of Raspbian, the Raspberry Pi's preferred operating system.

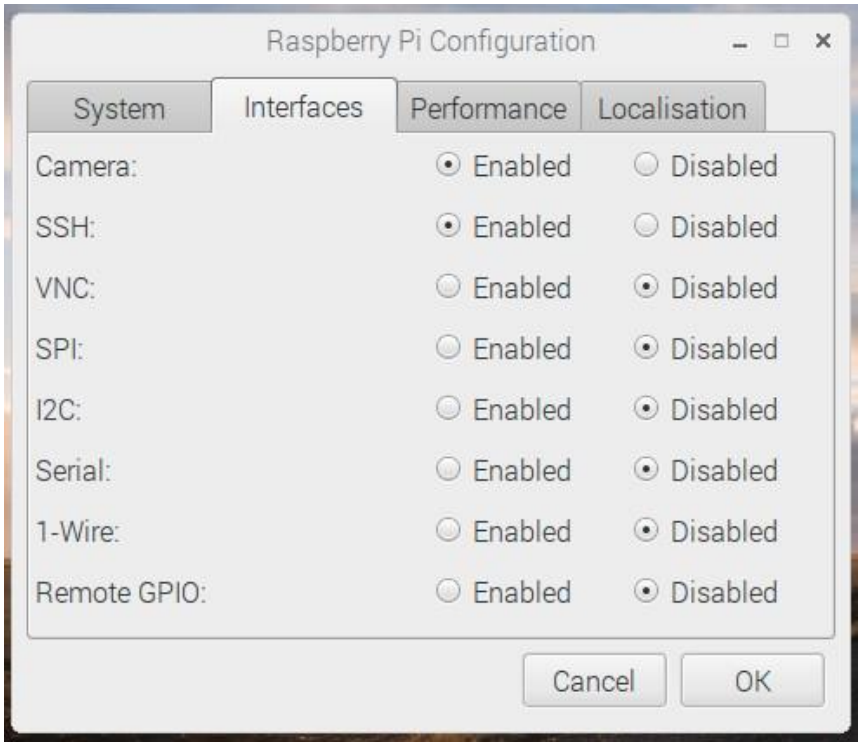
Safety precautions:

- Raspberry-Pi provides 3.3V and 5V VCC pins
- Raspberry-Pi operates on 3.3V.
- Various sensors and actuators operate on different voltages.
- Read datasheet of a given sensor or an actuator and then use appropriate VCC pin to connect a sensor or an actuator.
- Ensure that signal voltage coming to the Raspberry-Pi from any sensor or actuator does not exceed 3.3V.
- If signal/data coming to Raspberry-Pi is greater than 3.3V then use voltage level shifter module to decrease the incoming voltage.
- The Raspberry-Pi is a costly device, hence you should show the circuit connections to your instructor before starting your experiment.

Interface diagram:

Procedure:

- First of all, switch off the Raspberry Pi board and connect the Camera Module to the Raspberry Pi's camera port.
- Then start the Raspberry Pi
- Now we have to ensure that the Camera software is enabled.
- For this, open the **Raspberry Pi Configuration Tool** from the main menu as shown in the fig. below.



- Now click on Interfaces
- Here the first option is Camera. Ensure that the 'Enabled' button is clicked.
- If not then click the 'Enabled' and again **Reboot the Raspberry Pi module**.
- Now write the program as per the algorithm given.
- Run code using Run module.

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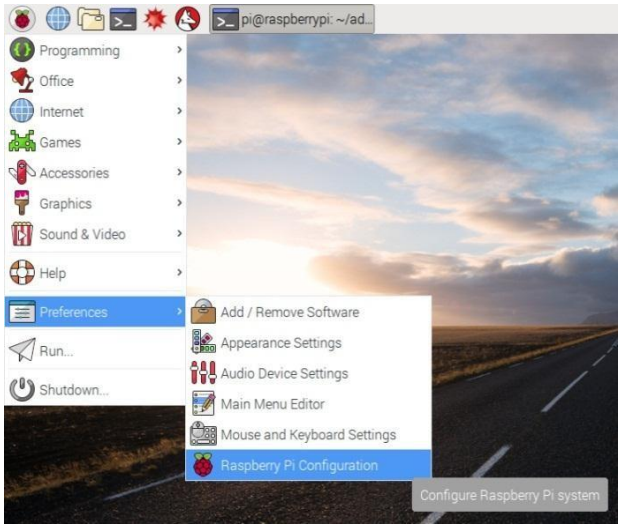

Algorithm:

- To program the Raspberry Pi model to control the Raspberry Pi Camera Preview:
    - Import Picamera library
    - Import time library
    - Create a variable(instance) of PiCamera class
    - Display the camera preview on screen using the command "start_preview()".
    - We can define 10 second delay to see the camera preview.
    - To stop camera preview after 10 second, use the command "stop_preview()".
- To program the Raspberry Pi model to capture still images from the Raspberry Pi Camera
    - Import picamera library
    - Import time library
    - Create a variable(instance) of PiCamera class
    - Display the camera preview on screen using start_preview().
    - We can define 5 second delay to see the camera preview.
    - Capture the image using camera.capture('path of the image. extension')
    - Then stop the camera preview using the command "stop_preview()".

Observation:

- Observe the output on Display screen of raspberry pi desktop for camera preview, captured images and recorded videos.
- To play the video type following command in terminal window:
  omxplayer video.h264
- Then press ENTER.

Conclusion:

We successfully learnt about the connectivity of Raspberry-Pi Understanding the connectivity of Raspberry Pi board with camera and also able to capture and store the image.

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