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IMPLEMENTATION OF IOT ENABLED SMART DEVICES USING AI/ML, NON -CONTACT MONITORING SYSTEM FOR COVID 19 DETECTION AND PRECAUTION

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***Abstract*— The recent outbreak of COVID-19 pandemic has exposed the wide spread of virus which leads to loss of human life. Another major issue is that handling the appliances directly during this pandemic situation. The virus will spread fast. To overcome this problem the proposed system is to automatically predict, detect the body temperature of human and also to handle the appliances through sensors. Raspberry-pi 4 is connected through IP address via partial Wi-Fi. Raspberry pi camera is used to detect the face of the object.**

For handling and controlling the appliances, PIR sensor and relay is introduced. The PIR sensor will detect the motion. This proposed system will prevent human from the corona virus and reducing the wide spread of the virus from direct handling of appliances. Hence this proposed system will reduce the loss of human life.

***Keywords*— Raspberry-pi 4,Raspberry- pi camera,MLX90614 sensor, PIR sensor, Ultrasonic sensor, Wi-Fi**

I. INTRODUCTION

Corona virus disease (COVID-19) is an infectious disease caused by a newly discovered corona virus. It is mandatory to predict and detect the body temperature of a person in this pandemic. For detecting the temperature MLX90614 sensor have been introduced. Due to this virus, people should not touch the appliances directly because the virus will spread fast. To overcome this problem non-contact monitoring and handling the appliances using IOT have been introduced.. Basically, IOT is a community wherein all bodily items are linked to the internet through network devices or routers and alternate information.

II. PROPOSED SYSTEM

The Ultrasonic sensor will detect the human. The Raspberry pi camera start to predict the image of human. MLX90614 sensor will detect the body temperature. The submerged dc motor pump starts to do the precautionary action (sanitary and water) for human.

The UV light kills the germs/virus on the belongings of human. For handling and controlling the appliances, PIR sensor and relay is being introduced.

This proposed system will prevent human from the corona virus and reducing the wide spread of the virus from direct handling of appliances.

III.BLOCK DIAGRAM

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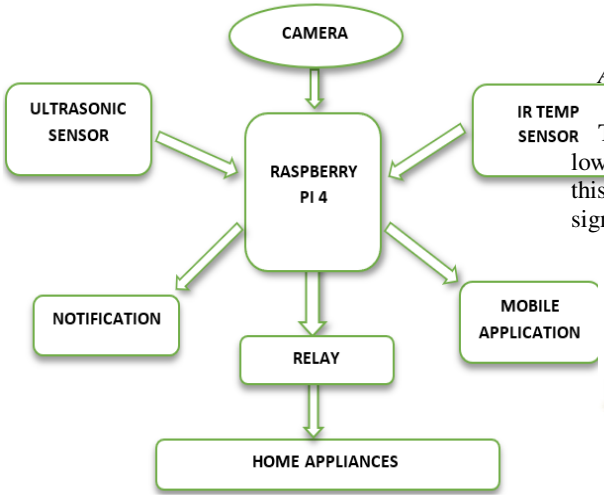

Fig 1.1

IV. WORKING

The working of the proposed system is implemented by the Face recognition using Artificial Intelligence (AI) and Machine Learning (ML). It will detect and identify the face of the human being.

In order to recognize and identify the human face, the images of the human are captured and trained using the raspberry-pi camera.

If the face recognition become successful, then the Temperature IR sensor will start sensing the human being temperature. If the temperature is exceeding the normal body temperature (98.6 degree Fahrenheit) then it will notify the information of that particular human being.

If the temperature is not exceeding the body temperature then the human being should take the Covid-19 precautionary actions using hand sanitary and washing hands.

After taking the precautionary actions the belongings of the human being is kept inside the closed box. The UV light rays which is attached in the closed box will sterilize the virus on the belongings. The UV light rays will fall on the belongings for 1 minute.

The PIR sensor is used to detect the motion of the human being inside the room. If PIR sensor detects the motion of the human being, then the relay will starts triggering the PIR sensor and controlling the home appliances automatically.

This will avoid the contact of touching the home appliances directly. Due to the automatic control of the home appliances the spreading of COVID -19 virus can be prevented effectively.

