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Intellisense Integrated Safety Entrance System (IISES) using Arduino to prevent the spread of COVID-19

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ABSTRACT: COVID-19 pandemic caused by a novel coronavirus has taken a toll everywhere across the globe. The impact of COVID-19 can be seen in the majority of sectors of development. As already suggested by the WHO the most effective ways to prevent transmission are by wearing a properly fitted mask, sanitization and checking the temperature. The healthcare system which was playing a major role in limiting the spread of COVID-19 has been going through a crisis for a long time. So keeping this problem in mind we came up with an answer which is the "Intellisense Integrated Safety Entrance System". Our system is a reasonable IoT-based solution planning to increase COVID-19 indoor safety, covering several relevant aspects: 1) mask detection 2) contactless temperature sensing 3) automatic hand sanitizer dispensing 4) Fingerprint scanning. All of these features depend on Arduino Mega using various components like infrared sensor, ultrasonic sensor, servomotor, camera, etc. After proper analysis of all these measures, an individual is allowed to enter the workplace. this technique is easily utilized for secure and safe entrance solutions at various locations like offices, banks, colleges, schools, industries, and hospital gates.

KEYWORDS: COVID-19, IoT - based solution, Arduino, mask detection, Contactless temperature sensing, automatic hand sanitizer dispensing, Fingerprint scanning

I. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). According to the reports the first case was recognized in Wuhan, China, in December 2019. From that point forward, the disease has spread throughout the world, leading to an ongoing pandemic. The World Health Organization (WHO) as of March 11, 2020, declared it a deadly disease that gained its roots across the globe and severely affected 114 countries.

The spread of covid19 is caused by airborne transmission and surface transmission which is more prominent in densely populated areas.

As per the research effects and symptoms of COVID-19 differ from person to person. But most common symptoms observed in the majority of people are fever, cough, difficulty in breathing or shortness of breath, chest pain, tiredness, loss of taste or smell.

Amidst the rapid transmission of disease WHO has issued some preventive measures such as wearing a mask in public places while properly covering the nose and mouth, maintaining a safe distance of 1 meter, cleaning our hands using alcohol-based sanitizer, soap, and water, in case of high body temperature/fever avoid going to public places.

This pandemic of novel coronavirus showed the fragility of the existing healthcare delivery systems of many countries. The countries that spend even a good percentage of their Gross Domestic Product (GDP) on healthcare services have also succumbed to this COVID-19 crisis. In fact, the Indian health care system was crumbling under the strain as there was a severe shortage of staff and supplies. This research paper suggests various appropriate measures that can be

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implemented as the lockdown simply cannot stop the transmission with no definite treatment. There should be a multifaceted plan for ceasing the transmission chain and for future preparedness in case of such drastic situations and to strengthen our primary healthcare system.

The pandemic took a toll on all sectors across the world as the situation started worsening. Moreover, the lockdown period was extended leaving people with no choice but to change the traditional workflow. Educational institutes adapted online mode of education and employees started working from home. When the situation started getting better and people were vaccinated the lockdown was uplifted in a phase-wise manner. Institutes, offices were reopened considering preventive measures for covid19. To reduce the effect of the virus and its spread the reopened institutes, offices were compelled to take certain steps.

In the current system, a security guard is positioned at the entrance to make sure that the person entering the premises is wearing a face mask properly and is going through the thermal scanning. The thermal scanning is done using a temperature gun. After checking the mask and screening temperature next important step is sanitizing which is done using a foot-operated sanitizer machine. The machine allows people to sanitize on their own as the bottle dispenses the liquid by pressing the pedal with their foot.

Therefore keeping above stated problems in mind we are going to present a feasible solution in this paper i.e., is "Intellisense Integrated Safety Entrance System". Our system is a reasonable IoT-based solution planning to increase COVID-19 indoor safety, covering several relevant aspects: 1)mask detection 2) contactless temperature sensing 3) automatic hand sanitizer dispensing 4)Fingerprint scanning of these features depending on Arduino Mega using various components like infrared sensor, ultrasonic sensor, servomotor, camera, etc. After proper analysis of all these measures, an individual is allowed to enter the workplace. this technique is easily utilized for secure and safe entrance solutions at various locations like offices, banks, colleges, schools, industries, and hospital gates. This automated technology will help to curtail the spread of this novel virus.

