

IOT BASED COVID-19 FOR AUTOMATION

Submitted in partial fulfilment of the requirements for the award of
Bachelor of Technology degree in Biomedical Engineering

By

RIDDHITA THAKUR(39240032)



**DEPARTMENT OF BIOMEDICAL ENGINEERING
SCHOOL OF BIO AND CHEMICAL ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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APRIL -2023



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DEPARTMENT OF BIOMEDICAL ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project report is the bonafide work of **RIDDHITA THAKUR** who carried out the reports entitled "**IOT BASEDCOVID-19 FOR AUTOMATION**" under my supervision from Jan to April 2023.

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12/4/2023

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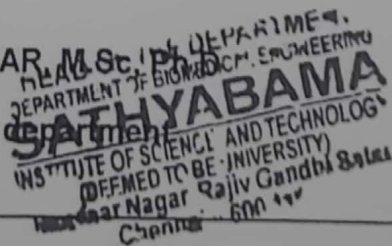
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Submitted for Viva voce Examination held on 18th April 2022

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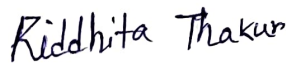
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External Examiner

DECLARATION

I, **RIDDHITA THAKUR(39240032)** , hereby declare that the Project Report entitled “**IOT based Covid- 19 for automation**” done by us under the guidance of (Internal) is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in B.Tech Biomedical Engineering.

1.Riddhita Thakur



SIGNATURE OF THE CANDIDATES

DATE:18.04.2000

PLACE: CHENNAI

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I extend my thanks to my family members for their unconditional love, belief and care.

ABSTRACT

According to data obtained by the World Health Organization, the global pandemic of COVID-19 has severely impacted the world and has now infected more than eight million people worldwide. The rise of COVID-19 pandemic has had a lasting impact in many countries worldwide since 2019. Face-mask detection had been significant progress in the Image processing and deep learning fields studies. Many face detection models have been designed using different algorithms and techniques. The proposed approach in this project is developed to avoid mask-less people from entering the desired places (i.e., Mall, University, Office, ...etc.) by detecting face-mask using deeplearning, TensorFlow, Keras, and OpenCV and sending a signal to Arduino device that connected to the sensors and counts the peoples while entering and exiting. This helpsto maintain the social distancing inside those places and limit the Total number of persons. If the total number of people count increased, the Arduino microcontroller willgive the buzzer alarm to notify the person. In This project, we detect the faces in real- time and identifies whether the person wears a mask or not.

KEYWORDS—

Deep Learning, Sensors, Computer Vision, Convolutional Neural Networks (CNNs), public Safety, face mask detection, OpenCV, COVID-19.

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CHAPTER – 1

INTRODUCTION

We are in a world of digital transformation. In every aspect technology is one common thing people depend upon. If we look back in the 1970s, people used to count visitor manually by counting them or they used a manual tally counter. But today we can see that many methods have been introduced to count people without the need of any human presence. The sensors and cameras will simplify our job counting the people. We just need to program them to perform the required task.

The primary method of counting visitors include hiring people to stand and manually count the number of guests or workers who enter or exit from the venue or location. Even the tally counters are not user friendly and don't have many advantages.

Therefore, these methods prove to be unreliable and come at a great cost.

The demand for the electronic device which can control the room appliances has a great surge such that it can be implemented in many real time applications like in hotels, living room, garage and so on. The model can track the number of persons entering and leaving the room and also switches the lights and fans on and off if the room is engaged or vacant respectively. By employing this device in the room reduces the laborious works to search for the switch to light the room at once you entered. The persons entering the room through the entrance will be sensed by the Infrared Sensors (shortly IR sensors) and the signal sensed is sent to the Arduino UNO for processing and controlling the count in the room and also explicitly monitor the lights and fan in the room.

CHAPTER - 2

LITERATURE SURVEY

1. **Mustafa Musa Jaber, Thamer Alameri , Mohammed Hasan Ali , Adi Alsyouf , Mohammad Al-Bsheish , Badr K. Aldhmadi , Sarah Yahya Ali , Sura Khalil Abd , Saif Mohammed Ali ,Waleed Albaker and Mu'taman Jarrar –**

Today, COVID-19-patient health monitoring and management are major public health challenges for technologies. This research monitored COVID-19 patients by using the Internet of Things. IoT-based collected real-time GPS helps alert the patient automatically to reduce risk factors. Wearable IoT devices are attached to the human body, interconnected with edge nodes, to investigate data for making health-condition decisions. This system uses the wearable IoT sensor, cloud, and

web layers to explore the patient's health condition remotely. Every layer has specific functionality in the COVID-19 symptoms' monitoring process. The first layer collects the patient health information, which is transferred to the second layer that stores that data in the cloud. The network examines health data and alerts the patients, thus helping users take immediate actions. Finally, the web layer notifies family members to take appropriate steps. This optimized deep-learning model allows for the management and monitoring for further analysis.

