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IOT BASED INDOOR AND OUTDOOR HEALTH SAFTEY MONITORING SYSTEM

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ABSTRACT

A The basic aim of the project is to detect the presence of a face mask on human faces and body temperature of the person on live streaming video as well as on images. Artificial Intelligence has shown the promising results in health care through its decision making process. We have used machine learning as well as deep learning to develop our face mask detection. To create a safe, COVID-19 healthy environment, we propose a dynamic Computer Vision based automated solution system focused on the real-time face monitoring of people to detect the face masks in public places by using Raspberry Pi to detect face mask protocol violations through an integrated Pi camera and to monitor body temperature with the help of contactless temperature sensor and automatic hand sanitization system. Thus, the above system will help the society by saving time and also helps in contaminating the spread of corona virus. This can be implemented in entrances, offices, colleges, schools etc.

1. INTRODUCTION

When the worldwide COVID-19 epidemic situation deteriorates, there is an increasing demand for protective mechanisms such as face masks, with temperature being the primary factor. For this purpose, we have to use face masks and sanitizers, to reduce the spread of disease. In a pandemic situation, we have to follow the safety measures taken by authorities to stop the spread of disease, such as mask wearing requirements, social distancing, quarantine, self-isolation within the country's borders and abroad, and often prohibitingpublic gatherings.

2. PROBLEM STATEMENT

In public locations, major protocols want to be observed to save you the unfold of the virus, particularly sporting a face mask and keeping off social touch. To create a safe, COVID-19 loose environment, we recommend a dynamic Computer Vision primarily based totallyautomatic answer machine centered at the real-time face tracking of humans to stumble on each face mask and frame temperature in public locations with the aid of using the use of Raspberry Pi four Model B to stumble on face masks protocol violations via an included Pi digital digicam and to reveal frame temperature with the assist of MLX90614 sensor. A safety clearance machine is deployed a good way to permit that character to go into if they're sporting a face mask. This is due to the fact their frame temperature is in take a look at with WHO guidelines. As a part of this set up, the machine has a digital digicam module to reveal the face masks and a non-touch temperature sensor to decide the frame's temperature.

3. OBJECTIVE OF THE PROJECT

The main objective of our prototype is to have the country as mask free. Using this monitoring system, we can ensure the gradual decrease of cases mainly social gathering places like malls, Educational Institutions and Work places. We can eradicate the spread of virus through respiratory system or through surface touches by checking the body temperature and mask detection.

4. PROPOSED MODEL

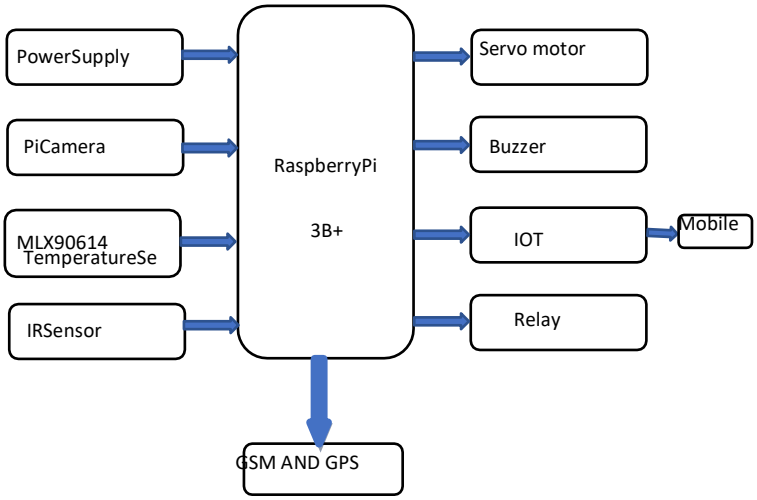

Fig:1 Block diagram of proposed model Face mask and Temperature detection system consists of input and output devices along with Raspberry Pi which acts as a brain to the system. The above is a block diagram for the Face mask and Temperature Detection system.

The Raspberry Pi module processes the entire software image processing procedures, and the system's output is displayed on the Monitor.