V. HARDWARE REQUIREMENTS

A. Raspberry pi -4

The Raspberry Pi 4 Model B is the latest version of the low-cost computer. It consists of 40 pins. The RAM used for this proposed system is 2GB.The Pi 4 (Model B) has significantly faster wired-network than other pi models.

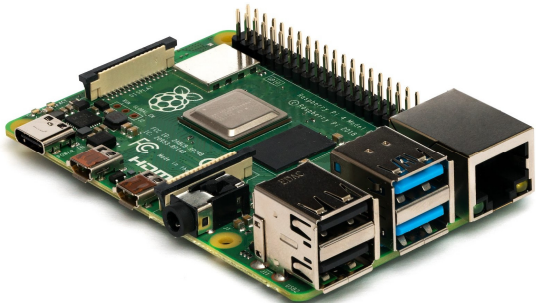

Fig 1.2

Raspberry Pi 4 specs

The specifications of raspberry pi 4 includes the 2GB RAM, interfaced using Wi-Fi.

B. *Raspberry pi camera*

This Raspberry Pi camera module board is a high definition 5MP camera that can capture good quality photos. Apart from just capturing photos, it can also shoot videos. The **Pi camera module** is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol. It is normally used in image processing, machine learning or in surveillance projects.

Fig 1.3

C. *Ultrasonic sensor*

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An Ultrasonic sensor is an electronic device that measures the distance of a target object by emitting Ultrasonic sound waves and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound. Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

Fig 1.4

D. Temperature IR sensor

MLX90614 sensor measures and detects temperature of an object & its surrounding environment. The MLX90614 consists of two devices embedded as a single sensor, one device acts as a sensing unit and the other device acts as a processing unit. The sensing unit an **Infrared Thermopile Detector** called **MLX81101** which senses the temperature and the processing unit is a **Single Conditioning ASSP** called MLX90302 which converts the signal from the sensor to digital value and communicates using I2C protocol. The MLX90302 has a low noise amplifier, 17-bit ADC and a powerful DSP which helps the sensor to have high accuracy and resolution.

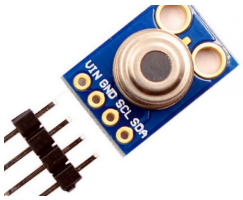

Fig 1.5

E. Passive Infrared sensor

A **Passive Infrared Sensor** (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications.

Fig 1.6

F. Relay

The **relay "switch"** is utilized by means of a **low-voltage** pulse. Since the Pi only tolerates a maximum of 5V (the GPIOs even only 3.3V) without relays, there is the risk that the Pi could burn out. However, if you have two separate circuits this cannot happen

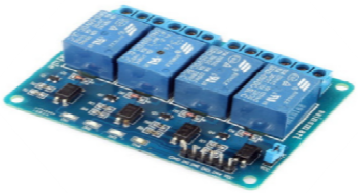

Fig 1.7

G. UVC light

An **Ultraviolet light** is a lamp that emits long-wave (UV-C) ultraviolet light and very little visible light. This is mostly used to kill bacteria & viruses.

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Fig 1.8

VI. SOFTWARE REQUIREMENTS

A. Set up of raspberry pi 4 model

Step 1: Downloading Required OS
From the official raspberrypi.org download the operating system.
Step 2: Writing OS to SD Card
Open the Raspberry Pi Image and select the custom setup then select the OS from the Downloaded folder and carefully set the target as SD card.
Step 3: Configuring WIFI
wpa_supplicant
Enter the WIFI ID & Password
Step 4: Power Up Pi
Power up the pi with the type-C cable.
Step 5: Connecting
In order to view it remotely VNC-Viewer is downloaded on the Desktop.

B. Tensor flow using python for object detection

Step 1: Update the raspberry pi
Step 2: Install tensor flow
Step 3: Install Open CV
Step 4: Compile and Install the Protobuf
Step 5: Set up Tensor flow and Directory Structure and python path variable.

