

# An App based smart System for Students Attendance Monitoring and activities of student with in the campus Using Raspberry Pi

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**Abstract**—The main purpose of this paper is to develop a safe and secure attendance monitoring system using Biometrics and Radio Frequency Identification (RFID) Technology for both computers and microcontroller. The idea behind this project is to develop an attendance maintenance system for schools, colleges and well as organizations which also has the provision to detect any form of intrusion in restricted areas and report it immediately. This system is realized using a PIR sensor (to detect human presence in room), a RFID reader (to confirm the identity of the person in room) and a camera. Raspberry pi B+ is used to control the communication between these peripherals and the whole setup is connected to the internet in order to optimize it. The system can also detect the current location of the students and send through PC. With the help of microcontroller one can receive live feeds of various campus activities, keep updated with the current topics in his/her enrolled courses as well as track his/her friends on a real time basis. Parents as well as student will be notified student is lagging behind in attendance. There is a functionality of automatic attendance performance system.

**Keywords**— *RFID, PIR Raspberry Pi B+, camera, Finger Print Sensor, GPS, Attention Tracking.*

## I. INTRODUCTION

In recent years, there is a problem of irregularity of students which may affect the student growth in education. This problem is also faced [1] by parents as they don't know whether their attending the school/college or not. Today, in most Institutions teachers take attendance by calling out names or passing a sheet of paper. Both ways have respective drawbacks. First way of taking attendance is time consuming as well as prone to errors and in second case there are chances of having proxy attendance. So RFID, PIR, finger print and GPS Based Attendance Monitoring System [2] using door locking/unlocking system aims at removing all these problems and drawbacks. In this System,

Each student is assigned a RFID Tag that has a unique ID. Whenever the Student enters the college premises, he will sweep that card near the Reader. The Reader will read the Student's Information and if that information is correctly matched then the door of the Institution is opened and student is permitted to enter. After some time the door gets closed

automatically and at the same time alert message will get displayed on monitor indicating that at the attendance has been taken. At the same moment will be track the student location and send to the monitoring section. Here Microcontroller is used for controlling the events. This System is implemented using RFID Card Reader [3] and finger print sensor, ARM9 Microcontroller, RFID Tags, finger print, GPS.

The project aims at designing an attendance maintenance system for schools, colleges and well as organizations which also has the provision to detect any form of intrusion in restricted areas and report it immediately. To achieve this a PIR is required to detect the presence of any human being in the room [4]. An RFID is required to validate the presence of the person in the room by tallying his identity with those in the database. A camera is required to click the picture of the room and send it via email as an alarm. An internet connection is required to register all these movements on a website so that it can be accessed from any place and any device. The microcontroller would then match the tag number with the list of approved tags stored in its memory and if validated would allow entry, if not then a camera attached would click a picture of the person assuming him/her to be an intruder and an alarm would be sent via email to the concerned authority. All the information would also be uploaded to a web page so as to avoid any ambiguity and enable easy access to a person in charge.

## II. LITERATURE SURVEY

Security is a major factor in all kind of aspects. This project [5] discussion will bring privacy all over the world. So in a thought of bringing privacy through security level, this project has been developed. This system mainly uses three divisions which are image acquisition module, embedded main board, and human machine communication module. Each unit is having its own major role over the project. In this paper, two major areas have been focused. Those are authentication and identification system performs the authentication function with the finger vein recognition. Every time when the user is going to use the system, the finger vein of will be scanned and comparison will be done. Finger vein recognition is very effective when compared with pattern recognition, pin number security the other type of Biometric security methods like finger print security, palm print security, image scanning and

some recognition techniques. FVR system uses the vein scanning. As it is related to the biological factor, it is very difficult to change the vein information of a user. So, this system can provide more security than any other security level. In this FVR system [6], we are focusing on high security with RFID technology initially each and every user will be given with one RFID secret card. This will make an effective initial communication between the user and the device. This technique will make the device to extract the user information from its memory once the vein image is taken, then it will be compared with the data base for further processing. This will generate a matching result in the image acquisition platform.

### III. BACKGROUND

Below are the modules used to develop the kit

#### A. Raspberry pi B+



Fig. 1. Raspberry Pi board

Raspberry pi [7] is a portable and powerful minicomputer. The board length is only 85mm and width is only 56mm. Its size only as big as a credit card but it is a capable little PC. It can be used for many of the things that your desktop PC does, like high-definition video, spreadsheets, word-processing, games and more. Raspberry Pi also has more wide application range, such as music machines, parent detectors to weather stations, tweeting birdhouses with infra-red cameras, lightweight web server, home automation server, etc. It enables people of all ages to explore computing, learn to program and understand how computers work.

#### B. PIR HC-SR501



Fig. 2. PIR Board

PIR sensors allow [8] you to sense motion, used to detect whether a human has moved in or out of the sensor's range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR,

"Passive Infrared", "Pyroelectric", or "IR motion" sensors.

