SMART BODY TEMPERATURE AND ATTENDANCE RECORDING SYSTEM

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ABSTRACT - In the traditional hand-held thermal screening systems, it is difficult to screen the vast number of people entering the area. The process is laborious and has a high probability of error during the process of screening the temperature of the person. Smart Body Temperature and Attendance Recording System is used as one of the solutions to handle this type of situation. In this system, a webcam is used to detect facemask and recognize the person and an MLX-90614 non-contact temperature sensor is used to measure the body temperature. Each person is given a unique RFID tag. Any person entering the campus needs to scan RFID tag. RFID reader is used to read the RFID tag. An ultrasonic sensor is placed beside the RFID tag such that if the distance is within the threshold range it activates the RFID reader and temperature sensor. If the body temperature is normal, then it records the attendance in excel with the help of plx-daq software and allows person inside. If temperature is high or invalid RFID tag is used than it gives out a buzzer and the person is not allowed inside the community.

Keywords – MLX-90614 Temperature sensor, RFID reader and tags, Ultrasonic Sensor, plx-daq software.

I. INTRODUCTION

With millions of cases and hundreds of thousands of deaths due to Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infections [1], screening people for SARS-CoV-2, the virus responsible for COVID-19, has become a national priority. The first cases were reported in Wuhan, China [2]. Covid-19 screening can evaluate large numbers of patients while reducing healthcare exposures and limiting further spread of the virus.

Temperature screening has been a focal point of case detection during the pandemic because fever is one of the earliest and most frequently reported manifestations of the illness.

Hence, various governments across the world have made it mandatory to screen the body temperature at the entrance of various public institutions as a precautionary step to contain the pandemic. So, any person entering an office building or educational institution needs to be screened to ensure that the person is having normal temperature.

It is observed that the body temperature and the attendance are taken separately, and an additional person is required to operate the handheld infrared thermometers for measuring the body temperature of every individual entering the campus.

The purpose of contactless temperature screening along with attendance strategy is to avoid the involvement of an additional person and to save time and effort put into taking attendance and body temperature manually.

Smart Body Temperature and Attendance Recording System is a setup device which can be used to detect face mask, recognize the person, and screen the person's temperature who is entering into a certain area. It eliminates the presence of third person to screen the temperature of the visitor. It allows the person only when the person is having temperature below the threshold value or else it will ring an alarm.

1.1. RELATED WORK

A cost-effective attendance system that implements fingerprint matching has been proposed in which a fingerprint sensor was interfaced with Arduino UNO [3]. A web

application was used to store and access the attendance. To transmit the data to the attendance system Ethernet shield was used between Arduino and database.

Another attendance system was proposed which included face recognition along with RFID scan [4]. To enhance security, fingerprint sensor was also used after face recognition. A similar system was proposed in which the camera installed will take a picture of the whole classroom, followed by detecting individual faces in the image, recognizing the students, and then updating their attendance [5].

Contactless Attendance Marking System with Thermal Screening was proposed [6]. attempted to develop a system that screens the body temperature using contactless temperature sensor and take the attendance using face recognition. If the face doesn't match, an image and SMS will be sent to the faculty.

An IoT based contactless body temperature scanning system has been proposed [7]. The average accuracy of the proposed system was 99.86% compared to a standard device.

A real time face mask detection system was proposed in which a Convolutional Neural Network (CNN) model was developed using TensorFlow, Keras, Scikit-learn and OpenCV [8]. It also used a JavaScript API to access the webcam for real time detection.

A contactless temperature detection system was proposed which could detect temperature values of multiple people [9]. It is based on the thermal imaging of the person in which the elevated temperature of the person is detected, and the person is prevented from entering the institution or offices, and the spread of virus can be controlled. The system not only identifies the person with high temperature but also checks whether the person is wearing a mask or not.

A face mask detection system was proposed [10] which restricts the growth of COVID-19 by finding out people who are not wearing any facial mask in a smart city network where all the public places are monitored with CCTV cameras. If a person without a mask is detected, the corresponding authority is informed through the city network.

