Smart Solution to Prevent the Fast Spread of Covid-19 in workplaces

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ABSTRACT: The effects of the coronavirus outbreak have had a profound impact on every aspect of our daily lives, including the way we work. Due to the closure of many companies and industries such as technology or finance, offices have been temporarily closed as remote working becomes the standard. They are also organizations whose doors must remain open to support society during this outbreak. In this work we are focusing on accomplishing body temperature detection, facemask detection along with RFID verification and maintaining social distancing.

KEYWORDS: Image processing, IOT, Artificial intelligence, Deep learning, social distancing, TensorFlow

I.   INTRODUCTION

The discovery of the new normal is happening every hour for businesses around the world. The effects of the coronavirus outbreak have had a profound impact on every aspect of our daily lives, including the way we work. We also know that Covid-19 is not mitigating without a vaccine. The project "Smart Solution to Prevent the Fast Spread of Covid-19 In Workplaces" comes in act. It is mainly focused on resolving the plight that our world is facing, that is covid-19. In the project, we are focusing on accomplishing body temperature detection, facemask detection along with RFID verification and maintaining social distancing. Image processing, IOT, Artificial intelligence and Deep learning are some of the technologies used in our project.

In order to successfully adapt to the new normal and be successful, we cannot simply react to Covid19-related workplace problems as they arise, but must monitor key patterns and trends to predict challenges and effectively and proactively manage our efforts in real time. However, this requires personal intervention and manpower, but its more based on the use of modern technological resource in order to reduce the efforts by man.

Problem parameters:

- ➢ Whether the employees are wearing mask?
- ➢ What is the employee's body temperature? Is it high or normal?
- ➢ How can no contact attendance system be implemented?

- ➢ How to ensure that employees do not form groups while working?

For all the above-mentioned problem parameters we have come up with a solution. Our solution ensures that in industries and organizations all the SOPs prescribed by the government are being followed.

The device at the entry area will perform following errands:

- • Mask detection – It scans the face of the employees to detect the presence of mask.
- • Body temperature detection - It detects the whether the body temperature of the employees is normal.
- • Logs the attendance - It detects the RFID tags of the employees and mark the attendance.

II.   HARDWARE REQUIREMENTS

1.   Raspberry pi

A low-cost computer that plugs into a TV monitor or computer and uses a typical mouse and keyboard.
Capabilities - from playing HD videos, surfing the internet to creating spreadsheets, games and word processors.
Most Raspberry Pi Models have 40-pin pin out.
It supports Raspberry Pi OS (previously Raspbian) and Ubuntu, RISC OS and Windows 10 IOT Core.
The main programming languages supported are Scratch and Python and support many other languages.
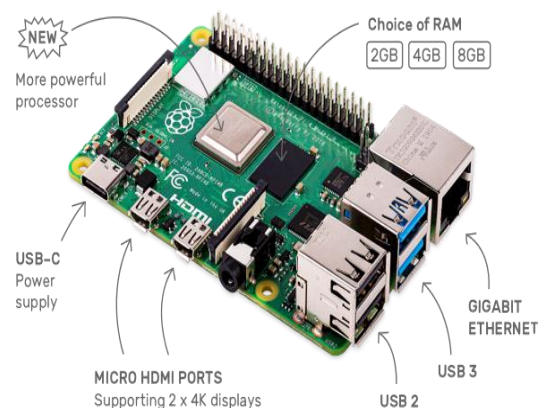
Raspberry pi model

2.   Pi Camera Module

Pi camera is a customizable plug-in for the Raspberry Pi, and the interface uses a dedicated CSI interface. The CSI

bus supports extremely high data rates and only transmits pixel data. All high-resolution photos from Raspberry Pi cameras, along with Full HD 1080p video fully programmatic. All software is compatible with the latest version of Raspbian OS. Numerous third-party libraries have been created for this, including the Picamera Python library, libcamera, etc.

MLX90614

It is an infrared, non-contact thermometer. Temperature sensor for air conditioning in residential, commercial and industrial buildings, windshield dehumidification

- Operating Voltage(V): 3- 5
- Operating Current(mA): 2
- Communication protocol: I2C
- Power saving mode
- Customizable PWM output for continuous reading
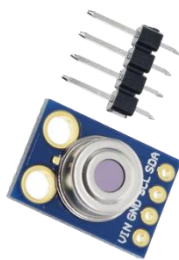
MLX90614

3. Radio Frequency Identification

It uses electromagnetic fields to auto recognize and trail tags. The RFID system contains a small radio transponder, a transmitter and a receiver. Activated by an electromagnetic polling throb from the nearest RFID reader, the tag directs digital information to the reader.