PIRs are basically made of a pyroelectric sensor which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

#### C. RFID Mifare RC522



Fig. 3. RFID

A Radio-Frequency identification system has three parts:

- 1) A scanning antenna
- 2) Transceiver with a decoder to interpret the data
- 3) Transponder - the RFID tag - that has been programmed with information.

The scanning antenna puts out radio-frequency signals in a relatively short range. The RF radiation does two things:

- 1) It provides a means of communicating with the transponder (the RFID tag) AND
- 2) It provides the RFID tag with the energy to communicate (in the case of passive RFID tags)

This is an absolutely key part of the technology; RFID tags [9] do not need to contain batteries, and can therefore remain usable for very long periods of time (maybe decades). When an RFID tag passes through the field of the scanning antenna, it detects the activation signal from the antenna. That "wakes up" the RFID chip, and it transmits the information on its microchip to be picked up by the scanning antenna. Large numbers of tags can be read at once rather than item by item.

## D. Camera omnivision 5647



Fig. 4. Camera

The OV5647 is OmniVision's [10] first 5-megapixel CMOS image sensor built on proprietary 1.4-micron OmniBSI™ backside illumination pixel architecture. OmniBSI enables the OV5647 to deliver 5-megapixel photography and high frame rate 720p/60 high-definition (HD) video capture in an industry standard camera module size of 8.5 x 8.5 x ≤5 mm, making it an ideal solution for the main stream mobile phone market. The superior pixel performance of the OV5647 enables 720p and 1080p HD video at 30 fps with complete user control over formatting and output data transfer. Additionally, the 720p/60 HD video is captured in full field of view (FOV) with 2 x 2 binning to double the sensitivity and improve SNR. The post binning re-sampling filter helps minimize spatial and aliasing artefacts to provide superior image quality.

OmniBSI technology offers significant performance benefits over front-side illumination technology, such as increased sensitivity per unit area, improved quantum efficiency, and reduced crosstalk and photo response non-uniformity, which all contribute to significant improvements in image quality and colour reproduction. Additionally, OmniVision CMOS image sensors use proprietary sensor technology to improve image quality by reducing or eliminating common lighting/electrical sources of image contamination, such as fixed pattern noise and smearing to produce a clean, fully stable colour image. *It delivers RAW RGB Imagery to the RaspberryPi through the on board camera connector interface.*

## E. GPS

GPS [11] Was developed by the U.S. Department of Defense (DOD) and can be used both by civilians and military Personnel. The civil signal SPS (Standard Positioning Service) can be used freely by the general public, whilst the Military signal PPS (Precise Positioning Service) can only be used by authorized government agencies. The first Satellite was placed in orbit on 22<sup>nd</sup> February 1978, and there are currently 28 operational satellites orbiting the Earth at a height of 20,180 km on 6 different orbital planes. The below figure shows the GPS module chip and it uses serial communication.

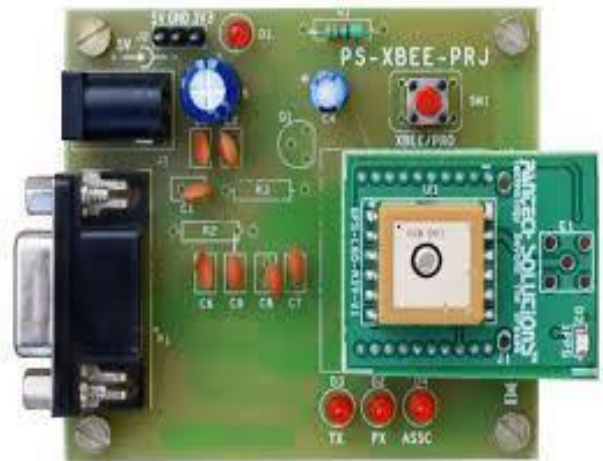


Fig. 5. GPS Board

## IV. DESCRIPTION

An organization is fundamentally dependent on its workforce, with it being its biggest expense as well as its chief reason for generating revenue, growth and profit. An organization here can refer to any industry, institution or company which employs people. As such it becomes essential to maintain reliable time and attendance information to make human resource management a lot easier. Also security is an essential issue and care has to be taken to insure that there is no breach or ambiguity in organizations and no unnecessary people enter in any workforce premises.