OBJECTIVES

- To prevent and slow down the transmission of COVID-19
- To ensure proper safety entrance of people
- To provide contactless entrance of people ensuring minimum risk to the security personnel

II. LITERATURE SURVEY

After referring to various literature, we found several face detection, thermal scanning and automatic hand sanitizer dispensing system but with different approaches and proposed solutions.

In [1] Dr.J.S. Leena Jasmine, Annie Getzial.j, Irene Bennita.b, Muthu Ramya.r, Priyadharshini.s (authors) proposed a Smart prevention system for combating pandemic situations using deep
learning and image processing using Matlab. In [2] Saman M. Almufti, Ridwan B. Marqas, Zakiya A. Nayef and Tamara S. Mohamed (authors) introduced a Real-Time Face-mask Detection system with Arduino to Prevent COVID-19 from Spreading. In [3] Megha Warungase, Ruchita Wagh, Komal Jundre and Prof. S.G. Chordiya (authors) proposed a Face Mask and Body Temperature Detection System to Prevent COVID in Work Environment using tools such as OpenCV, python, and Deep Learning. In [4] Mouad. M. H. Ali, Vivek H. Mahale, Pravin Yannawar and A. T. Gaikwad (authors) provided an overview of the Fingerprint Recognition System (A brief review of the conceptual and structure of the fingerprint recognition system). In [5] Ashlesha D. Mahalle, Mr.Rahul Nawkhare and Mr.Ashish Bandre (authors) proposed an Artificial Intelligence Based Mask Detection With Thermal Scanning and Hand Sanitization Based Entry System using an OpenCV-based computer vision and machine learning algorithm. In [6] Nenad Petrovic and Dorde Kocic (authors) introduced an IoT-based System for COVID-19 Indoor Safety Monitoring

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(basically an affordable IoT-based solution aiming to increase COVID-19 indoor safety). In [7] P. Dawson et al (author) explained the loss of Taste and Smell as Distinguishing Symptoms of COVID-19. In [8] Safa Teboulbi, Seifeddine Messaoud, Mohamed Ali Hajjaji and Abdellatif Mtibaa (authors) described the Real-Time Implementation of AI-Based Face masks Detection and Social Distancing Measuring System for COVID-19 Prevention. In [9] Saponara, Sergio & Elhanashi, Abdussalam & Gagliardi, Alessio. (authors) worked on Implementing a real-time, AI-based, people detection and social distancing measuring system for Covid-19. In [10] M. Razavi, H. Alikhani, V. Janfaza, B. Sadeghi, and E. Alikhani (authors) introduced an automatic system to monitor the physical distance and face mask-wearing of construction workers in the COVID-19 pandemic.In [11] Koo, Ja H., Se W. Cho, Na R. Baek, and Kang R. Park. (authors) proposed Face and Body-Based Human Recognition by GAN-Based Blur Restoration

ARDUINO

Arduino can be described as an open-source stage utilized for building gadgets projects. Arduino comprises of both an actual programmable circuit board (regularly alluded to as a microcontroller) and a piece of programming, or IDE (Integrated Development Environment) that sudden spikes in demand for your computer, used to compose and transfer computer code to the actual board.

The Arduino platform has come relatively popular with people just starting out with electronics, and for good reason. Unlike utmost former programmable circuit boards, the Arduino doesn't need a separate piece of hardware (called a programmer) in order to load new code onto the board-- you can simply use a USB string. furthermore, the Arduino IDE uses a simplified version of C, making it easier to learn to program. Eventually, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

ARDUINO MEGA

Arduino Mega 2560 is a development electronic board based on the Atmega2560 microcontroller.