C. Setting up of MLX90614 sensor:

Step 1: Enabling the I2C from Raspberry pi setting
Step 2: Download the required package library of MLX90614 from official website.
Step 3: Install some required packages using the below Commands
sudo apt-get install python-setuptools
sudo apt-get install -y i2c-tools
Step 4: After installing extract the files using
sudo python setup.py install
Step 5: Interfacing of MLX90614 with raspberry pi 4

VII. HARDWARE AND RESULTS

A. Training and saving the model in raspberry pi 4:

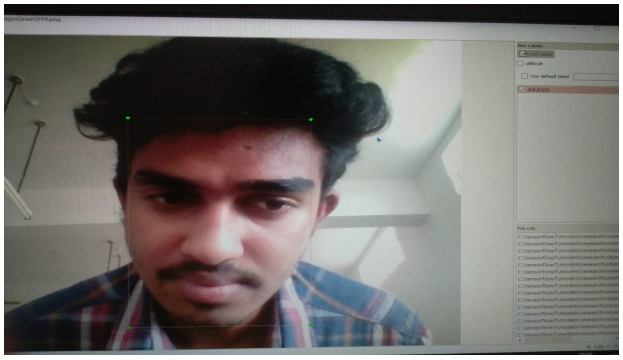

Fig 1.9

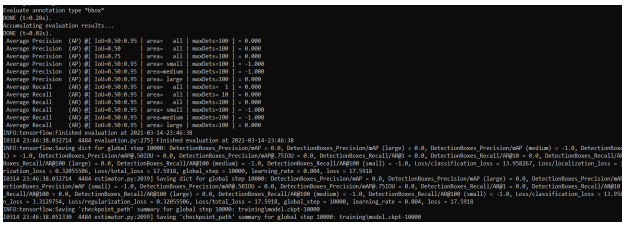

Fig 1.10

Training and labelling the model using the commands. The training of the images will take 14 hours to recognise the particular model.

B. Result of the face recognition for proposed system:

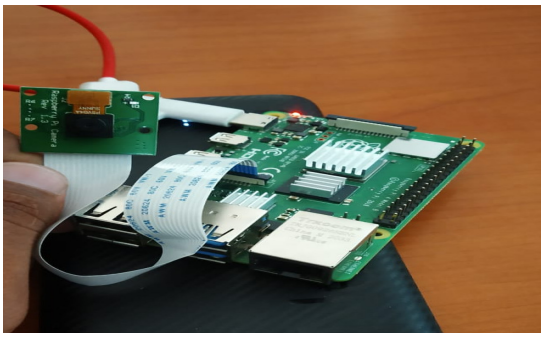

Fig 1.11

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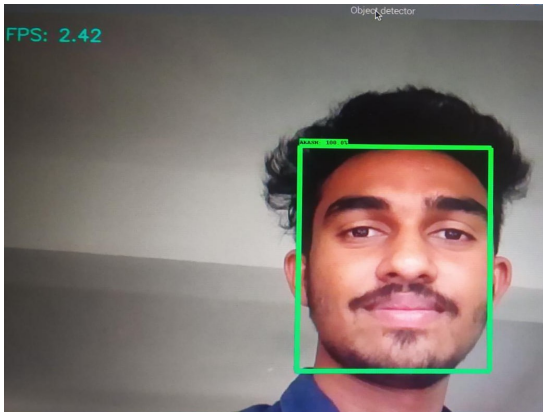


Fig 1.12

The raspberry pi camera is interfaced with the pi board and it will start detecting the image which is already fed into the tensor flow library files.

The result is it will detect the image in the closed box and appear with the labelled name of the image.

***C. Interfacing of MLX90614 sensor with raspberry pi 4*:**

Fig 1.14

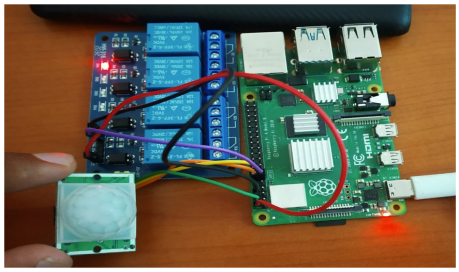
VIII. CONCLUSIONS

In recent days Human being are exposed to severe threats of COVID-19. To prevent these problems the proposed system of automatic temperature detection and handling appliances using smart devices will reduces the loss of human live. From this it is concluded that the proposed system is safe and affordable to the human being.

Fig 1.13

***D. Interfacing of PIR sensor with raspberry pi 4*:**

The PIR sensor and Relay is interfaced with the raspberry pi -4. Whenever the motion is detected the relay will act as an electromagnetic switch and PIR give signal to relay then the relay will be triggered. The signal is high the appliances will on. If the signal is low, then the appliances will off.



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