2. **Dhruv R. Seshadri , Evan V. Davies , Ethan R. Harlow, Jeffrey J. Hsu, Shanina C. Knighton, Timothy A. Walker , James E. Voos and Colin K. Drummond –**

The COVID-19 pandemic has brought into sharp focus the need to harness and leverage our digital infrastructure for remote patient monitoring. As current viral tests and vaccines are slow to emerge, we see a need for more robust disease detection and monitoring of individual and population health, which could be aided by wearable sensors. While the utility of this technology has been used to correlate physiological metrics to daily living and human performance, the translation of such technology toward predicting the incidence of COVID-19 remains a necessity. When used in

conjunction with predictive platforms, users of wearable devices could be alerted when changes in their metrics match those associated with COVID-19. Anonymous data localized to regions such as neighbourhoods or zip codes could provide public health officials and researchers a valuable tool to track and mitigate the spread of the virus, particularly during a second wave. Identifiable data, for example remote monitoring of cohorts (family, businesses, and facilities) associated with individuals diagnosed with COVID-19, can provide valuable data. such as acceleration of transmission and symptom onset. This manuscript describes clinically relevant physiological metrics which can be measured from commercial devices today and highlights their role in tracking the health, stability, and recovery of COVID-19+ individuals and front-line workers. Our goal disseminating from this paper is to initiate a call to action among front-line workers and engineers toward developing digital health platforms for monitoring and managing this pandemic.

3. XINQI FAN , MINGJIE JIANG, AND HONG YAN , (Fellow, IEEE)- Coronavirus disease 2019 has seriously affected the world. One major protective measure for individuals is to wear masks in public areas. Several regions applied a compulsory mask-wearing rule in public areas to prevent transmission of the virus. Few research studies have examined automatic face mask detection based on image analysis. In this paper, we propose a deep learning based single-shot light-weight face mask detector to meet the low computational requirements for embedded systems, as well as achieve high performance. To cope with the low feature extraction capability caused by the light-weight model, we propose two novel methods to enhance the model's feature extraction process. First, to extract rich context information and focus on crucial face mask related regions, we propose a novel residual context attention module. Second, to learn more discriminating features for faces with and without masks, we introduce a novel auxiliary task using synthesized Gaussian heat map regression. Ablation studies show that these methods can considerably boost the feature extraction ability and thus increase the face mask detection performance. Comparison with other models shows that the proposed model achieves state-of-the-art results on two public datasets, the AIZOO and Moxa3K face mask datasets. In particular, compared with

another light-weight you only look once version 3 tiny model, the mean average precision of our model is 1:7% higher on the AIZOO dataset, and 10:47% higher on the Moxa3K dataset. Therefore, the proposed model has a high potential to contribute to public health care and get against the coronavirus disease 2019 pandemic.

4. Manuel Martinez , Kailun Yang , Angela Constantinescu and Rainer Stiefelhagen –

The current COVID-19 pandemic is having a major impact on our daily lives. Social distancing is one of the measures that has been implemented with the aim of slowing the spread of the disease, but it is difficult for blind people to comply with this. In this paper, we present a system that helps blind people to maintain physical distance to other persons using a combination of RGB and depth cameras. We use a real-time semantic segmentation algorithm on the RGB camera to detect where

persons are and use the depth camera to assess the distance to them; then, we provide audio feedback through bone-conducting headphones if a person is closer than 1.5 m. Our system warns the user only if persons are nearby but does not react to non-person objects such as walls, trees or doors; thus, it is not intrusive, and it is possible to use it in combination with other assistive devices. We have tested our prototype system on one blind and four blindfolded persons, and found that the system is precise, easy to use, and amounts to low cognitive load.

5. Nidal Nasser ,Qazi Emad-ul-Haq, Muhammad Imran, Asmaa Ali , Imran Razzak ,Abdulaziz Al-Helali1-

Coronavirus (COVID-19) is a very contagious infection that has drawn the world's attention. Modelling such diseases can be extremely valuable in predicting their effects. Although classic statistical modelling may provide adequate models, it may also fail to understand the data's intricacy. An automatic COVID-19 detection system based on computed tomography (CT) scan or X-ray images is effective, but a robust system design is challenging. In this study, we propose an intelligent healthcare system that integrates IoT-cloud technologies. This architecture uses smart connectivity sensors and deep learning (DL) for intelligent decision-making from the perspective of the smart city. The intelligent system tracks the status

of patients in real time and delivers reliable, timely, and high-quality healthcare facilities at a low cost. COVID-19 detection experiments are performed using DL to test the viability of the proposed system. We use a sensor for recording, transferring, and tracking healthcare data. CT scan images from patients are sent to the cloud by IoT sensors, where the cognitive module is stored. The system decides the patient status by examining the images of the CT scan. The DL

cognitive module makes the real-time decision on the possible course of action. When information is conveyed to a cognitive module, we use a state-of-the-art classification algorithm based on DL, i.e., ResNet50, to detect and classify

whether the patients are normal or infected by COVID-19. We validate the proposed system's robustness and effectiveness using two benchmark publicly available datasets (Covid-Chestxray dataset and Chex-Pert dataset). At first, a dataset of 6000 images is prepared from the above two datasets. The proposed system was trained on the collection of images from 80% of the datasets and tested with 20% of the data. Cross-validation is performed using a tenfold cross-validation

technique for performance evaluation. The results indicate that the proposed system gives an accuracy of 98.6%, a sensitivity of 97.3%, a specificity of 98.2%, and an F1-score of 97.87%. Results clearly show that the accuracy, specificity,

sensitivity, and F1-score of our proposed method are high. The comparison shows that the proposed system performs better than the existing state-of-the-art systems. The proposed system will be helpful in medical diagnosis research and healthcare systems. It will also support the medical experts for COVID-19 screening and lead to a precious second opinion.

6. Ziwei Song , Kristie Nguyen , Tien Nguyen , Catherine Cho and Jerry Gao

—

According to the World Health Organization (WHO), wearing a face mask is one of the most effective protections from airborne infectious diseases such as COVID-19. Since the spread of COVID-19, infected countries have been enforcing strict mask regulation for indoor businesses and public spaces. While wearing a mask is a requirement, the position and type of the mask should also be considered in order to increase the effectiveness of face masks, especially at specific public locations.

