STUDY GUIDE FOR MODULE NO. LAB M06

Setting-up Thermal Camera with RPi

MODULE OVERVIEW

The Raspberry Pi is a series of small, affordable single-board computers developed by the Raspberry Pi Foundation, a UK-based charity organization. These credit-card-sized computers are designed to promote computer science education, DIY projects, and experimentation in the field of embedded computing.

MODULE LEARNING OUTCOMES

By the end of this module, participants should be able to install and operate thermal camera using Raspbery Pi

LEARNING CONTENT

Setting up a thermal camera using a Raspberry Pi 4 involves connecting a thermal camera module to the Raspberry Pi and installing the necessary software to capture and process thermal images. Here's a general guide to get you started:

Components Needed:

1. Raspberry Pi 4:
    a. Ensure you have a Raspberry Pi 4 board.
2. Thermal Camera Module:
    a. Choose a compatible thermal camera module. One popular option is the MLX90640 sensor.
3. MicroSD Card:
    a. Use a microSD card with sufficient capacity (8GB or more).
4. Power Supply:
    a. Provide a suitable power supply for the Raspberry Pi.

Steps:

1. Prepare the Raspberry Pi:
    a. Insert the microSD card into the Raspberry Pi.
    b. Connect peripherals such as a monitor, keyboard, and mouse if needed.
2. Install Raspberry Pi OS:
    a. Follow the steps in the previous response to install the Raspberry Pi OS on the microSD card using a tool like Etcher.
3. Connect the Thermal Camera Module:
    a. Connect the thermal camera module to the Raspberry Pi's GPIO pins. Ensure you follow the pinout specifications for the specific thermal camera module you are using.
4. Power Up the Raspberry Pi:
    a. Power up the Raspberry Pi by connecting it to a power source.
5. Enable I2C Interface:
    a. Thermal camera modules often use the I2C interface. Enable the I2C interface on your Raspberry Pi. You can do this using the Raspberry Pi Configuration tool or by editing the /boot/config.txt file.

        sudo raspi-config

        Select "Interfacing Options" -> "I2C" -> "Yes" to enable the I2C interface.

6. Install Required Software:
    a. Install any necessary software libraries for the thermal camera module. Refer to the documentation provided by the manufacturer for specific instructions.

7. Test the Thermal Camera:
    b. Write a simple Python script to test the thermal camera. Use libraries such as smbus for I2C communication and the library provided by the thermal camera module manufacturer.

```
# Example script using the MLX90640 module
import board
import busio
import adafruit_mlx90640

i2c = busio.I2C(board.SCL, board.SDA, frequency=1000000)  # Adjust the frequency if needed
mlx = adafruit_mlx90640.MLX90640(i2c)
mlx.refresh_rate = adafruit_mlx90640.RefreshRate.REFRESH_16_HZ

while True:
    try:
        mlx.getFrame()
        for row in mlx.pixels:
            print(["{0:.2f}".format(temp) for temp in row])
    except ValueError as e:
        print(e)
        continue
```

Run the script to see if the thermal camera is capturing data.

8. Integrate with Image Processing or Display:

Depending on your project requirements, you might want to integrate the thermal data with image processing algorithms or display it on a screen. Remember to refer to the documentation provided by the manufacturer of your specific thermal camera module for detailed setup instructions and any additional steps required.

LEARNING ACTIVITY 1

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Create a detailed step-by-step method with pictures and detailed description on how you installed a thermal camera in a Raspberry Pi operating system.

STEP 1. Prepare the Raspberry Pi:
- a. Insert the microSD card into the Raspberry Pi.
- b. Connect peripherals such as a monitor, keyboard, and mouse if needed.

STEP 2. Install Raspberry Pi OS:
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STEP 3. Connect the Thermal Camera Module:
Connect the thermal camera module to the Raspberry Pi's GPIO pins. Ensure you follow the pinout specifications for the specific thermal camera module you are using.

STEP 4. Power Up the Raspberry Pi:
Power up the Raspberry Pi by connecting it to a power source.

STEP 5. Enable I2C Interface:
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STEP 6. Install Required Software:

Install any necessary software libraries for the thermal camera module. Refer to the documentation provided by the manufacturer for specific instructions.

STEP 7. Test the Thermal Camera:

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SUMMARY / CONCLUSION

In conclusion, setting up a thermal camera with a Raspberry Pi presents an innovative and accessible avenue for individuals and businesses alike to engage with thermal imaging technology. The seamless integration of a thermal camera module with the Raspberry Pi platform enables users to capture and analyze thermal data efficiently and cost-effectively. By following straightforward steps and leveraging the Raspberry Pi's user-friendly interface, users can quickly deploy customized thermal imaging solutions tailored to their specific needs.

This fusion of Raspberry Pi's versatility with thermal imaging technology offers a myriad of practical applications, from home automation and security to industrial monitoring and diagnostics. With its compact form factor and low power consumption, a Raspberry Pi-based thermal camera setup is suitable for deployment in diverse environments, providing valuable insights into temperature variations and trends. As advancements in both Raspberry Pi hardware and thermal imaging technology continue, we can anticipate further refinements and enhancements, cementing its position as a go-to solution for thermal imaging applications.

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