An Innovative Covid-19 Proof Entry System Using IOT

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ABSTRACT-In this paper, we proposed an innovative COVID-19 proof entry system aiming to decrease COVID-19 spread, coveringseveral relevant aspects: face mask decetion,contactless temperature sensing,intelligent visitor counting device.COVID-19 pandemic caused by novel coronavirus(CoV) is continued to be the cause of predicament for millions of lives and businesses even in 2020.As the world recuperate from the COVID-19 pandemic and scheme to take back state of normality,some standard guidance to prevent infection spread which includes regular hand washing,wearing a face mask when coughing and sneezing.Here we introduced a Machine Learning based system which detect whether a person wearing face mask properly.System using different set of technologies like openCV and tensorflow architecture which is capable of detecting masked and unmasked faces integrated by raspberry pi and USB camera and body temperature can be observed by using MLX90614 contactless temperature sensor.The design includes digital bidirectional visitor counter circuit that execute the task of counting number of visitors in the public places and horn a warning alarm when a person enters without mask or number of visitors exceeds the capacity limit of shopping malls,banks etc.

keywords-computervision,rasberrypi,USB camera,MLX90614 contactless temperature sensor.

I.   INTRODUCTION

Owing to the rapid spread of the COVID - 19 outbreak around the world, wearing a face mask in public is becoming more fashionable.Face masks are commonly worn by everyone to protect themselves from air pollution. Others are self-conscious about their appearance, as a result, they concealzeal from the civilians by covering their looks.According to experts, wearing masks will help inhibit Covid-19 spread.Covid-19 is a corona virus outbreak that has harmed human health over the last century.WHO announcedCovid-19 as a universalwidespread novel coronavirus was rapidly spreading worldwide.The first case of Covid -19 infection is recorded in Wuhan on 31st December 2019. Over and above 5 million people's were affecteddue to Corona virus in lesser thansix a year across 190 nations. The virus transmission in people through abutting contact and in congested areas. Artificial Intelligence (AI) is running technology which is based on deep learning and computer vision helpsin finding ways to prevent Covid-19. Machine learning enables researchers to estimate large amount of data to speculate theallocation of Covid-19to assistthreatening mechanism.

Here we introduce a technique ensures protection for people by face mask detection which uses the technique of deeplearning as well as machine learning. This developed model is intregrated with a USB camera to capture an image of a person in order to determine whether or not the person is wearing a mask. Machine Learning uses advanced algorithms and make decisions based on what it has learned from the provided data.Neural Network consists of an miscellany of algorithms uses graphs of neurons in Machine Learning for data modelling process. This model is integrated with the techniques of machine learning and techniques whichusesTensor flow, Keras and OpenCV. Here weintroduced a comparison between different machine learning algorithmsthat reached the greatest accuracy while taking the least amount of time during theprocessof training and mask identification. MLX90614 is an infrared thermometer for non-contact temperature measurements used to measure body temperature of

a person. It can be interfaced with any micro-controller which communicate through it's I2C interface. Visitor counting is a system used to count the visitors entering and exiting rooms, malls, sports venues, etc. Visitor counters has many advantages in terms of monitoring overcrowded behavior at public place. The significance of the design and construction of visitor counter is to manifest the fact that it provides the guarantee of the health and safety of the occupants in the malls,public places.

II. LITERATURE REVIEW

There are many other existing works in the market that contain some of the features relevant to the work proposed in this paper. Anyhow, to the optimal of our knowledge, there is no such work covering all the features together to achieve the current need while allowing execution on low-cost IoT devices at the same time.

In [1],Only face detection and recognisation is done by using the OpenCV and used face algorithms like Haarcascade_default.xml and EigenfaceRecognizer.

In this book[2], the author bring up you to computer vision and explains how one can quickly develop applications that enable computers to recognize and make decisions based on that data.

In the work of Z. Wangetal[3],described the dataset for face mask recognition is introduced and its approach by different algorithms in the context of campus and enterprise coronavirus prevention.

In the work of Ping,ArvindSundararajan on Face detection at University of Stanford in 2014[4],they used highly experience based thinking and scale clearly stated method of clustering mathematical relationship related peak for face detections.

In the work of Mahesh T. Dubey, P. Kale,P.Jagtap, P. Mende, P.Kalbande, B Nagne on IoT based Automatic Hand Sanitizer Dispenser, Dec 2020[5],here authors used ultra sonic sensor for sense the hands.when the hands are placed under the sensor,thearduinouno senses the distance and as a result sanitizer is pumped out through the connected pipes.

In the work of EnerstEdozie[6],the intelligent automatic hand sanitizer which uses sensors and ATMEGA328P to check hands under the pump outlet of bottle and ultrasonic sensor continuously calculate the distance between the hands and pump outlet.when the distance is less than 10cm then microcontroller response and turn on servomotor which is used to pump the sanitizer out through the outlet and display a message "The

Door Is Opened,You can go now"on the LCD screen and door open using the another servo motor.

In the work of Kuchta, R., &Vrba, R. (n.d.).,Non contact Temperature Sensor System[7],described the main ways of thinking in a concept of mobile temperature data logger and protable person with wireless move of temperature readings.