4.1 SOFTWARE COMPONENTS AND LIBRARIES:

- **Raspberry Pi**

Raspberry Pi is a microprocessor board, based on the Broadcom BCM2837, is a 64 bit ARMv7 Quad Core Processor. It has 40 general purpose input/output pins, USB ports, LAN port (Ethernet port) a micro-SD card slot, a DSI display port, a micro USB power input, a composite video and audio output jack, a CSI camera port, and a HDMI video output. It contains everything needed to support the microprocessor. Connect it to a computer in which Raspbian OS is installed and power it with an adapter [5].

In contrast to all previous boards, the Raspberry Pi 3 model B lacks on-board WiFi, Bluetooth, and USB boot capabilities. The Pi 3 is approximately 50% quicker than all earlier boards.The term "raspberry" refers to a fruit naming custom from the early days of microcomputers. Numerous computer businesses have fruit-inspired names. We're going to create a computer that only runs Python, hence the name "Pi."

- **SD Card**

Fig 1: SD card

The Raspberry Pi 3 is easy to set up and use. The tiny USB port may accept any USB power supply. A secure digital (SD) card is a type of portable, high-performance storage medium that may be used in a variety of electronic devices, including cameras and computers. Larger SD cards, such as those with 64 GB of storage space, are supported by the Raspberry Pi. The micro SD card serves as the Raspberry Pi's hard drive. After installing the Raspbian operating system on the card, you may save all of your documents, files, and projects to it as you work. The Pi will begin booting as soon as the power is switched on because there is no power button. Simply unplug it to turn it off.

- **USB Chip**

The Raspberry Pi 3 uses the same SMSC LAN9514 chip as the Raspberry Pi 2, but adds 10/100 Ethernet and four USB ports. The SMSC chip communicates with the SoC over a single USB channel, serving as a USB-to-Ethernet adapter and USB hub.

Fig 2: Universal Serial Bus Chip

- **Ethernet port**

Wi Fi is a reliable way to acquire internet access while using Raspberry Pi as a game console, media server, or stand-alone computer. Wi-Fi, on the other hand, is one of the slowest and least dependable ways to connect to your Pi via SSH or a remote desktop application. A wired connection is quicker and more dependable than a wireless connection. Your local network is circumvented by connecting to your Pi with an ethernet wire directly from your laptop or desktop. Because we don't share

Fig 3: Ethernet Port

bandwidth with other devices on your network, we don't share bandwidth with them. It also enables us to connect to our Pi while we are not connected to the internet at home. If we're having problems with our network connectivity and timeouts.

- **CONTACTLESS TEMPERATURE SENSOR:**

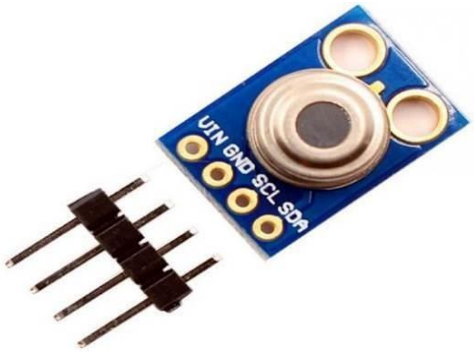

Fig 4: MLX90614 Contactless Temperature Sensor

The MLX90614 ESF is a non-contact infrared thermometer. It's what we're using right now to figure out frame temperature. It can withstand temperatures between -20 and 120 degrees Celsius. It detects the man's or woman's frame temperature and sends the data to the Raspberry Pi. After noise amplification, infrared radiation alerts collected from gadgets and our bodies are converted into electric alerts by the MLX90614 infrared sensor. The electric indication is then converted to virtual warnings and stored in the sensor's internal memory.

- **CAMERA MODULE**

This system makes use of a 5MP Raspberry Pi Camera Module Rev 1.3. With the Raspberry Pi 3B+, you may utilise any USB webcam. The 5MP camera module is excellent for small Raspberry Pi applications that have a limited amount of space. The high-resolution 5MP camera not only takes great images, but it can also record video, making it ideal for drones or a CCTV project. For additional calculations, the Raspberry Pi 3B+ continuously receives signal from the 5MP Camera module. Image processing, machine learning, and surveillance applications all make use of it.