This board is a good match for projects that require more GPIO pins and memory space because it carries 16 analog pins and 54 digital I/O pins out of which 15 pins are used for PWM output.

The Arduino Mega 2560 is similar to Arduino UNO but comes with more GPIO pins, more memory space, and is bigger in size.

Arduino Mega 2560 is programmed using Arduino IDE (Integrated Development Environment) software which is the official software introduced by Arduino.cc

The ATmega2560 controller on the board comes with 256 KB of flash memory used for storing code (out of which 8 KB is used for the Bootloader), while the SRAM is 8 KB of SRAM and EEPROM is 4 KB of EEPROM.

III. METHODOLOGY

A. SYSTEM DEVELOPMENT

The system is designed to detect proper masks in real-time, examine the temperature of a person, validate the fingerprint of a person and dispense sanitizer while entering the building.

B. SYSTEM REQUIREMENT

1. **Hardware Requirement**
   In this project we require the following equipment/sensors:-

- Arduino Mega

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- Fingerprint sensor
- Temperature sensor
- Lm2596
- AI Camera
- Water Pump
- LCD
- IR Sensor
- Ultrasonic Sensor
- Wires
- Container

All the decision-making and controlling parts of all the tasks take place in Arduino. The fingerprint and temperature of a sensor are sensed by these respective sensors and the face mask is detected by the camera. The proximity detected and dispensing of sanitizer is dispensed with the help of an infrared sensor and water pump respectively.

2. **Software requirements** for this project we are using Arduino, so all the coding is done in C++ on Arduino Software (Arduino IDE v1.8.19) which runs on the platforms Windows/Linux/Mac. The code is compiled and uploaded on the chip. The libraries used are as follows:-

- Adafruit Fingerprint Detection
- Adafruit Face Detection

"Adafruit Fingerprint Detection" is a library used for fingerprint detection, this library is available for free on Arduino's Official Library Manager. It is written in C++. "Adafruit Face Detection" is a library used for face detection, this library is also available for free on Arduino's Official Library Manager. This library is available in C++.

C. BLOCK DIAGRAM

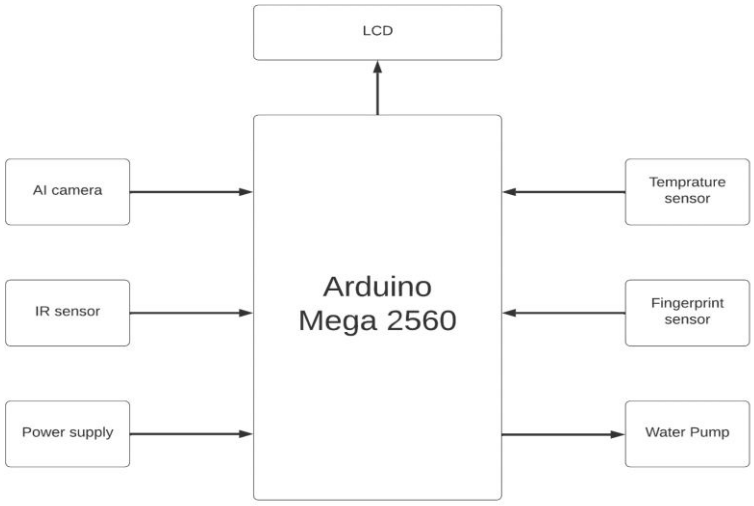

Fig 4.1 Block diagram of IISES

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D. FEATURES INVOLVED

Our system is an affordable IoT-based solution aiming to increase COVID-19 indoor safety, covering several relevant features:

- Mask detection
- Contactless temperature sensing
- Fingerprint scanning
- Automatic hand sanitizer dispensing

