

# System for Verifying Attendance using Face Recognition and RFID

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**Abstract** ;Managing student attendance effectively is essential for schools to provide a high-quality education to all of their students. The article describes a prototype for an automated attendance system to reduce the need for human intervention in data collection and, therefore, the possibility of fraud. The approach focuses on how Radio Frequency Identification (RFID) and facial recognition may work together to track which pupils should be allowed in a classroom and how many should leave. The manual process of keeping track of students' attendance has been substantially simplified thanks to the Smart Attendance System. In addition, the smart system maintains a record of each student enrolled in a given course and offers relevant data as required. In our proposal, the constraints of the current manual attendance system are substantially overcome via the use of facial recognition in conjunction with RFID verification. With the use of infrared (IR) modules, we have designed a system where the room's electronics only activate when there are people present, hence reducing the room's energy consumption.

**Keywords**— Image Processing, OpenCV, Facial Recognition, RFID Tags, RFID Readers, Arduino Project, IR Module, Class Attendance, Smart Classroom

## I. INTRODUCTION

Regular attendance in class is, undoubtedly, the most prior condition for the students to ensure a good academic result. Lack of proper and efficient monitoring system cause the students to refrain from attending the class regularly which in turn brings a very sad performance in the exam. Consequently, valuable time and energy of the students are wasted, sometimes they are dropped out and the reputation of the academic institute sharply declines [1]. Apart from this, engaging of the teacher to take attendance halts the continuity of the class and that hampers the quality of the class as well. On the other hand, a minimum of 70 percent attendance for each course is mandatory to avoid being barred from the exam. In [3], a system was proposed, where a student can also know the information regarding his attendance beforehand so that he can be cautious of it. The traditional attendance system drastically fails to solve these problems effectively that has eventually become a great concern nowadays.

Our improved system working on recognizing face with identification number leaves no loophole of fraudulence and

it can initiate a smarter system that addresses each issue mentioned above more accurately without any sort of

manual mistakable effort. Images of the face of every student with their name and identification number once recorded, our present system can recognize each student and count while he enters the class by verifying his face and RFID based identity card [4,9,13]. All sorts of mismanagements, fraudulence, and carelessness will disappear and no more hindrance for the teacher to continue class smoothly. Students will not deprive from a quality class.

Several projects have been done by using Arduino for developing smart attendance system. Since students from different countries, specially, from developing and underdeveloped are rapidly growing [3-5], the necessity and popularity of automated system based smart classroom projects are increasing. For example, IR module-based project for smart classroom has been implemented in different places [7]. Besides, Bluetooth module attendance system by pairing the mobile phone devices has been used by different universities [4]. Another project that we got to know during our research is GSM based automated classroom system [4].

Previously, RFID based classroom system has been proposed using raspberry pi and ATmega32 development kit [6]. However, raspberry pi or ATmega32 development kit does not make our project cost efficient [5]. We are going to make this project for the educational institutes; hence besides the insurance of accuracy and authenticity, cost effectiveness is also a big concern to us.