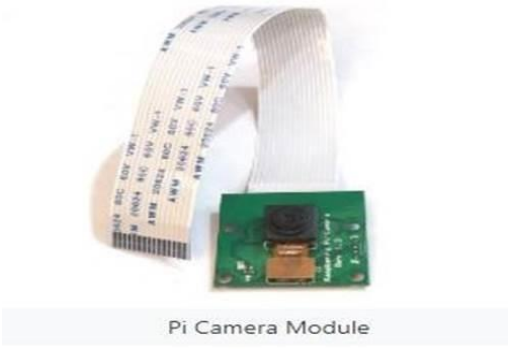

Fig 5: Pi Camera Module

The Raspberry Pi camera module is a tiny, light camera that works with the Pi. The Raspberry Pi communicates using the MIPI camera serial interface protocol. It's used a lot in image processing and machine learning software.

- **BUZZER**

The Raspberry Pi Camera v2 is the new official camera board from the Raspberry Pi Foundation. The Raspberry Pi Camera Module v2 is a custom-made add-on board for the Raspberry Pi that includes a fixed focus lens and a Sony IMX219 image sensor with an 8 mega pixel resolution. The Camera Module can capture high-definition video and still photos. It can record still photos and video at resolutions of 1080p30, 720p60, and VGA90. A 15-cm ribbon cable connects the Raspberry Pi's CSI port to it. The camera is compatible with all Raspberry Pi versions 1, 2, 3, and 4.

Fig 6: Buzzer

- **IR SENSOR**

An infrared sensor is a digital gadget that emits heat and allows you to sense a few aspects of your environment. The Raspberry Pi camera module is a small, light camera that connects to the Raspberry Pi. The MIPI camera serial interface protocol is used by the Raspberry Pi to interact. Image processing and machine learning applications make extensive use of it. Typically, all items emit a certain type of heat radiation within the infrared spectrum. These sorts of radiations are invisible to the naked eye, but an infrared sensor can detect them . The emitter is undoubtedly an infrared LED (Light Emitting Diode), and the detector is undoubtedly an infrared photodiode, both of which are sensitive to infrared light of the same wavelength as that emitted.

Fig 7: IR Sensor

- **Servo meter**

A servo motor is a rotary actuator or motor that can control angular function, acceleration, and velocity with extreme precision. In essence, it possesses abilities that a regular automobile no longer possesses. As a result, it employs a common motor in conjunction with a sensor to provide function feedback.

Fig 8: Servo meter

Servo motors have extremely fine control over position and speed. A potentiometer can now detect the shaft's mechanical location. As a result, it connects to the motor shaft through gears. The present position of the shaft is converted into an electrical signal by a potentiometer, which is then compared to the command input signal. In contemporary servo motors, electronic encoders or sensors measure the shaft position.

- **PUMP MOTOR**

The working principle of a diaphragm pump is simple: two valves open and close to propel a piston back and forth using air pressure. It can even be as complicated as air-driven vanes that are finely balanced. This type of pump can be employed in multiple applications thanks to the usage of an air motor. Air motors may be made tiny and light, making them perfect for use as a portable pump. The use of air as a submersible pump result in a sealed machine with no exterior moving parts. It can be used indoors or around flammable liquids because it doesn't emit fumes or consume electricity. These features make it a highly useful pump to have on hand

Fig 9: Pump Motor

5. RESULTS AND DISCUSSION

- **With mask and normal temperature**

The figure 10 shows the mask detection with 100% accuracy.

Fig 11: Temperature and Pulse measurement

The Figure 11 shows the temperature and pulse rate measurement.

- **WITHOUT MASK WITH GPS LOCATION**

Fig 12: Without Mask Face Detection

The Figure 12 shows the without face mask detection with 99.98% accuracy.

6. CONCLUSION

In this challenge we've got effectively applied a running prototype of Face masks, Body temperature and Hand sanitization detection machine. This challenge may be utilized in locations with big gatherings along with schools, colleges, offices, purchasing department shops etc. The machine determines whether the character is wearing a face mask before sending the data to he microcontroller. The character's frame temperature is read by the non- contactless temperature sensor, which then opens the barrier arm and lets the character in. With the help of this challenge, an automatic response is created, eliminating the need for a human to screen COVID-19 protocols. Raspberry Pi is sort of effective sufficient to stumble on face mask in video/picture streams, however with destiny Raspberry Pi releases, the procedure might be less complicated to accomplish. As a result, a face masks, frame temperature, and hand sanitization can assist us lessen the chance of infection. This is due to the fact we are able to lessen the big variety of humans accrued in a single location without carrying mask.

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