However, this makes it difficult for conventional facial recognition technology to identify individuals for security checks. To solve this problem, the Spartan Face Detection and Facial Recognition System with stacking ensemble deep learning algorithms is proposed to cover four major issues: Mask Detection, Mask Type Classification, Mask Position Classification and Identity Recognition. CNN, AlexNet, VGG16, and Facial Recognition Pipeline with FaceNet are the Deep Learning algorithms used to classify the features in each scenario. This system is powered by five components including training platform, server, supporting frameworks, hardware, and user interface. Complete unit tests, use cases, and results analytics are used to evaluate and monitor the performance of the system.

The system provides cost-efficient face detection and facial recognition with mask solutions for enterprises and schools that can be easily applied on edge-devices.

7. Anjali K, Reshmi Anand, Sraddha D Prabhu, Geethu R.S.-

There is a rapid increase in the spread of the CovidVirus. This has resulted in serious health issues among people. There is a dire need for a proper system to detect COVID symptoms and Alert Officials. The proposed solution is an IoT based multiple Health Monitoring System to detect symptoms of COVID and alert officials. It consists of a contactless temperature sensor, Oximeter, Automatic Hand Sanitizer, Camera module, Room Occupancy limiter and a Social Distancing module. It is a contactless method for patient evaluation. The Internet of Things enables devices to connect to the internet and communicate with each other. Data from these IoT-connected devices will help to identify the scenario and take necessary action. Contactless Temperature Sensor, Oximeter, and Heartbeat rate sensors are used to measure temperature, Oxygen level, and Heart rate respectively. NodeMCU reads sensor values, ESP32 camera module capture picture, and stores for future reference. The sensors measure the data. Normal temperature reading is from 97°F to 99°F and normal SpO2 reading is at least 95% [1]. If the measured value crosses the normal value, those details are immediately sent to health workers with a picture of the individual. The proposed solution also consists of a module to maintain Social Distancing and also an automatic Hand Sanitizing module. As the entire setup is automated, it reduces time and labour and also ensures satisfactory results.

8. Mullapudi Chaitanya Krishna¹ Student, Electronics and Communication Engineering, Vellore Institute of Technology, Vellore, Tamil Nadu, India-

Automated counter system is an efficient solution for counting the number of people entering or leaving a room. This paper attempts to provide a unique solution which can automatically count the number of people. It intelligently discovers and counts the number of people with the help of internal code from the Arduino UNO. This has been achieved by using an Infrared sensor, piezoelectric sensors and the development board Arduino UNO. Two Infrared sensors are placed at entry and exit of a room. A series of piezoelectric sensors are placed under a mat between the two infrared sensors. The sensors acquire the data and send to the Arduino which maintains the count. The system requires low voltage and minimum maintenance to continue the operation.

9. Khushbu Pandey, Reshma Lilani, Pooja Naik, Geeta Polz Electronics & Telecommunication Engineering Department, KCCEMSR, Thane, India-

Image compression is a relatively recent technique based on the representation of an image by a contractive transform, on the space of images, for which the fixed point is close to the original image. The aim is to discover which techniques are the most efficient and best apply to the project undertaken. It is a computer application for automatically identifying or verifying a person from digital image or a video frame from a video source. This paper presents a real-time image processing of human face identification for home service robot (HSR). This vision system is set up by two individual sub-systems. The first one is face detection and tracking subsystem based on adaptive skin detector, condensation filter with parallel computing particles, and Haar-like classifier. And a simple and fast motion predictor is also proposed for face tracking.

10. Wei Jiang , Sumit Majumder , Graduate Student Member, IEEE, Samarth Kumar, Sophini Subramaniam , Xiaohe Li, Ridha Khedri , Tapas Mondal Mansour Abolghasemian , mran Satia , and M. Jamal Deen , Fellow, IEEE –

Severe acute respiratory syndrome coronavirus (SARS-CoV-2) has caused a pandemic since early 2020. The coronavirus disease 2019 (COVID-19) has already

caused more than three million deaths worldwide and affected people's physical and mental health. COVID-19 patients with mild symptoms are generally required to self-isolate and monitor for symptoms at least for 14 days in the case the disease turns towards severe complications. In this work, we overviewed the impact of COVID-19 on the patients' general health with a focus on their cardiovascular, respiratory and mental health, and investigated several existing patient monitoring systems. We addressed the limitations of these systems and proposed a wearable telehealth solution for monitoring a set of physiological parameters that are critical for COVID-19 patients such as body temperature, heart rate, heart rate variability, blood oxygen saturation, respiratory rate, blood pressure, and cough. This physiological information can be further combined to potentially estimate the lung function using artificial intelligence (AI) and sensor fusion techniques. The prototype, which includes the hardware and a smartphone app, showed promising results with performance comparable to or better than similar commercial devices, thus potentially making the proposed system an ideal wearable solution or long-term monitoring of COVID-19 patients and other chronic diseases.

Index Terms—COVID-19, SARS-CoV-2, vital signs, wearable monitoring system, telehealth, e-health, chronic diseases, public health, body temperature, heart rate, HRV, SpO₂, respiratory rate, blood pressure, cough, Electrocardiogram, ECG, Photoplethysmography, PPG, lung function.

CHAPTER – 3

AIM AND SCOPE

3.1 AIM—

The Main aim of this project, to detect the faces in real-time and identifies whether the person wears a mask or not.