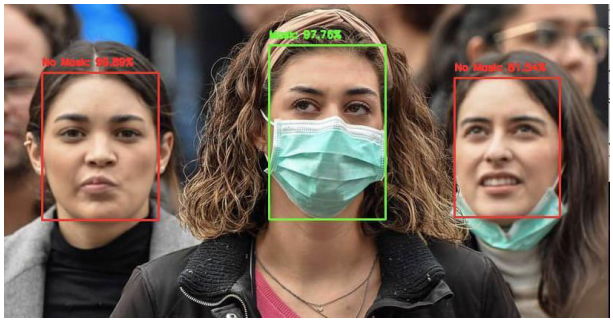

Fig D.1 Mask Detection

Fig D.2 Temperature Sensing

Fig D.3 Fingerprint

Fig D.4 Hand Sanitizer Dispensing

E. WORKING OF SYSTEM

The “Intellisense Integrated Safety Entrance system is a four-step process which includes 1) Mask Detection 2) Temperature Detection 3) Fingerprint Detection 4) Sanitizer dispensing. Starting from the mask detection when a person stands in front of the system his/her image is captured. If the person is wearing a mask the LCD will display “Mask Detected” and the person can move on to a further step but if the person isn’t wearing a mask the LCD will display “Entry Restricted”. After mask detection the next step is temperature detection in which a temperature sensor will note the temperature of the person if the temperature is admissible then the LCD will display “Temperature Normal” and if the temperature isn’t admissible the LCD will display “Entry Restricted”. The next step is fingerprint detection when a person places the finger on a fingerprint sensor the fingerprint sensor scans the fingerprint and further, it is matched with the database that is saved in the computer if the fingerprint scan is valid then the LCD will display “Welcome” and if the scan isn’t valid the LCD will display “Entry Restricted” and the person cannot enter. Completing

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the above three steps brings us to the last step of fingerprint dispensing in which sensors will check the proximity of the person standing in front of the system, if the proximity is admissible the dispenser will be activated and if the proximity isn't admissible the dispenser will remain inactive. The successful completion of the given four steps will ensure the safe entrance of a person in the building following all safety measures issued by the government to reduce the spread of Covid-19.

F. FLOWCHART

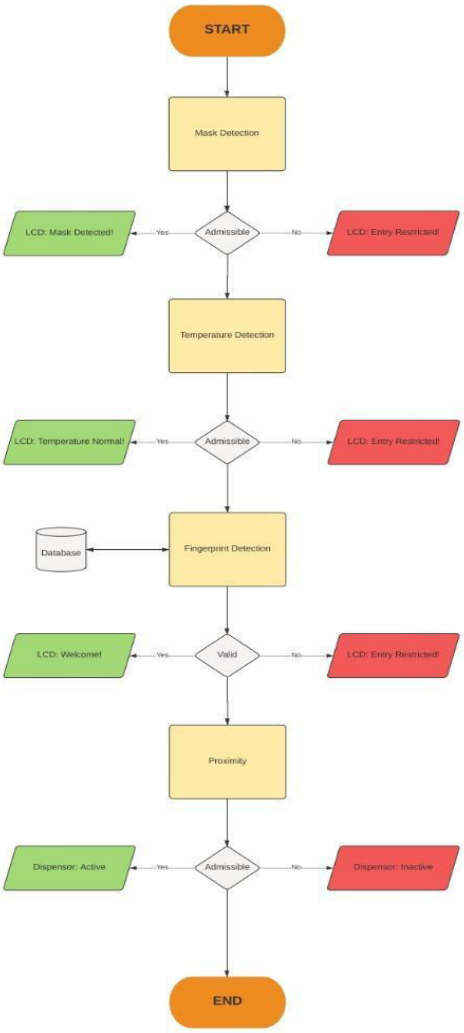

Fig. 4.2 Flow chart of IISES

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IV. CONCLUSION

The system designed in this paper is helpful for contactless entry of a person in the premises and it also reduces the possibility of spreading the COVID19 virus. The system is a handy, cost-effective and efficient tool to battle the ongoing crisis. Therefore with the help of this paper, the ultimate goal is to integrate the proposed system for efficient working during the pandemic crisis in order to achieve a safe environment for the security personnel and the people entering the premises.

