IOT Based Attendance System With COVID-19 Protection

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ABSTRACT

The performance of the students or employees which so ever organization they belong to can be measured by checking their regularity. Generally, in schools and universities participation is set apart by calling their registration numbers or names and marks the participation in participation registers. In research centres also records are kept up to follow the understudies and use of lab segments. In each and every situation it is tedious and increase work on administration. Subsequently, organizes begun utilizing student attendance marking systems depend on biometric information like fingerprint reading. In the current circumstance made by Coronavirus all over the world, the thermal screening is likewise vital to permit the employee or student to enter into the organization. The Fundamental goal behind this project is to make an IOT based attendance system with COVID-19 security which can perform the preliminary thermal screening of the individual. Presently a day, we are having basic attendance framework in various institutions however as innovation is developing older frameworks are being supplanted by IOT based attendance system using different hardware such as Arduino, Wi-Fi module, fingerprint scanner, GSM module etc. It also includes functionalities like initial thermal screening using a precision integrated-circuit temperature sensors and automatic door opening using a servo motor. So, the major benefit of our system is that it provides a safe and secure attendance system with coronavirus protection.
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Keywords : Fingerprint Reading, Coronavirus, Thermal Screening, Biometric.

Introduction

As a part of any organization first of all what matters is regularity and the best way used these days to measure this is attendance of the student or employee. The vital role that attendance plays is that it directly effects the performance of an individual. Attendance shows punctuality of an individual toward his work. As a result, in most of the schools and universities minimum 75 percentage of attendance is must

these days. In each of government or non-government offices weather large or small the attendance is must. A unique identity is used to mark this attendance as in school or universities a

unique registration number is assigned to every student and in other organization the unique Id is given to employee. At many places till today manual attendance record is maintained in registers which is very time consuming. In schools, teacher is used to call each and every student name in class and mark the attendance or a register is passed to each and every student and each individual has to mark his presence by signing in front of their name in these both the cases the issue arises that these types of methods are least authenticated, as in many

cases we have seen fake roll call during this whole process. So, to overcome all this different biometric based attendance system are being developed and are being continuously upgraded as per requirement. Even we have variety of choices available with us but episode of Coronavirus forced us to think and worry of adding temperature screening module. The Organizations made screening obligatory to filter everybody prior of entry inside the premises of the organization. This preliminary screening is being done manually nowadays. Due to which the main issue in this system is wastage of man power as a person has to do the screening and a high risk to the person health who is being exposed of doing this job. The goal behind this is to make a secure IOT based attendance system which can also perform initial thermal screening and will only allow a person free from covid-19 symptoms.

Related Work

A few attendance frameworks have been created and are also being used. These frameworks are planned either utilizing Wireless technologies like Wi-Fi, BLE (Bluetooth low energy) and RFID (Radio frequency identification) also technologies such as speech recognition, fingerprint matching, face recognition.

This framework of attendance marking with Radio frequency identification has bring into consideration. [1] In this framework RFID was used which uses radio waves toread the tag or labels integrated on an object using a reader. RFID tag was integrated on the ID card of the students which they have to swipe in a machine containing the reader, the reader fetches and verify the user by matching it with available database and marks their attendance. The RFID tag actually contains an integrated circuit which transmit the data to reader using radio waves. this system has a disadvantage

that the RFID tag can be misused easily by someone else. [2] So, to correct all this other modified system was introduced like they added face capturing in this RFID attendance system. When any student swipes the ID card the system verifies the identity of the student after which a camera takes image of the student and identifies. Later they added fingerprint scanning of the students to enhance the security of the system.

The attendance systems which are based on Bluetooth technology are made using mobile applications where the Mac Ids of understudy's gadgets was mapped to get their identity. [3] A lecturer can take attendance by tapping the application installed in lecturer's device. Prior to beginning of the lecture, the web services will be activated and remains the same till the session closes. Henceforth, instructor can take attendance on different instants during the address hour and discover the fake attendance.

Utilizing Bluetooth low energy beacons a brilliant and smart participation checking was proposed. [4] Beacons are little, low force transmitters which intermittently emits signals. These signals are generally extraordinary identifiers recorded by device(mobile) applications and afterward conveyed to available web service. Every time during login new token is generated and request is sent to the lecture planned. Since start and till finish of the lecture, device application tracks understudy and mac id of device time to time after a certain interval, later it is sent to the web services. The issue with these Bluetooth based frameworks is understudies must have Bluetooth empowered gadgets. In case, understudy doesn't have gadget then we need to return to manual attendance marking for such understudies. Despite the fact that some safety efforts were contemplated yet by sharing the device the understudy can give fake attendance.

