



IoT based COVID-19 Risk Mitigation System

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Abstract: The latest global epidemic, COVID-19 has it brought great change to the livelihoods of people of all backgrounds across the nation. This virus was recognized cause severe acute respiratory syndrome and is part of the coronavirus group, which involves SARS and the other known colds[1], [2]. As usual it is slow restored, it is also important that health and well-being of members is guaranteed. Instead of a biometric manual system, Face recognition can be used to mark the presence of members. Alternatively, an infrared contact sensor can be used monitoring individual body temperature. If the body the temperature exceeds the boundary value, they will not be allowed to enter the building or college premises, otherwise, their presence in organization / institution will be considered. Also, an automatic hand sanitizer will be fit on the door to sanitize the person's hand when their temperature is being tested. An automated turnstile gate attached to the system which only opens when the individual's body temperature is normal and he/she is sanitized.

Index Terms - Internet of things, covid-19, pandemic, ultrasonic, IR, Automatic hand sanitize

I. INTRODUCTION

After one year since the first reported case of novel coronavirus which is a respiratory disease similar to flu caused by virus. which unlike other viruses had a global effect. The first ever reporting of the virus has seen in China, but later on it spread so quickly in other nations within few weeks. According to[3], until April 8th, 2021 total cases found were 133,823,756 and it took 2,904,016 lives worldwide. The most major and common symptoms of this virus were fever, sore throat, loss of taste, tiredness, body pain, nasal congestion and loss of smell[4]. In almost most of the cases, this virus is being transferred from one person to another via respiratory droplets and also, by surface contact for example touching the surface touched by a covid infected person. The incubation period of the virus varies greatly from person to person. It can be long depending upon the immune system of the individual and the environment he/she is being treated. But on the count, it is approx. 14days and when the case is extreme it is about 27-28 days[5]. Furthermore, even asymptomatic person can spread the virus which makes the situation more complex. The total COVID-19 cases reported so far, 44% are the asymptomatic ones[6]. However, cutting the spread of this virus, face masks and sanitizers have played a vital role. However, still the main problem is approved medications and a better vaccine. There are many safety measures taken by government to break the chain of this virus. Some of them were like wearing masks, maintaining social distancing, quarantining people who are infected, self-isolation, arguing people to travel as less as possible within and outside the country, lockdown, partial lockdown and cancellation of public events[7]. Despite now the pandemic seems to be a weaker now but the government is still applying the same rules over the most affected regions. In this paper, we are aiming to develop a automated and cost-effective IoT-based system which will help organizations and institutions to prevent the spread of the virus and respect COVID-19 safety rules and guidelines in order to reduce the disease to spread inside the premises. The main focus of the system is to prevent entry to people with COVID-19 symptoms like higher body temperature. This system will make sure the person enters only after his hands are sanitized and his or her body temperature is within permissible range.

II. LITERATURE REVIEW

The ongoing pandemic of the novel coronavirus or COVID-19, originating in one city of PLA(People's Republic of China) called Wuhan which is capital of Hubei, was declared a global pandemic on 11 March 2020 by WHO emergency committee.[8]. The pandemic has ongoing for over a year now and cases related to it is still rising rapidly which can be tracked in real time on the website of Johns Hopkins University[9] and other forums. This rise in cases have put most of the world under lockdown with distrust and despair growing by the day. So, there is an urgent need of advanced and innovative technology solution to fight this global crisis. Most of the pre-existing technologies and health care facilities have broken down. So, there is an immediate need incorporate the latest emerging technologies in the health care system. Developed countries like China, Japan, South Korea and USA and many other are already using new technologies like Artificial Intelligence, Cloud Computing, Blockchain, IoT and other to minimize the footprint of this pandemic on people's life and the economy[10]. Internet of Things or IoT denotes to the interconnectedness of ordinary objects with the internet. Using this technology everyday objects can be mad into smart devices which can communicate and share data with each other as well as the internet without having and human involvement[11]. Over the past year many have developed and test IoT-based solution to fight covid-19. Mohammed et al. [12] developed an infrared camera mounted helmet system which can detect and find an infected person from a crowd and then the current GPS location and an optical image captured using an optical camera will be send to the concerned authorities for further action. Li et al. [13] developed an IoT based early COVID-19 detection system which used data analytics on existing data such as questionnaires and other forms

of data to automatically generate a list of people classified in three categories confirmed, suspected and suspicious. Gil et al. [14] have tried to give a organized assessment of the diverse surveys done on IoT. To find the opportunities and challenges to get maximum out the IoT related data they reviewed current IoT approaches, technologies and models. In [15] an IoT based indoor safety system is proposed which contains a contactless temperature measuring system as well as mask detection system. However, there is no system for sanitizations. There are many Arduino based solution for the system detecting temperature. In [16] an Arduino based system was designed to measure real time temperature and was visualized using MATLAB but the sensor used do not all for a contactless measurement. In [17] another similar system to remotely measure temperature using Arduino and smartphone was presented. Our main goal through this project is to present a comprehensive solution to COVID-19 risk mitigation and develop an IoT-based affordable system.