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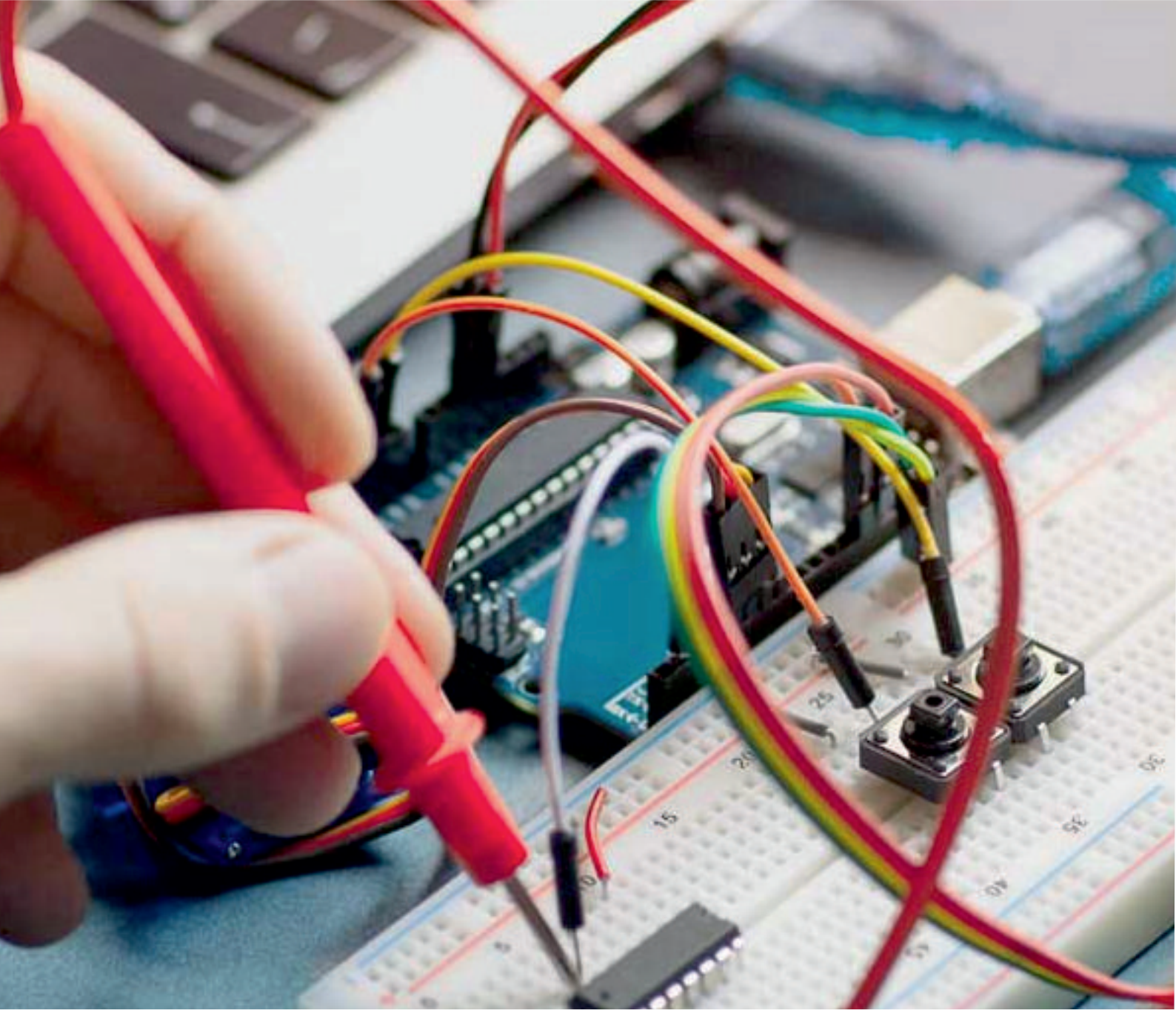

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