The attendance system with fingerprint matching. [5][6] It has been introduced in which fingerprint of the students are used to check their regularity. The system was divided into two modules; enrolment module and verification module. A fingerprint scanner was connected to Arduino UNO microcontroller. firstly, database was created by scanning and storing the biometric information of all the students. Later the fingerprint of students was verified. The system compared the fingerprint of the student with the biometric information in the database. If fingerprint was matched then the attendance was marked. Also, sometime web based application was taken into consideration to access the attendance database. Main concern in this system

was to provide a reliable attendance system with reduced power consumption and storage.

The attendance system with face recognition and temperature screening has been proposed. [7] In this system thermal screening is done to check the temperature of students before allowing to attend the class and attendance is marked using face recognition. Ultrasonic sensor is used to trigger the system when a student comes closer to the device. The camera gets activated which captures image of the student and verifies it in the database of authorized persons. After which temperature screening takes place. The temperature of student is measured using temperature sensor and attendance is marked if the measured temperature is normal body temperature i.e. not exceeding the threshold limit. The main concern in this system is to provide contactless attendance system in this pandemic situation of Coronavirus.

Objective

The Main objective behind this project is to make an IOT based attendance system with covid-19

protection which can perform the automatic thermal screening of the person.

Now a days, we are having simple attendance system in different organization but as technology is evolving older system are being replaced by IOT base attendance system. But since the COVID-19 has evolved the preliminary screening is must before entering in any organization and mark the attendance. This preliminary screening is being done manually nowadays. Due to which the main issue in this system is wastage of man power as a person has to do the screening and a high risk to the person health who is being exposed of doing this job. To avoid all this this system is imposed to avoid manual screening this automatic thermal screening system is being combined with biometric attendance system with an additional feature of automatic door opening system only if the person belongs to that particular organization and has no Covid symptoms. There are various frameworks which are planned and available today based on Wireless technologies like Wi-Fi, Bluetooth low energy (BLE) and Radio frequency identification (RFID) also technologies such as speech recognition, fingerprint matching, face recognition. But the major benefit of our system is that it provides a safe and secure attendance system with COVID protection.

Methodology

This IOT based attendance system with Covid-19 protection is designed using different concepts and modules. This system is fingerprint recognition-based attendance system which can also perform the thermal screening with an automated door opening system. It contains four major modules; fingerprint recognition module, temperature screening module, alert module and automated gate module.

Functional Modules of the proposed system:

Fingerprint Recognition Module:

The dataset required to train the module is created by collecting the fingerprint of different users working in the particularorganization. Initially, user needs to provide the fingerprint twice. The module will analyse both the fingerprint given by user and a template with respect to the entered fingerprint is generated based on processing results and stores it in fingerprint library. When it comes to the matching part, user gives the finger impression through optical sensor after which the system generates a template similarly as generated during the collection time of the fingerprint and compares it with available templates in library of the authorized person of dataset. All you need to do is write some simple commands and the fingerprint scanner will be ready to store more fingerprints. The database of fingerprints can also be downloaded from the unit and can be sent to other modules. The fingerprint template, the analysed version of the fingerprint, the image of a fingerprint or the raw images from the optical sensor all of them are retrievable.

Temperature Screening Module:

Once the fingerprint scanning is done and user fingerprint recognition is done successfully then it comes to temperature screening part of the system. User's attendance is recorded only in normal condition

i.e. the temperature measured doesn't exceed the normal body temperature. In any of the faulty situation buzzer will start emitting sound and assigned authorities will receive an alert SMS.

Alert Module:

When the temperature screening will be taking place and in any of the faulty situation the alert module will come into play. The measured temperature will be processed by the microcontroller, after processing if the temperature is unusually high the microcontroller will activate the buzzer which will start emitting sound and alert message is sent to assigned authority. The alert module will use short message service that is SMS.

Automated Gate Module:

After the temperature screening if the measured temperature reading is normal then the servo motor connected to gates will be activated by the microcontroller which will open the gates for that user. if temperature is unusual then the servo motor will not be activated therefore the gates will remain closed and that user will not be allowed to enter the organization.