III. Proposed Idea

The setup to check the early symptoms of the covid-19 virus of a particular individual will be fixed at the entrance of any organization of institution. When an individual will enter the organization premises, it will be mandatory for him/her to through the system. Only after the well-being of the individual is reported by the system then only, he/she is allowed to enter the organization premises and the same data will also be stored on a hard copy to avoid any risk of data loss.

If by any chance the individual is unwell the system will send an alert by a buzzing sound and the gates of the entrance door will not be opened for the individual. A distinctive feature of the planned model mendacities in the fact that it covers various aspects of good health and well-being of the individual entering in a respective organization. The COVID-19 detection system procedures work well in making sure that every person entering their way in the organization is perfectly well and it's the duty of the individual to make sure that they follow all the procedures of the system. Thus, implementing such type of system will ensure maximum safety can be provided to the individual working for the organization.

IV. Methodology

This innovative project can become a blueprint for the companies having large number of employee and very useful for other places for public gatherings like malls, theatres etc. This project has its advantage to check the body temperature contactless and disinfect the individual using sanitizers. This system can be very helpful for the current pandemic situation as well as future in chance of any other virus break. The proposed system contains a hand sanitizer dispenser, contactless temperature reader and an autonomous door. Hardware Required-

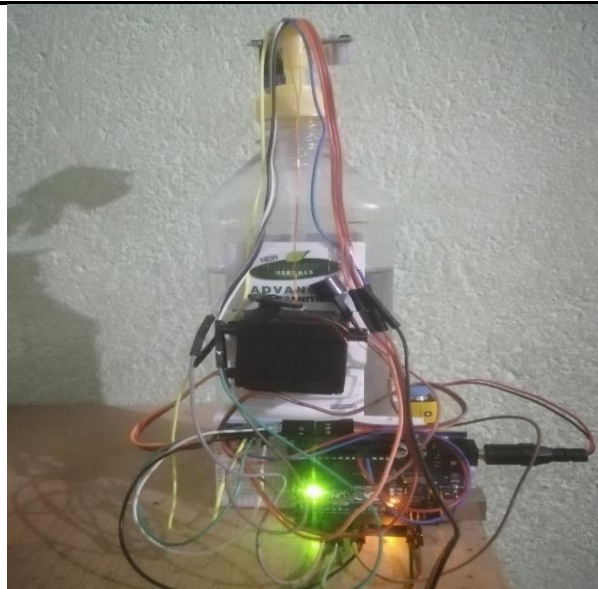
1. Contactless temperature sensor- The contactless body temperature sensor also known as MLX90614 is an infrared thermometer using for getting non-contact body temperatures. The sensor consists of two units. One is temperature sensing unit that detects the temperature and other processing unit. This unit is responsible for the conversion of the sensor value that is in 17-bit ADC format so as make it accessible through I2C communication protocol.[18].
2. Servo motors-A servo motor is a complete electrical device needed, which spins the components of a machine with high capability and with high accuracy. Servo motor is also called as control motor. They are reused in feedback control system. The shaft giving output of servo motor can rotate to a certain angle, and move to a defined location and velocity that a common motor will not able to do. Servo motors don't allow full rotation, it only allows rotation at an angle 0-180 degrees. The position of servo motor is directly controlled by PWM (Pulse Width Modulation) [19].
3. Ultrasonic sensor- An ultrasonic sensor is an electronic device which is used to calculated the distance of any object from the sensor. This sensor consists of two parts first is a transmitter which is used to emit the sound wave using piezoelectric crystals present in the sensor and second is the receiver which receives the sound that is bounced back from an object. The sensor also converts the received sound wave into electrical signals for us to detect and measure[20].
4. Bluetooth Module- A Bluetooth module is a sensor which directly connects to any electrical device having inbuilt Bluetooth and later on it is used to transfer all the data from the sensor to the device it is connected via Bluetooth.
5. Arduino- Arduino is a microcontroller board which has both hardware and software part developed for use by anyone meaning it is open-source. For hardware part, it is made of a solid board. There are many variants of this board such as Arduino Uno, Arduino Genuino, Arduino Zero, Arduino due, Arduino Yun, Arduino Mega and Arduino Nano. Most of these board consist of a 8-bit microcontroller chip called ATmega328.[21].