3.2 SCOPE –

- Can used in Airport's , Hospital's and Hotels .
- Can detect covid

3.3 OBJECTIVE—

According to data obtained by the World Health Organization, the global pandemic of COVID-19 has severely impacted the world and has now infected more than eight million people worldwide

CHAPTER – 4

MATERIALS AND METHOD

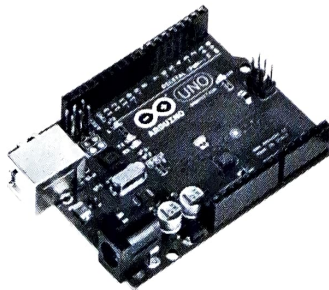
The approach of this project is to make use of internet and use all appliances in the best way possible. I tried to make use of a device for sensing which will make human efforts less. The demand for the electronic device which can control the room appliances has a great surge such that it can be implemented in many real time applications like in hotels, living room, garage and so on. The model can track the number of persons entering and leaving the room and also switches the lights and fans on and off if the room is engaged or vacant respectively. By employing this device in the room reduces the laborious works to search for the switch to light the room at once you entered. The persons entering the room through the entrance will be sensed by the Infrared Sensors (shortly IR sensors) and the signal sensed is sent to the Arduino UNO for processing and controlling the count in the room and also explicitly monitors the lights.

And hardware here used is for making appliances work perfectly. Approach of this is to the system mainly uses Arduino UNO board for the process of monitoring, Relay for the process of external switching of the circuit, LCD Display board to display the person in the room and finally the IR Sensors. The lists of the components-

4.1 HARDWARE USED -

A. Arduino UNO:-

Arduino UNO is an interactive board which receives various signals as input, it operates different operations based on the signal given to Arduino UNO. It has 13 digital pins and 6 analogue pins. A typical Arduino UNO is given in the figure



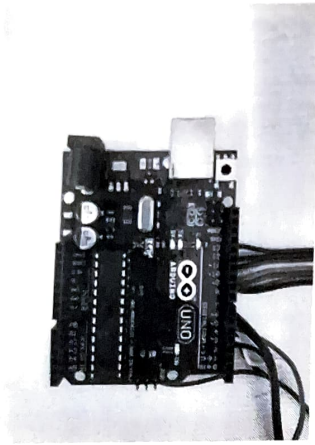


Fig. 1 Arduino UNO

Digital pins are connected to the digital output and the analogue pins are used to get basic input signals. It has a 32kb of flash memory to store the program *that is coded for the operation*. It is connected to the system using a B-type cable. The software used to code is Arduino UNO 1.8.8 as the latest version.

B. LCD – display board:-

Liquid Crystal Display board of dimension 16x2 where it can display of 32 characters in two lines each of 16 characters. It has 16 external holes for connections as shown in the figure 2. These output holes can be connected to the bread board with the help of male to male breakable pins. It seeks a voltage of 5V from the source provided to the Arduino UNO board. It has three ground connections.



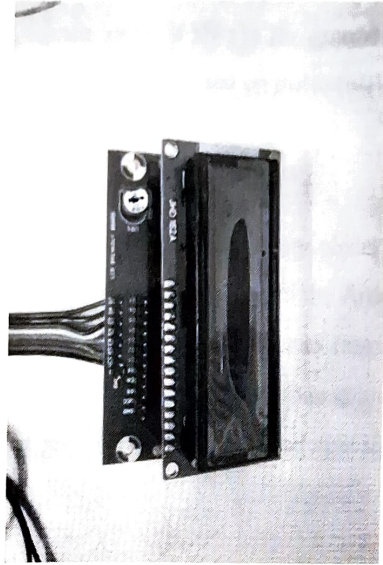


Fig 2.LCD Display board

C. 5v – relay module:-

Relay module is a magnetically operated switch which closes the external circuit based on signal received from the Arduino UNO board. The relay seeks voltage from the source to induce a magnetic field which attracts a metal strip and closes the external circuit; at once it receives the positive signal from the Arduino UNO.

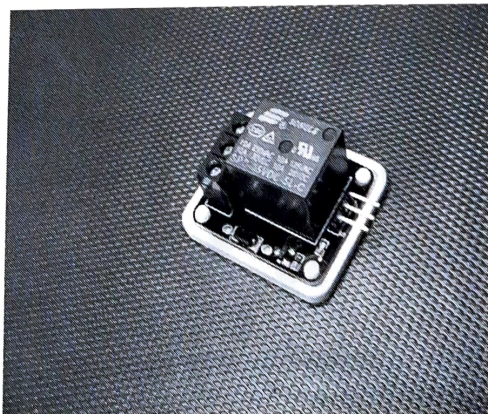


Fig.3 Relay Module

There are three external pins available in the relay module to connect to the external circuit as given in the figure 3. The middle point is always the ground, the positive line of the external circuit can be to the either of the two pins based on the normally open and normally closed.

D. Infrared sensors:-

Obstacle detection sensor generates a signal when any object encounters it. It has transmitter and receiver at its end. They send analogue signals to the Arduino UNO for processing. It has two extrapolation facing outwards they are receiver and transmitter as shown in the figure 4. Black coloured knob is the transmitter whereas the white coloured is receiver. It has three pins to get connected they are for ground, Vcc and sending output signal.