Workflow:

Initially the user needs to give the finger impression through optical sensor and a template with respect to the entered fingerprint is generated and stores it in fingerprint library. Then, compares it with available templates in library of the authorized persons of dataset. If the fingerprint matches then the temperature is measured using the thermal sensor, if the temperature is below 37 degree Celsius then the user is considered as not infected and the attendance is updated in database and can be seen on a 16X2 lcd display and also in an android application available to assigned authorities using Node MCU Wi-Fi module and if temperature is found above 37 degree Celsius then the user is treated as infected as a result buzzer beeps up, alert SMS is send to the authorities as well as the guardians of an individual using GSM SIM900A module and the gate

remains closed as a result the user will not be allowed to enter in the premises.
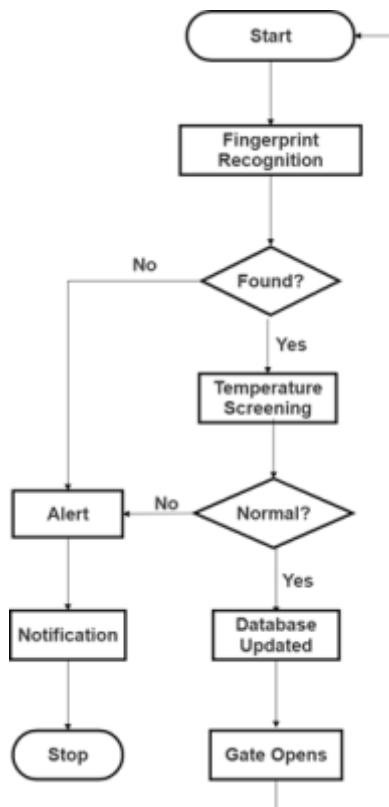
Fig 1: Workflow Diagram of Proposed Attendance System

Proposed System Implementation

The section below shows the implementation of the above proposed system.

System components

The detailed architecture of proposed system shown in Fig.2. The main components are discussed below.

Arduino UNO –

This component acts as the brain of the system as all the components are controlled by this central unit. Arduino UNO is a microcontroller board that is supported by an 8-bit ATmega328P microcontroller. It contains USB connection, 14 digital I/O pins, 6 analog input pins, power barrel jack, a reset button, and an ICSP header. The microcontroller board is being programmed with the help of Arduino IDE stands for Arduino Integrated Development Environment. This Arduino UNO board comes with 32KB offlash memory, 2KB of SRAM and works at operating voltage of 5 volts.

NodeMCU ESP8266 -

The NodeMCU 8266 board is supported by ESP8266 chip which have Tensilica Xtensa 32- bit LX106 RISC microprocessor. It can operate at clock frequency of 80MHz which can be adjusted to 160 MHz while using 3.3V operating voltage. It comes with RAM of 128 KB and Flash memory of 4MB to store program and data. The high processing power comes with in-built Wi-Fi system making it ideal for IoT projects.

R305 Fingerprint sensor–

This R305module is a well-known type of fingerprint sensor module which is utilized in biometrics security in detecting the fingerprint and then verifies it. The module is connected to microcontroller using TTL serial and data is sent in large number packets to get notice prints, photos, etc. During the enrolment of new fingerprints the flash memory available on the board comes to action and stores the fingerprints.

LCD display -

For better interaction of the device to user, a clear message should be conveyed while taking attendance so a 16X2 Liquid Crystal Display (LCD) is used where 16X2 signifies that it has capability to show 16 characters in one line and similar is with the second line and each character having 7X5 pixel matrix.

LM35 temperature sensor -

LM-35 temperature sensor is circuit sensor which can be integrated on the board and gives output in the form of analog signal which is proportional to the temperature it reads. The voltage comes out as output from the sensor can easily be used to get a temperature reading in Celsius degree.

GSM SIM900A module -

The SIM900A is a GSM module which is used for developing IOT Applications. The SIM900A GSM module is a dual band GSM engine that can work on two different frequencies that are 900MHz and 1800MHz. This module can be used to make audio calls, send SMS, Read SMS, etc.