Working and System Design-

Our system consists of following sub-systems-

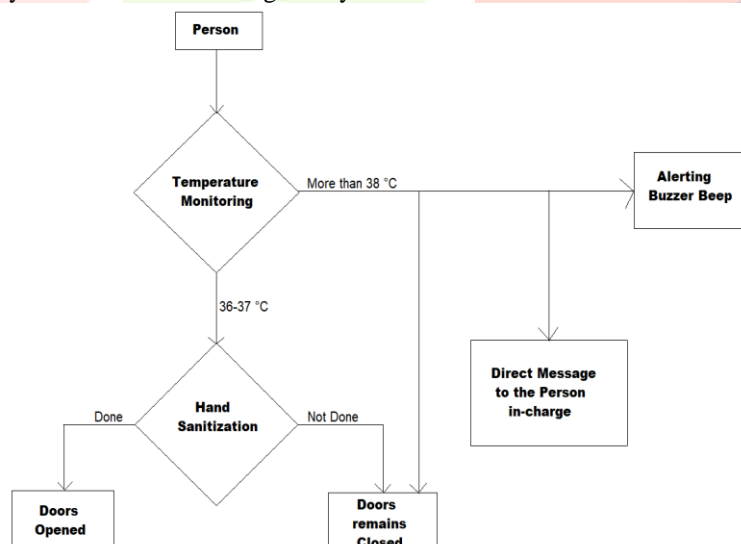
1. Temperature Monitoring/Check:

Whenever an individual tries to get in the premises of the organization, then at the entrance his/her body temperature will be checked using contactless body temperature system. And when his/her body temperature is normal then only he/she can enter in the organization premises. And when the device detects a temperature more than what is specified then that person will not be allowed to enter.



2. Disinfect System: When the individual's body temperature is normal then an automatic hand sanitizing machine will sanitize their hands as they will put their hands below the machine. Their hands will be detected by the ultrasonic sensor and the sensor will tell the system to sprinkle the sanitizer over the individual's hand.
3. Autonomous Doors- When the individual is sanitized and also his body temperature is perfectly fine then only the door of the organization will open. If both the conditions are not fulfilled and any one of the conditions is fulfilled then also the door will not open. For the door to open the individual should get a clearance from the temperature monitoring and also should be sanitized. The arms of the doors will be connected by the servo motors and when both conditions are fulfilled the system will rotate the servo motor and along with it the arms of the doors will also be rotated allowing the individual to enter.

Sending the data to Database- When the person's body temperature is above the threshold and therefore, he is having a fever then an automatic message will be sent to a person in charge that an unfit person is trying to enter the organization and later on he/she is taken care by that person in charge. Along with it all the body temperatures of everyone entering the organization will be send to the google database so that later on those results can be used at the time if needed. All the systems will be connected to Arduino board will the help of bread board and jumping wires. The prototype of the proposed system will be connected via laptop for the power supply. All the coding is done in python3 language and the software used for coding is Arduino IDE. Windows10 operating system is used for making this system.



V. Conclusion and Future Scope

Conclusion:

The proposed prototype is used to check individual's body temperature constantly, and when the body temperature crosses the threshold mark, unfit body is brought to notice to a person which is in charge and he/she is not allowed to enter the premises. The system also contains hand-sanitizer to disinfect the person's hand when he/she is entering in the premises and if the hand sanitization and body temperature check both are not done then the door will not open for the particular individual. The system is designed in such a way that it ensures everyone entering in the organization premises is physically fit and is not displaying any visual symptoms of coronavirus.

Future Scope:

This model can be installed in several other places where there is social gathering like theatres, marriage functions, malls etc. and along with it several other functionalities can be added like mask detection system in which if the individual is not having his/her face covered with a mask then he/she will not be allowed to enter the place. For this a mask detection system needs to be installed which will cover the aspects of Artificial Intelligence and Machine Learning. Also, a full body sanitizer dispenser can be installed in it which will sanitize the full body rather than only sanitizing the hands which the current prototype is doing. As we are currently in a global pandemic age, several changes can be made in the prototype according to the need and thus it can be very useful as a precaution for any future virus breakdown.

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