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Research Article

Development of COVID-19 Detection Smart Doorbell Based on IoT

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I N F O

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A B S T R A C T

A unique thermal sensor camera must be utilised to detect a person with covid 19 symptoms. A Coronavirus doorbell has been invented in this research, which can be used to uniquely identify persons using their fingerprints, and they can also be identified for COVID positive. This is an electronic based gadget made with a Raspberry Pi 3, an IR sensor, a Serial 16x2 Serial LCD, a Raspberry Pi camera, and tools for fingerprint scanning. A COVID doorbell has been obtained by combining these tools to detect an infected person based on his temperature. When a person's temperature exceeds 104 degrees Celsius, it detects it by touching his finger with a finger print sensor, captures an image of the infected person, and alerts the person inside the house with the appropriate message. This system thus has the potential to save human lives from COVID.

Keywords: Fingerprint, IR Sensor, Bio-matric, Camera, Python, IoT (Internet of Things)

Introduction

People are afraid of COVID-19 in today's world. People have even been observed coming less out of their homes during these periods of time.[1] Scientists, specialists, and technical experts are working to find a way to stop it from spreading, and many devices and gadgets have been developed in this direction to identify infected people and track them down in order to prevent the spread of covid-19.[2] Many electronic types of equipment are proving to be helpful in this direction, for example, air conditioners are used in buildings.[3-5] Many smart gadgets are being developed for buildings that can detect people who are infected with covid-19 and thus reduce the spread by providing them and others with the indication.[6] A doorbell allows visitors to announce their presence and request entry into a building, as well as allowing the occupant to verify the identity of the visitors in order to help prevent COVID-19 invasion at any time.[7] This Doorbell will detect people with high temperatures outside your home to identify their presence.[8] This smart device will notify residents when an infected person arrives at the door.[9] This will improve people's quality of life while also contributing to the advancement of smart homes.10 Due to its distributed framework developed with Raspberry-pi 3, IR sensor, Camera, C programming, and laptops, the Doorbell system also allows for quick fault detection and diagnosis.

Tools and Technology

Raspberry Pi 3: The Raspberry Pi is a smart-card-sized computer that connects display and keyboard shown in Figure 1. It is a tiny computer that can manage all electronics-related projects that a personal computer can handle. The Raspberry Pi 3 Model belong to the third generation of the Raspberry Pi. There is a powerful processor in the Raspberry Pi 3 Model B that is 10 times faster than the previous generation. Raspberry Pi devices come in a variety of memory sizes, which are designed

for educational projects. Various Raspberry Pi models are available, including the Raspberry Pi 1 model B, Raspberry Pi 1 model A, and Raspberry Pi 1 mode. Raspberry Pi 1 model A+, Raspberry Pi Zero, Raspberry Pi 2, Raspberry Pi 3 model B, and other Raspberry Pi models are available and applicable for home security.[11]

Figure 1.Raspberry Pi 3 Model used in Current Project

Serial 16x2 Serial LCD: Figure 2 shows how a serial port with 5V level indicators may be used to control a serial 16x2 LCD module from Nex-Robotics. For communication with any device, it needs two lines, TX and RX. The serial LCD is the most recent version. It's an uncomplicated and cost-effective method.[12]

Figure 2.LCD Module used in Current Project

Fingerprint sensor: It is an excellent and powerful biometric fingerprint reader module. Figure 3 shows how the client can save their unique finger print information in the module and design it in 1:1 or 1: N mode to distinguish themselves from others.[13-14]

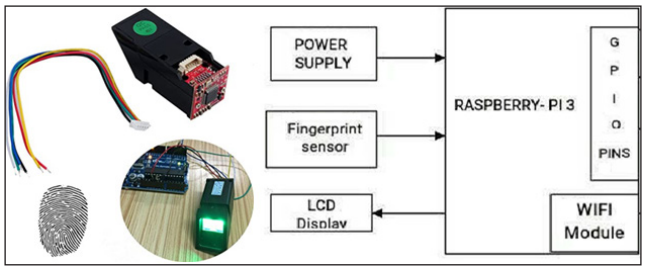

Figure 3.Block Diagram of Finger Print Scanner

Infra-red (IR) Sensor: Everything including mass produces heat, which is a form of energy. Because any object or person emits heat, an infrared thermometer can use the difference between the IR rays emitted by the person and those emitted by the bordering environment to determine the temperature of the person. Infrared technology is suitable for a wide range of wireless applications. Sensing and remote controls are the two main areas. The infrared portion of the electromagnetic spectrum is divided into three regions: near infrared, mid infrared, and far infrared.[15-16]

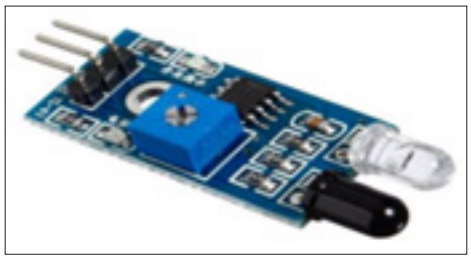

Figure 4.Infrared Sensor

Raspberry pi Camera: The Raspberry Pi Camera Module v2 is a custom designed add-on board for the Raspberry Pi with an 8 megapixel Sony IMX219 image sensor and a fixed focus lens. A camera port has been added to the Raspberry Pi Zero! Users can now use a Raspberry Pi camera with your Zero thanks to the new Raspberry Pi Zero Camera Adapter. It claims to support static images up to 3280 x 2464 pixels and video up to 1080p30, 720p60, and 640x480p90. It connects to the Raspberry Pi via one of the small sockets on the board's upper surface and uses the dedicated CSi interface, which has been specifically designed for camera interoperability.[17-18]