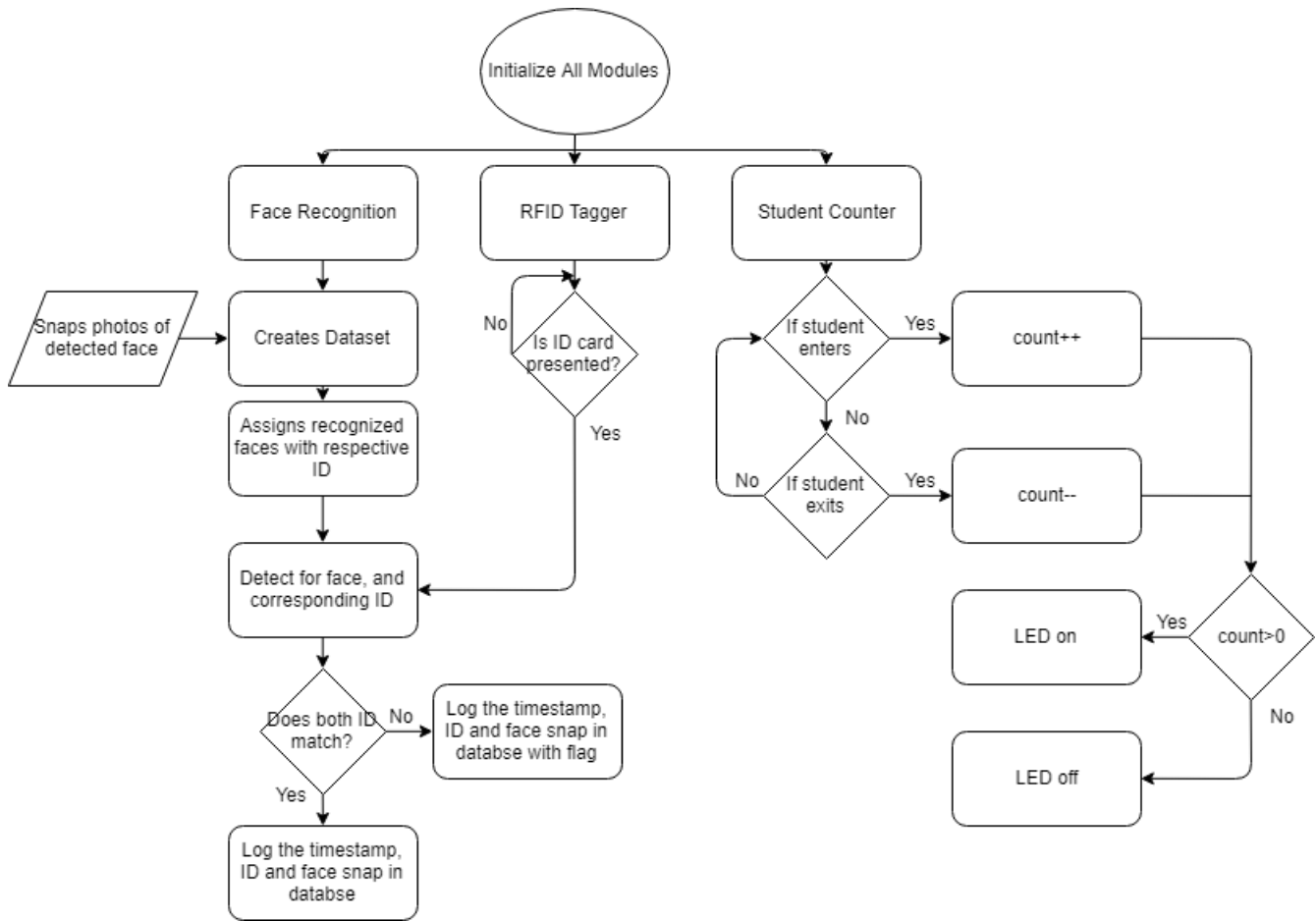
In this paper, we proposed an attendance system based on Face Recognition and Verified the information by RFID and thus keep records by recognizing face, identifying identification number, entry and exit time by Real Time Clock (RTC) module [9-11]. This information can be logged by using SD card or by uploading it to the internet by using an Ethernet shield, as per clients' need [14].

The following parts of the paper are put in an order as such. Section 2 focuses on the model of our project that we have already proposed. Section 3 represents the circuit diagram with proper illustration and also how we had implemented our hardware of this project. Finally, Section 4 is the conclusion where we also discussed about the future scope.

## PROPOSED MODEL

Here a detailed block diagram of Attendance System based on Face Recognition and Verification with RFID is depicted in Figure 1. Face recognition part is done through

several steps [12-15]. As our code prepared with Python in Open CV generates 2D grayscale images of the students that work as the input and after being trained on those images, the system finally detects faces on live camera feed [10,11].



**Figure 1.** Flowchart of the proposed circuit model

Radio frequency identification (RFID) system is based on two components which are a reader and a tag. Here the tag is attached to an object and the reader identifies the proper object. The data here is transmitted by using radio wave [2].

The RFID tag has an embedded transmitter and receiver. A typical RFID tag consists of two parts, an integrated circuit and an antenna. The integrated circuit is used for collecting and running information. And the function of the antenna is to receive and transmit a signal [4]. RFID tags can be of three types and they are active, passive, battery-assistive passive [3]. RFID tags are equipped with non-volatile memory storage [5].