1.2. METHODOLOGY

The first step of this project was to formulate the research questions. The next step was to gather information about techniques used for contactless temperature screening. This can be done by reading articles and investigating projects from previous years. From the literature study, components that were needed for the prototype could be determined. A prototype can be then prepared from the information and techniques gathered. When the construction is completed successfully, the Arduino software Integrated Development Environment (IDE) shall be used to program the algorithm. This system is designed using the concepts of Machine Learning, Image Processing, RFID Technology, and contactless temperature screening. First, the Face Mask detection module detects if the person entering is wearing a facemask or not, then the face recognition module recognizes the person's face. The object Proximity module checks the distance between the person and the temperature screening module. The ID Scanning module is used to scan the person's ID card. The Body Temperature recording module measures and records the body temperature of the person. Tests were done where different people scanned their cards from different angles to investigate the exact field of view of the sensor and its proper placement. Then it was tested with hot and cold objects to ensure its proper working. The system was also tested using both valid (or) registered and invalid (or) unregistered RFID cards to ensure its proper functioning.
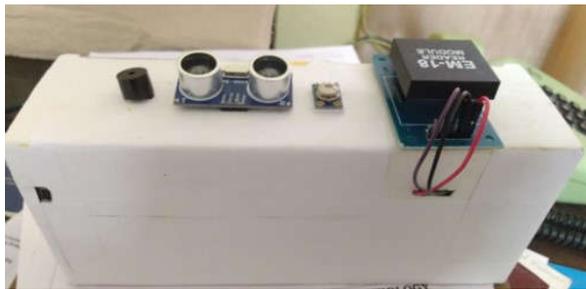
Fig 1. Top view of the system

Fig 2. Scanner's perspective view.

II. BLOCK DIAGRAM
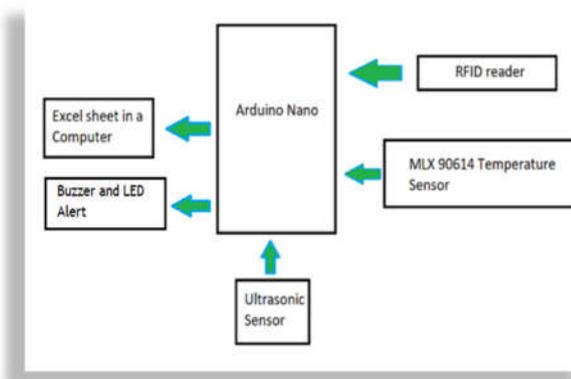
The major operations performed by this system are

Fig 3. Block diagram of Contactless Thermal Screening System

The RFID reader, MLX 90614 contactless temperature sensor and Ultrasonic sensor are given as input devices to Arduino nano and the buzzer and excel sheet provide the output. The ultrasonic sensor is used to detect the distance of the person from the temperature sensor. RFID reader is used for scanning the RFID tag which is carried by

the person entering the community or institute. It contains information like name, roll no., etc., of that person. The MLX-90614 sensor screens the body temperature if the id card is valid. The Excel sheet is logged with the details of the person. If his/her temperature is higher than the threshold value, then it gives a buzzer indicating the symptoms of virus.

III. PROPOSED IMPLEMENTATION

The detailed interfacing of components with arduino is shown in fig.4. This system scans the person's face to detect if he/she is wearing a face mask, then their faces are also scanned for facial recognition for marking the attendance, both of which can be done using a webcam of the same laptop/computer system that our screening system is connected to and using image processing in Python and OpenCV. Once that is done, the screening system consisting of the MLX 90614 non-contact temperature sensor screens the body temperature automatically while the RFID card is being scanned by the RFID reader module. To scan the body temperature accurately, the person needs to be close enough (within 5cm range). To achieve this, the system is equipped with ultrasonic sensor to measure the distance and check if the person's hand is within the range while scanning his/her ID. Since, it is mandatory for college students to carry their ID cards, the ID scan (RFID) ensures that the same person whose face has been recognized is wearing his/her own ID card and attendance will be marked only if the face and the ID match. A Script can be written to automate the task of initiating the software processes simultaneously. The ultrasonic sensor sends the trigger pulse, whenever the trigger pulse hits any objects within its range, then it retraces back to ultrasonic sensor and is collected by the echo pin. If the distance is less than 10cm, the EM-18 RFID reader module collects the information of the scanned tag and sends it

to arduino nano. The Tx pin of the RFID reader module is connected to the Rx pin of Arduino. The SEL pin of the reader is connected to 5V of Arduino to make it high so that serial TTL mode of transmission is selected. If the card is valid then it activates the MLX 90614 sensor which takes the temperature of the person and sends the information to arduino nano, from here it is displayed in excel sheet with the help of plx-daq.
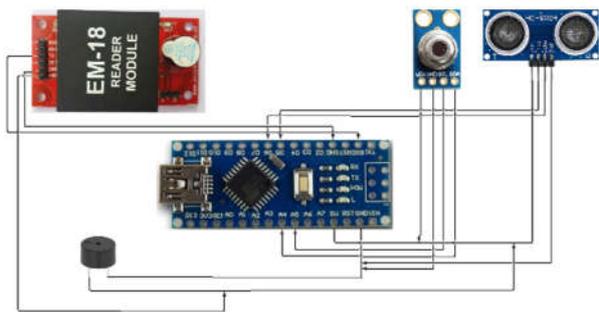

