

Attendment:New Age IoT Powered AI based Attendance Solution

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Abstract— The problem statement focuses on the reduction of fake attendance and time-consuming process of conducting attendance using the traditional methodology. In the recent times the problem of proxy attendance has been overwhelmingly serious. Students have started neglecting the need to attend the lectures. Over the course of time this can lead to reduction in productivity as the time and energy spent in learning will be wasted by the masses in doing unproductive activities. Our approach focuses on reducing the number of flaws in the system and making it robust to external malpractices as well as automates it.

Keywords— Arduino UNO; ML; Ionic; RESTful; attendance.

I. INTRODUCTION

The solution we focus on is by designing a complete system including an Arduino driven module and an app to go with it. The Arduino driven module generates a QR-Code with specific information encoded in it. The QR-Code is then scanned by the student using the application provided to them. The scanned code then triggers the procedure of registering one's attendance in the database. This system will be helpful in the educational organizations to automate the process and save time and resources invested in conducting attendance by reducing the use of perishable resources the process and save time and resources invested in conducting attendance by reducing the use of perishable resources.

II. RELATED WORK

Redmon et al's[3] YOLO model achieves a high rating on the PASCAL Virtual Object Classes (VOC). This work of theirs is inspired by GoogLeNet and Network in Network[4] models for image classification. IOT based Attendance Management using Raspberry Pi model 3 along with RFID technology aimed at reducing the time required in current methodology to record the attendance in educational and other institutes along

with the automation of the whole process[2]. RFID systems are widely used in various fields right from health, transportation, industrial technologies, agriculture, etc. Add to it the ever-increasing usage of IOT technology. Thus, attendance can be managed using these two technologies[1].

III. PROPOSED SYSTEM

Implementation involves Arduino along with various modules with their library supported by Arduino. Also, a mobile application along with server and database configuration is necessary.

Faculty will make an entry of every lecture and prior coming to the lecture will activate the QR-code and student has to scan the QR-code only twice will entering and exiting from the class and his/her attendance will be marked for all lectures.

A. Hardware

- Arduino UNO

The IOT module is driven by the Arduino which offers transition between the Internet and the physical world.

- Relay Module

The function of the relay module being cutting off the power supply of the system, results in conservation of electricity making the entire setup energy efficient.

- RTC Module (DS3231)[6]

RTC is a clock module which keeps track of the current time and date which is one of the base for QR-Code generation.

- OLED 0.96-inch Display[5]

The display module will particularly be useful for displaying the results produced by Arduino. In our case it will help in producing the QR Code generated by the microcontroller.

- **WIFI Module (ESP8266)**

The ESP8266 will help the microcontroller to connect to the Internet and control the Arduino module over it. It will accept the request from the app and display the QR code accord

B. Software

- **Mobile application**

The mobile application is based on the Ionic framework which being platform independent can be used on any OS that is Android, iOS or Windows. This increases the efficiency and retains its functionality all-throughout. This mobile app will provide the login to both teachers and students. Teachers control the Arduino module for generating a new QR code. The app will provide a QR code scanner which is to be used by students for marking the attendance. The mobile application has two major sections viz Faculty and Student.

The faculty can login with its credentials and select lecture in a respective classroom at a particular time, after the lecture is marked the students can login with their credentials to mark their start/end phase by scanning the QR-code code generated by the device. Upon a successful scan the attendance for the student will be marked.

- **YOLO based facial detection**

YOLO or You Only Look Once is an algorithm which repurposes the role of a traditional classifier for Object Detection. The algorithm encloses the detected objects within specific bounding box to generate the accurate output based on a confidence score. You can feed it an image or a video.. A completely different approach is used by YOLO, rather than repurposing a Classifier for Object Detection it looks at the image just once. Because of this we have used it over R-CNN and all its variants that are Fast R-CNN and Faster R-CNN.

Given an image, a grid of 13x13 cells are formed out of it and each of these cells can predict up to 5 bounding boxes. Here, output is given in the form of confidence percentage. This shows the surety in recognizing the object that belongs to a predefined class. Thus, it basically gives a probability distribution over all possible classes. YOLO can be trained on PASCAL VOC dataset which is capable of detecting various different classes. The combination of bounding box and class prediction gives the final score that results in the probability whether the bounded object is of predefined class or not. If we take the math into consideration, at a single go the algorithm will be able

to make 845 bounding boxes but most of it will be ignored due to low confidence score.

Ultimately, the user feeds an image to the model, it goes through CNN in a single pass comes out with the bounding box around an object along with the class name. YOLO is based on Darknet library and implemented in Python using Open-CV and Numpy modules.