RFID working
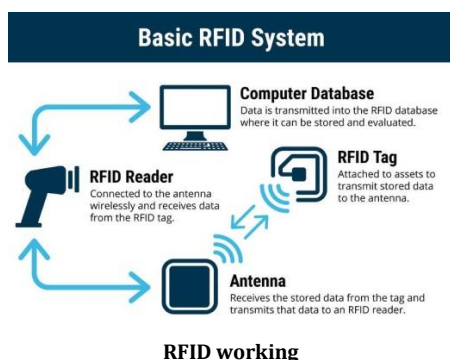
III. SOFTWARE REQUIREMENTS
1. Raspberry Pi OS

Raspbian, free OS grounded on Debian that has been enhanced for Raspberry Pi. The Raspberry Pi operating system has around 35,000 pre-compiled software packages in a beautiful setup that can be effortlessly installed on Raspberry Pi tools. Recommended software.

Raspberry Pi Imager is a rapid and comfortable way to put in an OS on a microSD card. The user interface of the Raspberry Pi operating system is similar to most other operating systems such as Ubuntu Linux, Windows, and macOS.

2. Open CV

Computer vision is the process by which we understand images and videos, how they are stored, how we manipulate them, and extract data from them. OpenCV (Open Source Computer Vision Library) is an open source software library for computer vision, machine learning, and image processing. The goal of OpenCV is to provide a common infrastructure for computer vision applications and accelerate the use of machine perception in commercial products. The library contains more than 2500 optimization algorithms. Algorithms can be used. Detect and recognize human faces, recognize objects in videos and human behaviour classification, track moving objects, extract 3D object models, search for similar images in image databases, etc. It has C++, Python, Java and MATLAB interfaces and is compatible with Windows, Linux, Android and MacOS.

Tensor flow

TensorFlow is open-source ML software platform. TensorFlow integrates various algorithms and models for deep learning and machine learning. It has a large and flexible ecosystem of tools, libraries and community resources. Use Python to provide a user-friendly interface. Use the framework to build applications, and these applications run in high-performance C++. Use instinctive APIs such as Keras to effortlessly shape and train machine learning models.

Keras

Keras is a free software library that delivers a Python interface for artificial neural networks. Keras acts as an interface to the TensorFlow library. Keras includes implementations of many commonly used image and text data tools to simplify the coding required. Used to write deep neural network code, provide a consistent and simple API, minimize the number of user operations required for use cases, and provide clear and simple errors that can be handled. It also includes extensive documentation and developer guides. Simple Keras reduces the developer's cognitive burden to a free user who can focus on the parts of the problem that really matter. Powerful Keras offers industry leading performance and scalability - it's used by NASA, YouTube, etc.

IV. METHODOLOGY/IMPLEMENATION

The flow of the project is that first, the face of the person to be examined is scanned for the mask, if the mask is detected   then   the   person is permitted

for temperature check. In case the detection result is FALSE the person is advised to wear a mask. Secondly, in the temperature checking process, the candidate's hand is placed near the IR temperature detector and if the result in the preferred range, he is allowed for admission check procedure. If it is the other case, the person is sent back to bring RT-PCR negative report. Upon clearing the above two tests, the person can scan their RFID tag to enter and once the tag is scanned by an RFID scanner, a Unique Password (OTP) is generated and sent to the person's registered cell phone number. The same is registered in the cloud. After entering this password into the mobile phone API, it will be verified with the password registered in the cloud, if TRUE, the person is granted access; otherwise, it will be refused.

While the above process is in action, the PI and PI camera will constantly monitor social distancing. The system's speaker will not remember people in line for social distancing unless there is a violation of this protocol.

All volatile parameters that are received during the procedure are compared with pre-trained and pre-defined non-volatile models and attributes and the output is monitored accordingly. This is the function of the monitoring system. This output is saved and displayed in the web application.
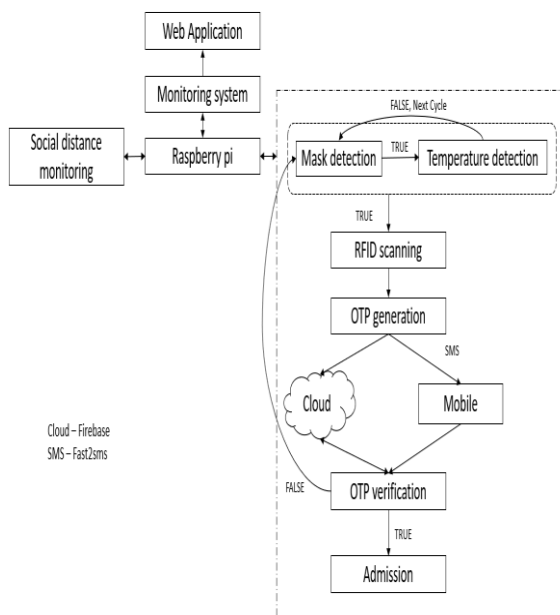
Flow chart

## V.   RESULT AND DISCUSSIONS

Training mask detection model

The main part of the project is mask detection because masks play a fundamental part in preventing the blowout of Covid19. First, we need to train the face mask recognition model in such a way that we get a good accuracy rate, to achieve that we need to train the model with a good number of pictures with and without masks.