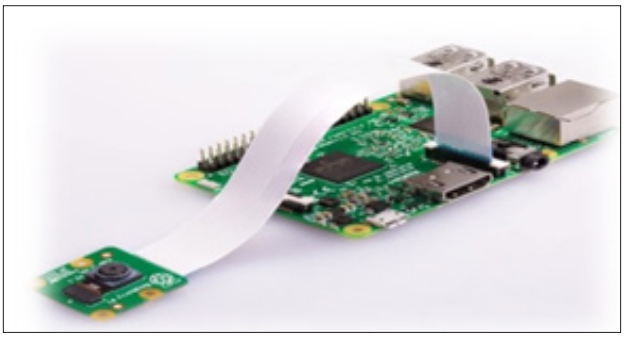

Figure 5.Rasberry Pie Camera

Proposed Solution and Implementation

The entire procedure begins when a person starts pressing the doorbell button. A hidden infrared thermometer measures body temperature at that point, through the finger/thumb temperature and the sensed temperature is displayed on the 7-segment display screen and compared to standard fever temperatures. There can be an option that doorbell will ring only if the visitor's body temperature is below 32°F; otherwise, an alarm will sound to warn the resident of that dwelling about a potentially infected visitor. In order to register the data of visitors in the database, one

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can enroll for an Algorithm for potential visitors as follows:

- Fingerprint Scanner Serial Port Initialization
- Obtain sensor data
- Begin the service by reading a finger
- Wait for the finger to be read
- If that finger isn't already registered, go to 8
- Message with id to print
- If already registered, continue to 10
- The read picture is converted to characteristics and stored in charbuffer 1
- Wait till that finger is read once again
- The read picture is converted to characteristics and stored in charbuffer 2
- The charbuffers are compared
- Raise an exception if the fingerprints do not match
- Creates a fingerprint scanner template and saves it
- Save the Id and location to the database
- Message of success to be printed

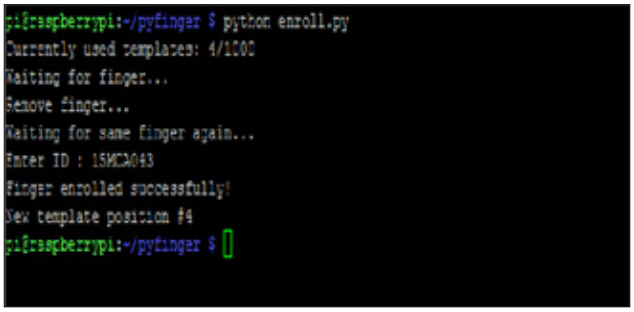

Figure 6.Show that Controller is used to Identify the Fingerprint. We have used Raspberry pi 3b

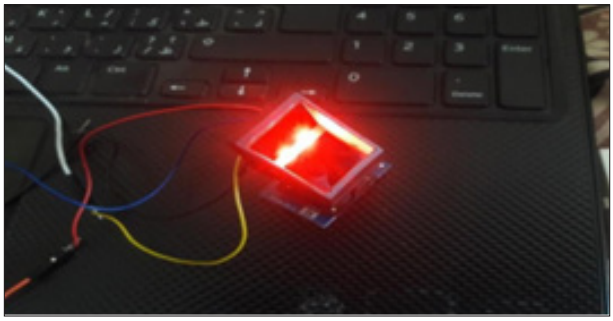

Figure 7.Fingerprint Scanner asking for Input Controller in Our Proposed System

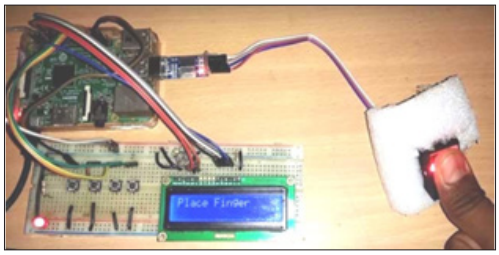

Figure 8.Shows that Scanner is Ready to Read the Student Fingerprint

Figures 7 and 8 show how a controller is used to detect a fingerprint. In our purposed system, we utilised a Raspberry Pi 3b controller and a fingerprint scanner, which asked for input and, according to figure 7, detected the temperature and printed the message successfully as per the algorithm.

Conclusion and Future Scope

The designed system has been successfully installed, and it will assist to decrease manual labour and infection risk. In addition, the suggested approach would save time and produce the report on time. Furthermore, it reduces widespread human errors, avoids, and appropriately manages COVID patients so that it may be used in the future to generate various reports. The current work is being done as a pre - development review during the project's assembly phase. It outlines the basic system's operating systems, linear actuator, transmission and distribution, thermal management, and electronic designs, as well as preliminary reliability and structural assessments. In the development of such gadgets, more computational and advanced development tools may be used further.

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