This module acts an extra layer of security to the entire system. It will be used to detect headcount of present individuals in the room. This will be done by accessing the frames from the CCTV feed received at the DVR and are put under process of prediction. It will give a count of students it detected which will then be compared to the no. of scan requests we got for a particular session to make sure no extra requests have been made. This will help in detecting false attendance.

- **Server**

- **MySQL Database**

The database being structured helps in keeping in account the needed information and calculation of the values becomes simple. It will help to keep track of the timetable and room allotment details for different lectures. Apart from that the student attendance is recorded so that it can be produced whenever necessary. As the submission of the start time and end time is made by student through the app by scanning the QR-Code while entering and exiting the classroom, commencement and ending of each session during the time interval between start time and end time will be mapped automatically to the records of the lecture made by the faculty and accordingly attendance will be marked of student for each lecture respectively.

- **Spring 'REST' API**

The 'REST' API is used to receive/send values in a key-value pair from/to the server. For the delivery of data from server to the consuming resources, API has to be developed. In this case RESTful based APIs i.e. 'REST' APIs are used to receive/send values in a key-value pair from/to the server. Technology used for developing REST APIs here is Spring MVC as it provides robustness and security to various network threats. Spring connectivity to the My SQL Database is done by mysql-connector v8.5 and for web-services jackson v2.2.3 library is used in creation of REST based APIs

- **Apache Tomcat Server**

It is used to deploy .war files created using the spring framework. It is used for deployment of RESTful APIs created by Spring MVC in the

proper environment. Deployment is as easy as copying the .war file of our code created using spring framework. Easy Apache (currently v4) is to be installed on the hosting provided to you, after which you can upload your .war file after that unzip it and you are as good to go.

IV. CONFIGURATION

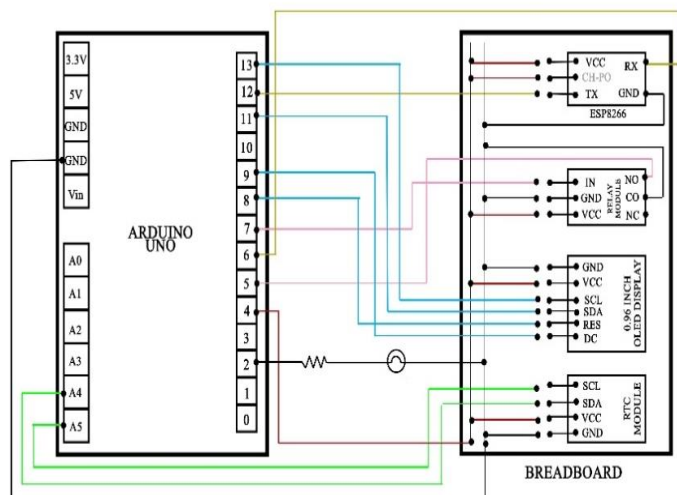


Fig 1. Pin Diagram

This is the basic layout of the IOT module which is responsible for generating and displaying QR-Code which is then scanned by the mobile application and the procedure for marking the attendance is initiated.

The GND and VCC connections are given in a row due to its recursive use in the circuit. The four modules used here are connected to the breadboard with connecting wires as shown. The distinct colored wires show the connection each module has. The display being used here is 0.96 inch OLED having 6 pins.[4] This in-itself is a unique combination and hence the connection are to be made precisely, taking into consideration the risk of ruining the setup is connected in an incorrect manner. The bulb at pin no. 2 is used to check whether the module is giving proper output.

V. EXPERRIMENTAL RESULTS

On testing the entire system, it was found that:

- The number of proxies had reduced drastically to about a negligible number.
- The adjustment of contrast on the display makes it difficult for one to scan the QR-Code from a picture clicked on mobile cameras
- One cannot mark more than one attendance as while marking the attendance the MAC address of that device is recorded and which is checked every time a request is received at the server.

- One cannot clone the application in their mobile device because of the same above reason.
- Even if one brings two devices to mark more than one attendance, he/she will be caught as the facial detection technology cross checks the head count in the classroom with no. of scans at that very moment.
- Teachers can have a detailed report of how many students were present on a particular date for any particular lecture.

VI. CONCLUSION

The main aim of reduction of proxies was tackled and a substantial improvement was seen. The reduction in the use of perishable resources was a noteworthy improvement over the current attendance system. The system also made the attendance process quick. Also, unlike other alternative such as the bio-metric solutions but this approach is very cheap and easy to use with little to no flaws, leaving a very narrow passage for cheating by the students.

For the future implementation of the project annotation of data has to be implemented on a priority basis. Facial detection model can be trained to uniquely identify each student and give their presence report accurately to the faculty instead of just the count of students in the class.

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