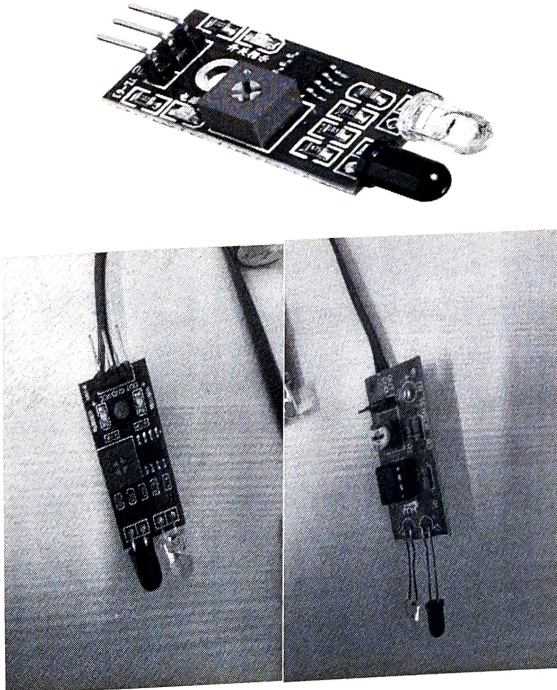


Fig.4 Infrared Sensors

E. Power source:-

Power source for the working of Arduino UNO can be given through the 9V DC battery with the help of power cord whereas the alternative one is the connection of Arduino UNO to the laptop using B type cable. During developing stages it will be easier to connect with B type cable, but as an end product it is advised to use DC battery.

It requires a maximum of 5V, in the real time model the power can be given from the AC socket by transforming it to pulsating DC and rectifying to DC.

F. Potentiometer: -

It is the device which is used to provide variable resistance to the circuit. In the LCD board, the third pin is facilitated for contrast adjustment by providing the necessary resistance to it along with the input voltage. It has three external pins to get connected to the circuit, one pin to the resistor terminal and other two pins are connected to both ground and VCC.

4.2.SFTWARE REQUIREMENTS—

Arduino IDE

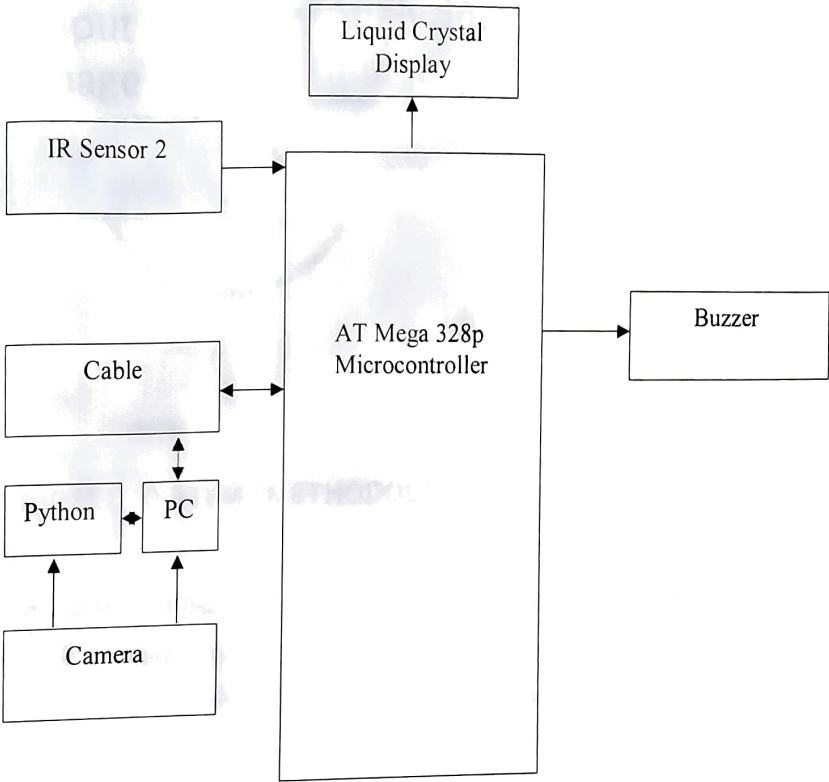
Python IDLE

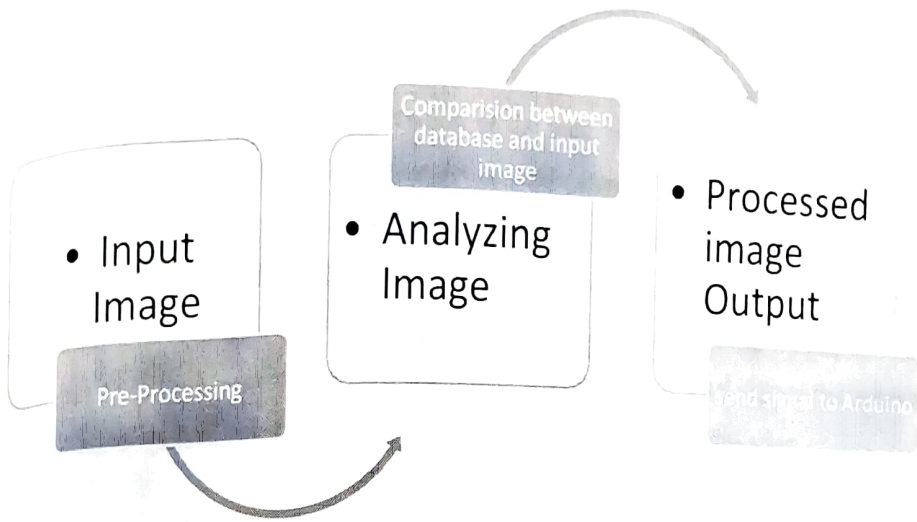
Programming Language—

Embedded 'C'

Python

4.3.BLOCK DIAGRAM —





4.4.PROPOSED SYSTEM / METHODOLOGY—

In Proposed System, it has now been proved that not wearing a mask will not only affect our health but will also affect others health if they come in close contact with us and as per World Health Organization and Indian Govt Laws to protect others and ourselves this proposed model will use the camera to monitor if people are wearing a mask or not. This method is been designed by Python that is connected by a USB to an Arduino UNO microcontroller. It requires to have PySerial, which is a Python API module uses for reading and writing serial data from Arduino or any other Microcontroller.