Fig 4. Circuit diagram of the system
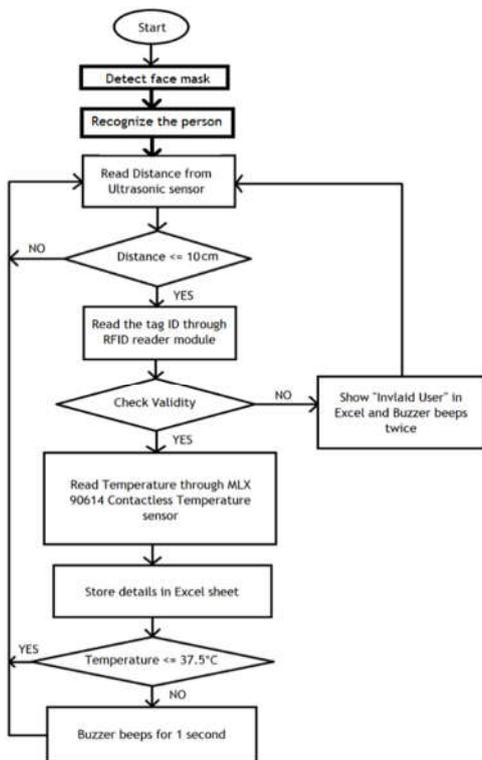
IV. FLOW CHART

Fig 5. Workflow of the system

V. RESULTS

1. Initially, we need to register the details of the students with each unique RFID tag.

2. After inputting the details of each student, the profile of the respective student will be saved in the database.

3. Now we can measure the temperature and take attendance using the system.

4. Finally the attendance is saved in the Excel sheet along with date and time as shown in Fig.6.

If person is having an invalid tag or high temperature than the attendance sheet is filled with default star (*) marks and a buzzer is alarmed to alert.
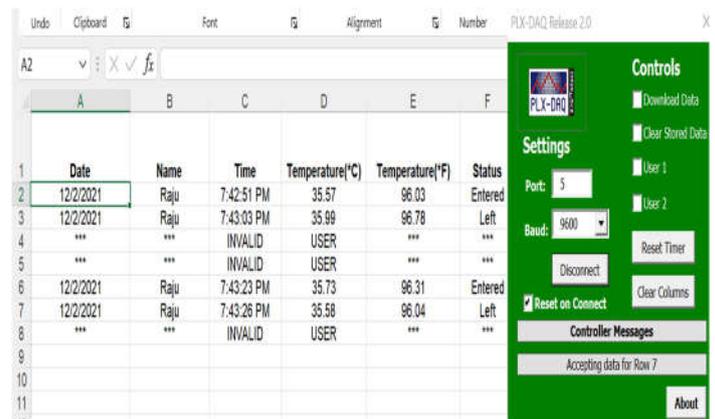

Fig 6. Attendance marking in excel

VI. APPLICATIONS

It can be used for various other applications based on the necessity such as:

- These non-contact devices can quickly measure and display a temperature reading so many people can be evaluated individually at points of entry.
- Can be implemented at the entrances of schools, colleges, malls, and other institutions.
- This system can also be used as pre

security check.

- Can be used to check whether the student, staff is authentic or not, and their health status too.

VII. MERITS AND LIMITATIONS

Merits:

- Simple in Construction.
- Portable and easy to use.
- Low power consumption.
- Records attendance automatically.
- It triggers an alert/alarm when the body temperature (℃) is too high.
- It is a more efficient and reliable way of screening body temperature compared to the conventional handheld devices.
- Non-contact infrared thermometers require minimal cleaning between uses.
- Using non-contact temperature measurement devices may help reduce the risk of spreading COVID-19 infections.
- In addition to the readings being contactless and safe for those being screened, the operator remains completely safe from possible infection throughout readings as well.

Demerits:

- Body Temperature may depend on various factors including the temperature of surroundings, encountering hot objects which may lead to temporary elevation of temperature and various other conditions.
- Devices failing to identify elevated temperatures or misreading normal temperatures as elevated.
- Marking attendance using RFID has a drawback i.e., there's a chance that a person might be possessing someone else's ID card. In which case, the

attendance and temperature calculated would be that of a wrong person. However, this can be solved by adding an extension of facial recognition to verify if it's the correct person scanning the ID card.

VIII. CONCLUSION

This paper describes about Smart Body Temperature and Attendance Recording System. This system helps in detecting facemask, reading body temperature, and recording the attendance automatically using webcam, MLX-90614 temperature sensor, and RFID tags respectively. It saves time and manual effort. RFID technology has high durability, requires low maintenance and is cost efficient to use. Similarly, the webcam inbuilt in the laptop can be used to detect if the person is wearing mask and to recognize them. By implementing this system, we will be able to eliminate the use of an additional person to screen the temperature of people entering an institution. It is a more efficient and reliable way of screening body temperature compared to the conventional handheld devices which require another person to screen the temperature. It also contains the feature of automatically marking attendance which saves a lot of time compared to the attendance taken manually, which makes it an effective device.

IX. REFERENCES

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