We trained the model with almost 2000 pictures of each with and without a mask. The accuracy rate we got is 98% after training.
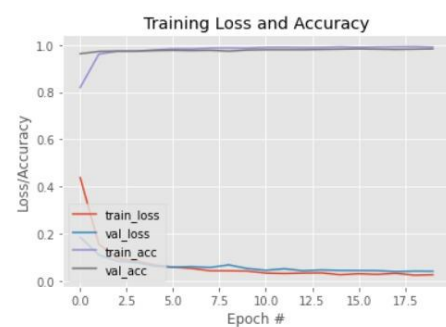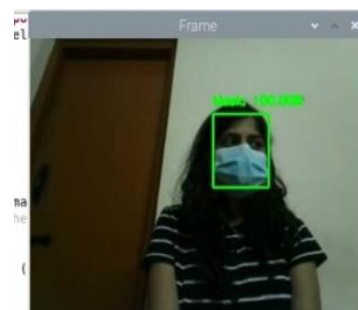

Training mask detection model
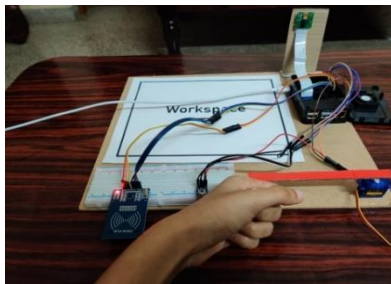
Facemask detection
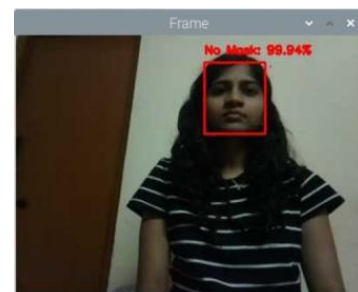
No Facemask detected

Facemask detected

Temperature detection

As soon as the facemask is detected, the hand of the employee is placed in front of the sensor to detect the temperature.
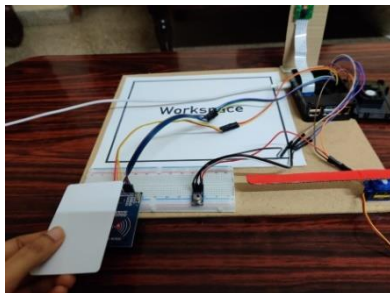
Placing the hand near the temperature detector

If the temperature is within the given threshold, it is considered as normal temperature, else, if it is not within the threshold then the temperature is considered as abnormal temperature.

RFID verification

When both facemask and temperature are detected then RFID verification begins.

**Reading the card**

Datasheet of the employees

The RFID card is read and the details obtained will be compared with the datasheet of the employee. OTP verification happens only when the details obtained and the datasheet of the employee are matched.

OTP Verification

As soon as the datasheet of the employee is matched with the details received after reading the card, then only OTP verification occurs. The OTP generated will be sent to the employee's number and is entered in the mobile application, which is created for verification purposes.

OTP sent to the employee's number
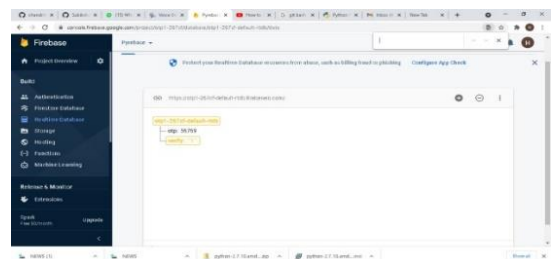
OTP updated in the cloud (after verification)

Social distancing

Social distancing is monitored with live video streaming as well as images.
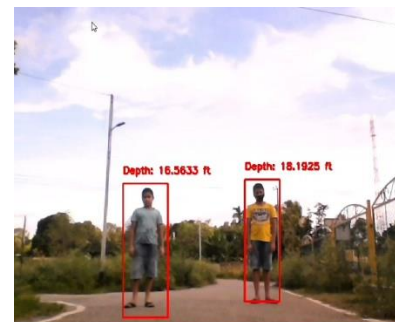
Social distancing is violated

Social distancing is maintained

VI.   CONCLUSION

In this article, successfully developed an automated system for the workplaces which detects the body temperature, face mask and the distance that should be maintained between two people along with the attendance system using RFID cards. This model is

affordable with scalable technologies and can be implemented in real-time. It totally replaces the traditional biometric attendance system and helps in contributing to the prevention of the rapid spread of the coronavirus.

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