4.5.METHODOLOGY-

In one embodiment is a method of providing postural feed back comprising: receiving by a microprocessor at repeated intervals data from a tri-axial accelerometer, the microprocessor and the tri-axial accelerometer comprising a sensor device attached to a user, the sensor device further comprising memory, an actuator, and a power

Source; normalizing by the microprocessor the received accelerometer data; determining by the microprocessor a postural description of the user based on the normalized received accelerometer data; and triggering by the microprocessor the actuator to output sensory feedback based on the postural description of the user. In another embodiment is a postural feedback apparatus comprising: a sensor device configured to be attached on a user, the sensor device comprising: a tri-axial accelerometer; an actuator, and a microprocessor configured to receive data from the tri-axial accelerometer about movement of the user; normalize the received accelerometer data; determine a postural description of the user based on the normalized received accelerometer data; and trigger the actuator to output sensory feedback based on the postural description of the user.

A. Search Strategy-

For selecting the primary articles, the major databases such as IEEE Xplore, SpringerLink, ACM digital library, Science Direct, and Google Scholar were searched for related articles. The articles were searched using several keywords related to

‘COVID-19’ (e.g. ‘CoV2’ or ‘Coronavirus’ or ‘COVID-19’) and keywords related to the machine learning, artificial intelligence and deep learning, for example, (‘Machine learning’ and ‘CoV2’ or ‘Coronavirus’ or ‘COVID-19’), (‘Artificial intelligence’ and ‘CoV2’ or ‘coronavirus’ or ‘COVID-19’), (‘Deep learning’ and ‘CoV2’ OR ‘coronavirus’ or ‘COVID-19’), (‘Machine learning’ and ‘influenza’ and ‘CoV2’ or ‘Coronavirus’ or ‘COVID-19’), (‘Artificial Intelligence’ and ‘influenza’ and ‘CoV2’ or ‘coronavirus’ or ‘COVID-19’), (‘Artificial intelligence’ and ‘lockdown’ and ‘pandemic’ and ‘CoV2’ or ‘coronavirus’ or ‘COVID-19’), (‘Machine learning’ and ‘lockdown’ and ‘pandemic’ and ‘CoV2’ or ‘coronavirus’ or ‘COVID-19’).

B. Inclusion and Exclusion Criteria-

The criteria for selecting an article were as follows: (a) The article is written in English, and (b) the article adopts, develops, or proposes AI and ML techniques, algorithms, systems, methods, or applications to fight the COVID-19 pandemic. In addition, we used the following exclusion criteria: (a) duplicate articles that are found through several scholarly databases; (b) articles that are not focused on our research

objectives; (c) articles that are not written in English; and (d) earlier versions of any article that has been published on the same set of data exploring the same objective.

C. Study Selection-

The search results comprised 913 articles from the stated databases. The Prisma flowchart in shows the article selection process in different phases following the exclusion inclusion criteria. From 913 articles, the study selection process was *initiated by removing duplicated articles, and a total of 619 were excluded during the first round of screening. Next, articles written in English were screened based on their abstract, and in some cases the introduction, to assess their compatibility with the inclusion criteria.*

D. Data Extraction -

Data extraction was conducted to explore different AI and ML techniques, algorithms, and systems and their implications for fighting the COVID-19 pandemic. Thus, the selected articles were read meticulously to collect and extract research data and construct the review article. The entire research process was supervised and monitored by two senior researchers with expertise in AI, ML, and health informatics to ensure the reliability and quality of this review article.

CHAPTER – 5

RESULTS

It is tested and experimented with a model, where the working is based on the IR sensor in the following cases:

A. Case (i):

The room appliances are in off state, if there is nobody in the room which implies that energy is getting conserved instead of wasting the fig.5 gives a pictorial representation of the circuit connection and the external appearance with the LCD display.

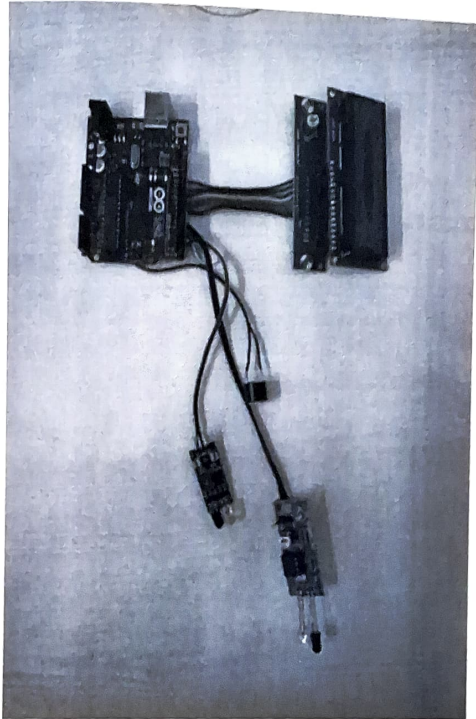


Fig.5 Circuit diagram

B. Case (ii):

The room appliances are switched on as the person enters the room. The pictorial representation is given and the circuit connection is shown in the figure 5 .

C. Case (iii):

The room appliances remains switched on even when the person count increases in the room.