The RFID reader transmits an encoded radio signal to the RFID tag by using a two-way transceiver and interrogator [1]. All the RFID tags that are available fall in three categories. They are classified according to the type of tag and reader. Those are, Passive Reader Active Tag (PRAT), Active Reader Passive Tag (ARPT) and Active Reader Active Tag (ARAT) [2]. We have used the second one for our proposed model.

The Facial Recognition is done using OpenCV library and running the respective codes on Python [14]. We have used OpenCV 2.4.0 and Python 2.7.13 specifically for this particular project, and the latter versions would need to have

the codes changed [11]. In our project, we use Haar-like feature detection algorithm to detect faces. Even though single strong classifier can detect most facial features

correctly, it still has considerable high false positive rates; hence we apply the cascading method [13]. Using cascade classifiers, our program scans every sub-window of the input feed image and classifies them as face, or non-face [14]. Majority of the non-face features are eliminated in the first few stages of cascading process, and then lets the program focus on the relevant face window. This method is very efficient since it is executed very fast and precisely.

The cascade classifier for multi-view face detection can scan the sub-windows in every position and scale of the input image, and classify each sub-window into face or non-face [12]. Both frontal face and profile face can be detected by this system. In the process of classification in the first few levels, the system can quickly eliminate a large number of non-face sub-windows, and then let the rest level of the cascade classifier focus on the suspicious face sub-window [14]. This detection method can achieve face detection rapidly and precisely. After the test in different kinds of dataset, we found that the cascade classifier can achieve high accuracy face detection and reach the requirement of face detection in real-time [10].

## II. DESCRIPTION OF THE PROPOSED MODEL

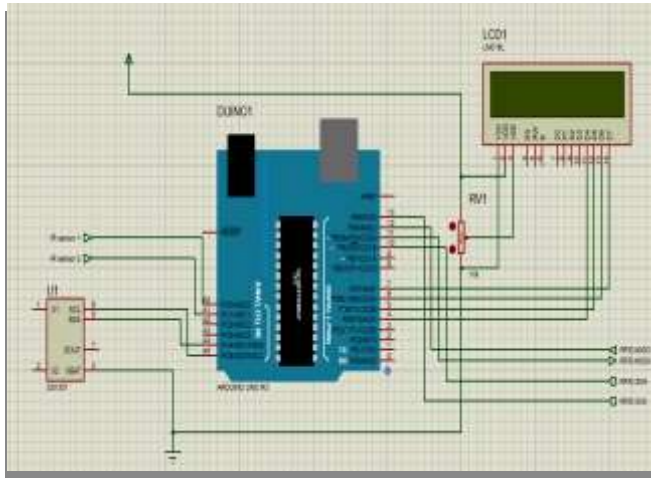
The development of the Attendance System based on Face Recognition and Verification by RFID is distributed into two significant units, one is the hardware side and another one is the software. Personnel with proper authority can login into the system and look for information from there, which keeps a log of the ID, time and date of every student that enters into the classroom. It

also can register new student using facial image, the tag ID

of each tag.

#### A. Detailed circuit description

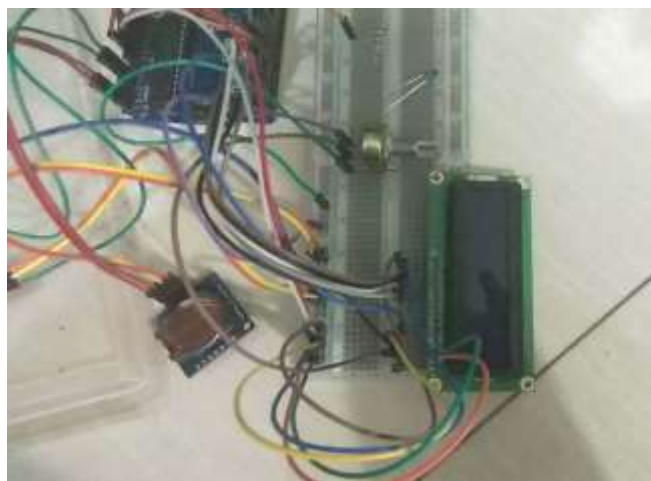
In this segment, circuit components that we have used for our proposed model are being displayed in Figure 2. We have designed our circuit by Proteus Professional software.