In the work of UgljesaJovanovic[8] on summary of Temperature Measurement of photovoltaic Modules describes about the implementation of temperature sensors used for Photovoltaic temperature measurement.The PV module tempearature measurement is considered as the accurate mensurement for conctact temperature sensors.

In the work of [9]Kadam Shah, PrakashSavaliya and Mitesh Pate on ,"Automatic chamber brightness controller with visitor counter",gives the count of people present in the room and if no person in the room then automatically power supply is stops for that room.

In the work of [10] Prof, AshaRawat on "Automated Room Light Controller with Visitor Counter", explains about the task of controls the room brightness and gives count of customers in the hall.

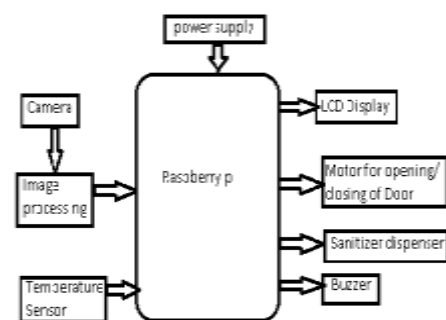## III. IMPLEMENTATION AND DESIGN
A.Block Diagram

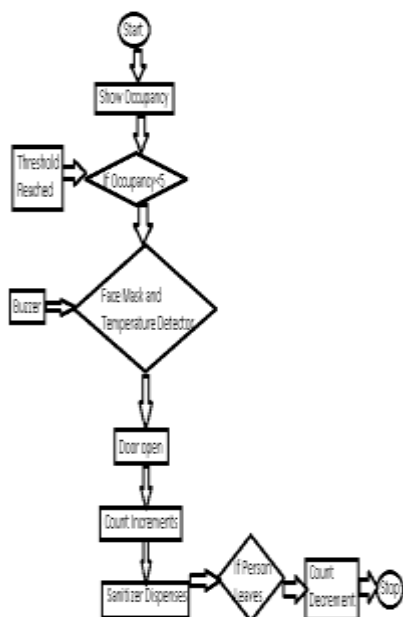Fig. 1:Proposed System block Diagram

B.Flow Chart

Fig. 2:Flow of execution of proposed design

III.HARDWARE COMPONENTS
A.Raspberry Pi
Raspberry pi is a mini computer available at low cost in the market.It's a low cost mini computer available in the market,invented in the British university town of Cambridge and developed by the Raspberry Pi Foundation,as a learning tool to increase the deeper understanding of computer science in all universities.. Although the major goal is to get kids into all programming languages with this powerful tiny computer.The result of using Raspberry gives a list of thousands of free projects.It can be used to monitoring your vivarium conditions, creating your own Pi photo frame and building your own torrent machine.Micro SD card is inserted into it for storing data because it doesn't come with an inbuilt storage space.

Fig. 3: Raspberry Pi Board

B.MLX90614 Thermometer
MLX90614 is an infraded sensor used for contactless temperature measurements.it is small in size,low cost and easy integration process.It is equipped with a low noise amplifier and a 17-bit ADC, resulting in high measuring resolution and precision.It has a an object temperature range between -70 degrees Celsius and 380 degrees Celsius and sensor temperature range between -40 degrees Celsius and 125 degrees Celsius.

Fig. 4: MLX90614 Temperature Sensor

C.USB Camera Module
The e-CAM51 USB - 5MP USB camera module contribute 24-bit white color having six LEDs and a high-resolution sensor.It does not necessitate the use of any exceptional drivers of operating systems that include built-in help for UAC and UVC,thesestandards such as audio streaming through UAC and video streaming through UVC.This Camera module allows us to capture 5MP still image and 720p video streaming capability.It have four general purpose pins such that 2 pins for user configurable GPIOs,1pin for External hardware trigger for still capture and 1 pin for predefined GPIO input for Flip/Mirror.

Fig. 5: USB 5.0MP camera module

D.16*2 Liquid CrystalDisplay(LCD)
The 16×2 LCD moduleis a the fundamental module that is frequently used in many designs for displaying comments and intermediate outputs. It indicates two such lines each of one character and 16 characters per line as shown in 5×7 matrix of pixels. It consists of two

registers namely data register and command register.Data register is used to switch from one register to another, with RS value as one representing the data register and RS value as zero representing the command register.

Fig. 6: 16*2 LCD Module

E.IR Sensor

The Infrared rays(IR) sensor module for obstacle detection is made up of an transmitter and receiver pins, an operational amplifier and a variable resistor. The LM358 is a Op-Amp for voltage comparision that compares voltage between pin2 and pin3.If the voltage drop at pin3is greater than pin2,than the output of Op-Amp is High,else the output of Op-Amp is Low.When the output of the Op-amp is high,then the LED connected to the Op-amp output(pin6) terminal illuminates.