CHAPTER – 6

SUMMARY AND CONCLUSION

From study of reference papers we came into a conclusion for making a very efficient and compact device that can detect people count and mask detection. The vision system is setup by individual subsystems face detection tracking subsystem based on adaptive skin detector, and a simple and fast motion predictor is composed for face tracking. The second is the face recognition system based on algorithms such as PCA and recognition procedures. It is robust and efficient to recognise many people on line in different views and unknown scene.

REFERENCE

- 1) Worldometer, "COVID-19 Coronavirus Pandemic," 2020, last accessed 20-Oct-2020.
- 2) W. H. Organization, "WHO Director-General's Opening Remarks At the Media Briefing on COVID-19-11 march 2020," 2020, last accessed 20-Sep-2020.
- 3) S. Russell and P. Norwig, "Artificial intelligence: A modern approach," *Neurocomputing*, vol. 9, no. 2, pp. 215–218, 1995, control and Robotics, Part II.
- 4) A. S. Ahuja, "The impact of artificial intelligence in medicine on the future role of the physician," *PeerJ*, vol. 7, pp. 1–2, Oct. 2019.
- 5) R. A. Miller, "Medical diagnostic decision support systems-past, present, and future: A threaded bibliography and brief commentary," *J. Amer. Med. Informat. Assoc.*, vol. 1, no. 1, pp. 8–27, Jan. 1994.
- 6) H. S. Maghdid, K. Z. Ghafoor, A. S. Sadiq, K. Curran, D. B. Rawat, and K. Rabie, "A Novel Ai-Enabled Framework to Diagnose Coronavirus COVID 19 Using Smartphone Embedded Sensors: Design Study," 2020, pre print on arXiv at <https://arxiv.org/abs/2003.07434>
- 7) I. D. Apostolopoulos and T. A. Mpesiana, "COVID-19: Automatic detection from x-ray images utilizing transfer learning with convolutional neural networks," *Phys. and Eng. Sci. in Med.*, vol. 43, pp. 635–640, Jul. 2020.
- 8) A. Narin, C. Kaya, and Z. Pamuk, "Automatic Detection of Coronavirus Disease (covid-19) Using X-Ray Images and Deep Convolutional Neural Networks," 2020, pre print on arXiv at <https://arxiv.org/abs/2003.10849>
- 9) U. Ozkaya, S. Ozturk, and M. Barstugan, "Coronavirus (covid-19) Classification Using Deep Features Fusion and Ranking Technique," 2020.
- 10) A. I. Khan, J. L. Shah, and M. M. Bhat, "CoroNet: A deep neural network for detection and diagnosis of COVID-19 from chest x-ray images," *Comput. Methods Programs in Biomed.*, vol. 196, pp. 1–2, 2020.

APPENDIXES -

FACE MASK PROGRAM -

```
# import the necessary packages
from tensorflow.keras.applications.mobilenet_v2 import preprocess_input
from tensorflow.keras.preprocessing.image import img_to_array
from tensorflow.keras.models import load_model
from imutils.video import VideoStream
import numpy as np
import argparse
import imutils
import time
import cv2
import os
```

```
def detect_and_predict_mask(frame, faceNet, maskNet):
    # grab the dimensions of the frame and then construct a blob
    # from it
    (h, w) = frame.shape[:2]
    blob = cv2.dnn.blobFromImage(frame, 1.0, (300, 300),
                                  (104.0, 177.0, 123.0))

    # pass the blob through the network and obtain the face detections
    faceNet.setInput(blob)
    detections = faceNet.forward()

    # initialize our list of faces, their corresponding locations,
    # and the list of predictions from our face mask network
    faces = []
    locs = []
    preds = []
```

```

# loop over the detections
for i in range(0, detections.shape[2]):
    # extract the confidence (i.e., probability) associated with
    # the detection
    confidence = detections[0, 0, i, 2]

    # filter out weak detections by ensuring the confidence is
    # greater than the minimum confidence
    if confidence > args["confidence"]:
        # compute the (x, y)-coordinates of the bounding box for
        # the object
        box = detections[0, 0, i, 3:7] * np.array([w, h, w, h])
        (startX, startY, endX, endY) = box.astype("int")

        # ensure the bounding boxes fall within the dimensions of
        # the frame
        (startX, startY) = (max(0, startX), max(0, startY))
        (endX, endY) = (min(w - 1, endX), min(h - 1, endY))

        # extract the face ROI, convert it from BGR to RGB channel
        # ordering, resize it to 224x224, and preprocess it
        face = frame[startY:endY, startX:endX]
        face = cv2.cvtColor(face, cv2.COLOR_BGR2RGB)
        face = cv2.resize(face, (224, 224))
        face = img_to_array(face)
        face = preprocess_input(face)

        # add the face and bounding boxes to their respective
        # lists
        faces.append(face)
        locs.append((startX, startY, endX, endY))

# only make a predictions if at least one face was detected
if len(faces) > 0:

```

```
# for faster inference we'll make batch predictions on *all*  
# faces at the same time rather than one-by-one predictions  
# in the above `for` loop
```

```
faces = np.array(faces, dtype="float32")  
preds = maskNet.predict(faces, batch_size=32)
```

```
# return a 2-tuple of the face locations and their corresponding  
# locations  
return (locs, preds)
```

```
# construct the argument parser and parse the arguments
```

```
ap = argparse.ArgumentParser()
```

```
ap.add_argument("-f", "--face", type=str,  
                default="Datasets",  
                help="path to face detector model directory")
```

```
ap.add_argument("-m", "--model", type=str,  
                default="Datasets/mask_detector.model",  
                help="path to trained face mask detector model")
```

```
ap.add_argument("-c", "--confidence", type=float, default=0.5,  
                help="minimum probability to filter weak detections")
```

```
args = vars(ap.parse_args())
```

```
# load our serialized face detector model from disk
```

```
print("[INFO] loading face detector model...")
```

```
prototxtPath = os.path.sep.join([args["face"], "deploy.prototxt"])
```

```
weightsPath = os.path.sep.join([args["face"],  
                                "res10_300x300_ssd_iter_140000.caffemodel"])
```

```
faceNet = cv2.dnn.readNet(prototxtPath, weightsPath)
```

```
# load the face mask detector model from disk
```

```
print("[INFO] loading face mask detector model...")
```

```
maskNet = load_model(args["model"])
```

```
# initialize the video stream and allow the camera sensor to warm up
```

```
print("[INFO] starting video stream...")
vs = VideoStream(src=0).start()
```

```
# loop over the frames from the video stream
```

```
while True:
```

```
    # grab the frame from the threaded video stream and resize it
```

```
    # to have a maximum width of 400 pixels
```

```
    frame = vs.read()
```

```
    frame = imutils.resize(frame, width=400)
```

```
    cv2.imshow("Live", frame)
```

```
    # detect faces in the frame and determine if they are wearing a
```

```
    # face mask or not
```

```
    (locs, preds) = detect_and_predict_mask(frame, faceNet, maskNet)
```

```
    # loop over the detected face locations and their corresponding
```

```
    # locations
```

```
    for (box, pred) in zip(locs, preds):
```

```
        # unpack the bounding box and predictions
```

```
        (startX, startY, endX, endY) = box
```

```
        cv2.rectangle(frame, (startX, startY), (endX, endY), (0,255,0), 2)
```

```
    # show the output frame
```

```
    cv2.imshow("Live", frame)
```

```
    key = cv2.waitKey(30) & 0xFF
```

```
    # if the `q` key was pressed, break from the loop
```

```
    if key == ord("q"):
```

```
        break
```

```
# do a bit of cleanup
```

```
cv2.destroyAllWindows()
```

vs.stop()

PEOPLE COUNT -

```
#include<LiquidCrystal.h>
```

```
LiquidCrystal lcd( 12, 11, 10, 9, 8,7);
```

```
#define splash splash1
```

```
#define ir1 6
```

```
#define ir2 5
```

```
#define buz 2
```

```
#define buz_ 3
```

```
int ir1_r, ir2_r, ir1_Stat, ir2_Stat;
```

```
int max_allowed = 5;
```

```
float rst, setDisp = 3;
```

```
int per_tot_Status;
```

```
void setup()
```

```
{
```

```
  Serial.begin(115200);
```

```
  pinMode(ir1, INPUT);
```

```
  pinMode(ir2, INPUT);
```

```
pinMode(buz, OUTPUT);  
pinMode(buz_, OUTPUT);
```

```
digitalWrite(buz, LOW);  
digitalWrite(buz_, LOW);  
LcDSet();
```

```
Serial.println("Ready");
```

```
}
```

```
void LcDSet() {
```

```
  lcd.begin(16, 2);
```

```
  splash(0, "Covid Safe");
```

```
  splash(1, "Room");
```

```
  delay(2000);
```

```
  lcd.clear();
```

```
}
```

```
void loop()
```

```
{
```

```
  getSensorOUT();
```

```
  getSensorIN();
```

```
  set_Disp(3);
```

```
}
```

```
void showDisplay() {
```

```
  lcd.setCursor(0, 0);
```

```
  lcd.print("Person No's:  ");
```

```
  lcd.setCursor(13, 0);
```

```
  lcd.print(per_tot_Status);
```

```
}
```

```
void getSensorIN() {
```

```
  ir1_r = digitalRead(ir1);
```

```
  ir2_r = digitalRead(ir2);
```

```
  if (ir1_r == 0 and ir1_Stat == 0) {
```

```
    per_tot_Status++;
```

```
    ir1_Stat = 1;
```

```
  }
```

```
  else if (ir1_r == 1 and ir1_Stat == 1) {
```

```
    ir1_Stat = 0;
```

```
    splash(1, "");
```

```
    Serial.println("RST");
```

```
  }
```

```
  if (per_tot_Status > max_allowed) {
```

```

    per_tot_Status = max_allowed;
    // splash(0, "Not");
    splash(1, "Not-Allowed");
    Serial.println("Maximum Allowed No of Person's Already Present in the Room \nVisit Later
    \nThank You!!!");
    digitalWrite(buz, HIGH);
    delay(50);
    digitalWrite(buz, LOW);
    delay(70);
    digitalWrite(buz, HIGH);
    delay(50);
    digitalWrite(buz, LOW);
    delay(70);

}

if (per_tot_Status < 0) {

    per_tot_Status = 0;

}

}

void getSensorOUT() {

    ir1_r = digitalRead(ir1);
    ir2_r = digitalRead(ir2);

    if (ir2_r == 0 and ir2_Stat == 0) {

        per_tot_Status--;
        ir2_Stat = 1;

    }

```

```
else if (ir2_r == 1 and ir2_Stat == 1) {
```

```
    ir2_Stat = 0;
```

```
}
```

```
if (per_tot_Status > max_allowed) {
```

```
    per_tot_Status = max_allowed;
```

```
}
```

```
if (per_tot_Status < 0) {
```

```
    per_tot_Status = 0;
```

```
}
```

```
}
```

```
void set_Disp(float val) {
```

```
    setDisp += 0.1;
```

```
    if (setDisp >= val) {
```

```
        showDisplay();
```

```
        setDisp = 0;
```

```
    }
```

```
}
```