System implementation

Firstly, a dataset is created which stores the fingerprint of the all the users of the organization for which fingerprint scanning machine is used which processes and generates template for each user. They are stored with the name of user. Arduino UNO microcontroller is used with R305 fingerprint reading sensor which provide user fingerprint as input data, the Arduino board also stores the code in it. Each and every time the code stored is executed and input is taken from the fingerprint reading sensor. Once the fingerprint reading is done and the user is recognised by the system the temperature is measured in the LM35 temperature sensor. The threshold temperature reading value is selected above which the reading is taken as unusual temperature reading and will be treated as coronavirus symptom. The measured temperature is then sent to Arduino UNO in the form of analog signal which will process the signal value to get the temperature reading and compares it with the normal body temperature. The measured temperature will be shown on 16X2 LCD display. If the temperature measured is found higher as compare to normal body temperature then the buzzer connected to the microcontroller will be activated which will start emitting sound and alert signal will be sent to assigned authority. But if the measured body temperature is not higher than threshold temperature then it will be treated as normal condition and the servo motor connected to the microcontroller will be activated which will open the gates and mark the attendance for that user and allow the user to enter the organization.
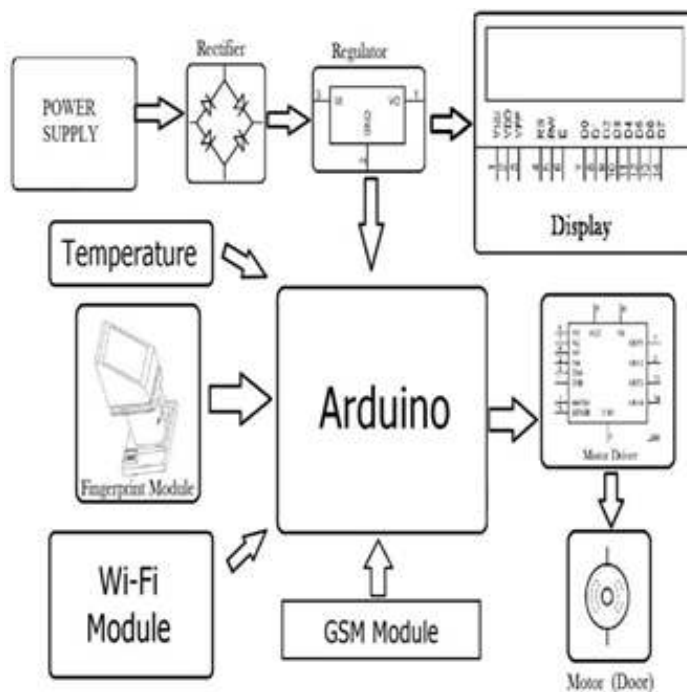
Fig 2: Architecture of the proposed Attendance System.

Discussion

As is utilized, it goes about as first layer of safety and subsequently unauthorized individuals can't enter and even one individual cannot mark the fake attendance of other individual. Individual can't give attendance in between as the date and time is recorded when attendance is marked. Many such systems are available but since coronavirus has emerged thermal screening is made a mandatory step before entering in any organization. So, to fulfil this requirement this system is designed where a contactless thermal screening is done automatically and only a normal individual is allowed to enter and the individual who is having high internal heat level won't be permitted. So, spreading of infection to different users can be controlled easily and at a very cost-effective rate.

Conclusion

The above proposed system is not just a simple IOT based biometric attendance system but it is designed keeping in mind the current pandemic situation we all are suffering from. As we know thermal screening is made mandatory in every organization to stop the spread of coronavirus infection so as aresult the system is combination of an IOT based attendance system and health monitoring system with high level of security and at a low cost. The main concern behind this system is health and security. In any of the unusual condition like high temperature or user doesn't belongs to the organization the buzzer rings and alert is sent to assigned authorities. Only in the normal condition attendance is marked and automated door opens and user will be allowed to enter. This system provides high level of authenticity, security and health care status too. This system can also be made by using other biometric features can also be used like face recognition and speech recognition. The major benefit of our system is that it provides a safe and secure attendance system with COVID protection.

References

Hasanein D. Rjeib, Nabeel Salih Ali, Ali Al Farawn, Basheer Al-Sadawi, Haider Alsharqi, Attendance and Information System using RFID and Web-Based Application for Academic Sector, (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 9, No. 1, 2018
.

Qureshi Rizwan, THE PROPOSED IMPLEMENTATION OF RFID BASED ATTENDANCE SYSTEM, International Journal of Software Engineering & Applications (IJSEA), Vol 11,
No.3, May 2020

Riya L., Suruchi G., Harshil J., Harish N., "Bluetooth Smart based Attendance Management System", International Conference on Advanced Computing Technologies and Applications (ICACTA-2015)

Bruno Z., Mario D., Drazen B., & Goran M., "Design and development of a smart attendance management system with Bluetooth low energy beacons" Zooming Innovation in Consumer Technologies Conference (ZINC). doi:10.1109/zinc.2019.8769433, 2019.

Ram Prabu J, Aswini N, Francis Brindha A, Pavithra R, Wireless Smart Biometric Attendance System, International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-2S December, 2018

Mayur Surve, Priya Joshi, Minakshi Vharkate, Automatic Attendance System Using Face Recognition Technique, International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-9 Issue- 1, May 2020

Archana Bhat, Vamsinandan , Contactless Attendence Marking System with Thermal Screening using Arduino, International Journal of Engineering Research & Technology (IJERT), Published by IJERT, NCAIT - 2020 Conference Proceedings, ISSN: 2278-0181, Volume-8 Issue-15, 2020.