Fig. 7. IR Sensor

IV. SOFTWARE IMPLEMENTATION

In this paper,implementing the COVID-19 proof face mask detection of the customer and hand sanitizer dispenser.The image is captured using the USB camera 5.0 and preprocessed by computer vision.Dataset is a collection of comparable sets of data that is composed of different elements but manipulated as a unit by a computer.The dataset is divided into train dataset and test dataset.The dataset is trained by the machine learning algorithms that can be learn and make predictions.The model is trained by the supervised learning method using optimization methods such as gradient descent.Finally,th accuracy is evaluated on the test data comparing with trained dataset.We use Python script to train the dataset using tensor flow and keras.with the trained data.

A.OpenCV

Thousands of machine learning methods are included in OpenCV, an open - sourced repository..OpenCV assist many varieties of computer programming languages likeC,C++,Python,Javaetc.Features GPU acceleration for real-time operations.It mainly focus on image processing, video capture for analysis including features like object detection and face detection.OpenCV can read and write, draw an image through code by processing the pictures saved in the computer.

B.SystemImplentation

In this project, we are building three phases.phase one deals with the implementatiom of face mask using computer vision and deep learning concepts. To identify that if you were wearing amask, I choose Tensor Flow with Keras library and OpenCV to build a very fundamental CNN model.The dataset of face mask,which was collected by taking photos will be used to create this model.By using these images we train a model in Tensor Flow to identify the person is wearing a face mask or not using a USB Camera.So the foremost step is to visualise the data. By visualising, the total count of images in both the categories of data set. We come to know that the 'MASK' class has images having mask and the 'NO MASK' class for images don't having mask.In the subsequent step, we divide dataset into two sets: the training set and test set.The training set contains the images that will be utilized to train the CNN model.The test set contains the images that will be used to test the model.The split sizemis 0.8,it implies that 80 percent of the dataset will be used to the training set, while the other 20% will go to the test set. The layers which are used to construct the sequential CNNmodelarePooling2D,Dropout,Conv2D,Dense and Flatten. We use the 'softmax' function in the final Dense layer to produce a vector that represents the likelihood of each of the two groups.This is the critical phase in which we fit images from the training set and test sets to the Sequential CNN model that we built using the Keras. We gave the model 30 irerations of training for accuracy. Moreover, to enhance accuracy and prevent over-fitting, we should practise for a larger number of iterations.After the completion of 30th iterations, model has a training set accuracy as 98.86% and a test set accuracy of 96.19%. This means that it has been well trained and is not over-fitted.We mark two probabilities for our results after we construct the model. ['0' denotes 'without

mask' and '1' denotes 'with mask']. I'm also using RGB values to adjust the colour of the boundary rectangle. ['RED' stands for 'without mask' and 'Grey' stands for 'with mask'].Following that, we are planning to use our USB camera to recognize whether we are wearing a mask or not. First and foremost, we must introduce face recognition. Here to detect facial features,we use feature based Haar Cascade Classifiers.This cascade classifier was developed by OpenCV ,for the detection of frontal portion of the face by training thousands of types images. Finally, we use the OpenCV to run USB camera in an everlasting loop, where we use the Cascade Classifiers to detect the face.If the person wearing a mask then the system go to further steps otherwise alert is given as to wear mask.The next step is to calculate the Temperature of the person.placing the hand below the MLX90614,it will display the temperature .If count of persons is as same as the predefined limit,then the door will not be open even if the person wear mask and normal temperature.

In the second phase,we are going to interface MLX90614 to raspberry pi,First, we'll download the library and packages needed to successfully interface the MLX90614 with the Raspberry Pi.If the connections and installation are right, we can use the command i2cdetect -y 1 to see if we get the sensor address value on the I2C bus.Now we create new python file which contain simple program for temperature detection.If the temperature of person is less than 35 degree Celsius,then the person is allowing to the mall and doors will open.Count is incremented after person enters and displays on the screen.

In the Third phase,we make Automatic Hand Sanitizer.In the first step,Interfacing IR sensor with Raspberry PI and then with the relay motor.IR sensor is connected to the 29 pin of Raspberry Pi and Raspberry Pi read the signal from the IR sensor and trigger the relay motor when the given prefined condition is satisfied,then the relay response and DC motor rotates which dispenses the sanitizier.

At the end,one more IR sensor is placed at the exit of the mall/office.when the person leaves,then IR sensor triggers and count is decremented.

V. RESULTS AND DISCUSSION

Fig. 8 :Output of Face Mask and Temperature detector

The Proposed system is implemented and the perfromace of the system is observed ubder many cases.when the person is wearing mask and temperature of person is less than 35 degree Celsius then door will open and count is incremented after that when the person placed under the sanitizer pipe,the sanitizer is dispensed and when person exits,the count is decremented.

Fig. 9: Output of Sanitizer Dispenser

Body Temperature

Fig 10:Hardware Implementation Kit

VI. CONCLUSION

To summarize,this paper presents the prevention and control of COVID-19 outbreak.The prevention and control is analyzed based on the prediction of face mask and body temperature of the customer.In addition to that,on the basis of controlling the COVID-19 outbreak of population turnover,proper occupancy is controlled by our proposed system.Finally, we developed a perfect system for building access control and monitoring.The studying and controlling of COVID-19 is meaningful topic for protecting health and lives of many people.So,proposed system can save many lives and controls the rapid spread of virus.

Acknowledgment

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