**Figure 2.** Circuit diagram of the RFID and LCD segment of our proposed project

In Figure 2 we can see that we have connected Arduino Uno R3 with a Real Time Clock (RTC), a LCD display, a Radio Frequency Module (RFID), 2 IR sensor modules. When the system will initialize, the LCD display will ask the student to show his tag or card. After the card being identified, the LCD will display the ID number along with the time of his entrance. As he passes across the IR sensor, the system records the count of the student and displays the number on the LCD. If someone leaves the classroom, the count goes down.

However, the most challenging and effective part is incorporating Face Recognition with the system. It ensures the accuracy of the system in identifying the authorized person. As face recognition is verified by another system developed by RFID, we can say the system is nearly perfect identification and counting system. However, we are also planning to connect both systems to run together and add a storage system through which we will be able to keep all the data.



**Figure 3.** LCD and RTC connected with Arduino through breadboard

In Figure 4, we can see that 2 IR modules and a RFID is connected with the Arduino Uno. The function of the IR modules is they are basically going to count the number of the students and when the count is 1 then

#### B. Hardware implementation of our project

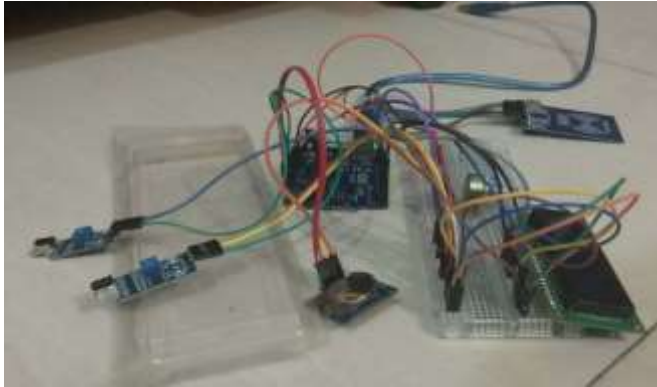
In the following section, we are going to discuss about how we implemented the hardware of our proposed project Attendance System based on Face Recognition and Verification by RFID. From Figure 3 to Figure 11 describe the hardware implementations.

Figure 3 is displaying the basic circuit design of our project. Here we can see that the LCD is connected to the

breadboard. Also, a LED, a RTC are connected. All of them combined connected to Arduino Uno. And the Arduino is connected to the laptop from where it is going to get power and run the whole module. The LCD and LED are the output here. There is a pot also which works as the contrast controller of the LCD display. We can set the contrast by using it whenever we need to do that.

the LED will glow and when the count will be 0 the LED will turn off. Every student is going to have a RFID tag and when they will touch it to the module the LCD will display their ID with the time stamp and will entry

it to the log.



**Figure 4.** RFID reader and IR modules are connected with Arduino

This Figure 5 is mainly displaying our half portion of the project which includes the RFID module, IR sensor, Arduino Uno, LCD display, LED which are connected to the laptop and also the RFID tags that the students are going to use.

Figure 6 is showing the ID of a student with the time stamp who has just punched his RFID tag or card to the RFID module. Each time when a student is going to that the LCD display will show like this.

identification number. Next stage is to show ID card to the reader, LCD display again shows his particulars. After that as he crosses the first IR sensor to get in the class, count goes up. This counted number will be displayed on LCD. As the students leave the class room crossing another IR sensor, count goes down and is played on LCD.

We can implement the two systems, face recognition and Identification by RFID to merge in one system and also add a storage system for our project. Due to lack of time we could not add the feature yet.

### III. CONCLUSION

The design and implementation of the Attendance System based on Face Recognition and Verification by RFID which was our aim and objective of the paper at the beginning ends with a success as both parts work as desired. There it goes without any saying that our proposed model has the potential to overcome the manual attendance system because it's efficient and convenient. Our model is more user-friendly and it provides the most accurate and organized data. And with just some few modification we can use our system in any secured facilities.

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