As such it becomes essential to have an attendance/intrusion detection system in every industry, institution and company. Most organizations have an automatic system to deal with this work. There are many reasons for doing so. Firstly, an automatic system reduces the probability of error, it increases productivity as it saves employee time which would be spent in case of manual attendance system and in the long run it saves money as it reduces labor cost. Here we will be implementing one such attendance/intrusion detection system. There are many algorithms and methods used to create attendance systems, each of them have some advantages and some or the other disadvantages. The idea behind the attendance/intrusion detection system used in this project is based on detecting a person's presence near the entry point where the system is placed via motion detection. Once motion is detected in its certified range, the system then asks for a person's id card and upon matching the id card with the verified id list in its database, the system allows entry and in case on any ambiguity it clicks a picture of the person in front of the entry door and alerts the necessary authorities about the situation. All the information would also be stored on a web page so that people with the right access can view the page from anywhere in the world and also to ensure that there would be no discrepancy or altering of information in the system on site itself.

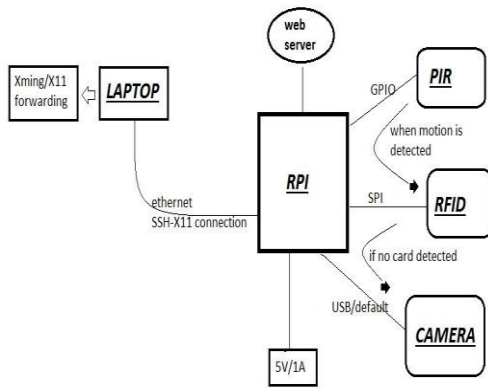


Fig 6. Block Diagram of Circuit

This diagram describes the method implemented to create the attendance/intrusion detection system implemented in this project. The microcontroller used is called as Raspberry Pi B+. The microcontroller is the brain of the system which ensures that every peripheral attached to it implements the function it is responsible for and therefore the whole system works efficiently and smoothly. For the Raspberry Pi to do the above mentioned functions it needs to be told, or rather coded as to how to do these functions and in which order every peripheral attached to it must function. We code into the Raspberry Pi by attaching it to a computer via RJ45 Ethernet cable. The Pi is powered by a 5V/1A power source. SSH (Secure Shell) is a network protocol used to provide a secure connection over an insecure network in a client server architecture, connecting an SSH client with an SSH server. The SSH client used is called PuTTY and the server used is Xming which is an X11 server for Microsoft Windows Operating System, Using this client-server interaction allows a Microsoft Windows user to open the Linux based Raspberry Pi Graphical User Interface( GUI ). The GUI possesses IDLE (Integrated Development Environment) for the Python Language. The code can be written here and on running it the result can be seen on the peripherals attached to our microcontroller. In order of use, the first peripheral attached is the PIR (Passive Infrared) sensor which is used for motion detection. The model used in this project is the HC- SR501 which has a range of 3-5 meters. Upon detecting motion the PIR is activated which triggers the RFID sensor into activation. The RFID sensor used is called the Mifare RC522 sensor and it can detect the UID (Unique Identification) of any RFID tag which works at the specified frequency of the RFID sensor, which in this case is 13.56 MHz. When the RFID is activated, the person in front of the system brings his/her RFID tag near the RFID sensor where it automatically reads the UID of the tag in question. The Raspberry Pi then matches the UID with the list of UIDs provided in the MySQL database. If the UID is present in the database then the information regarding that person is displayed and he/she is allowed entry. However, if the UID does not match with the list of UIDs present in the database then a message reading 'unauthorized' is displayed and a camera attached to the

Raspberry Pi clicks a picture. The camera used is named Omnivision 5647 and it is a Raspberry Pi compatible camera. A condition remains when a person does not have a RFID tag along with him/her. When such a person comes in front of a camera, then motion is detected but no card is presented. Therefore, the Raspberry Pi is programmed in such a way that if no card is placed in front of the RFID within 2 seconds, the camera is again activated to click a picture and it is stored with the name 'intruder'. This is the basic on-the-spot working of the system. and GPS is attached to the raspberry pi it shows the location. This information is fed to the internet and via the internet it will transform the data to the APP and the parent or school authority can easily track the required information by using the app.

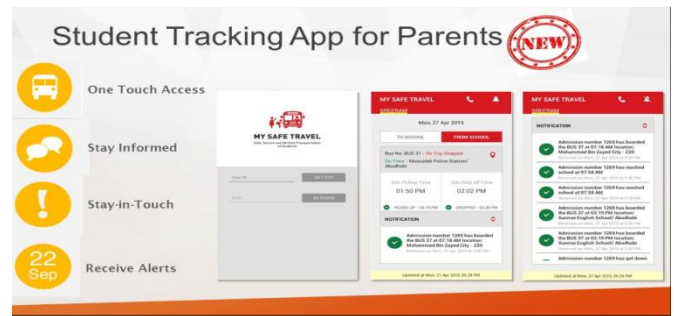


Fig 7. Android App based student tracking

## V. CONCLUSION

This project is to design an attendance maintenance system for schools, colleges and well as organizations which also has the provision to detect any form of intrusion in restricted areas and report it immediately. The idea is to make the whole system as clear and easy as possible.

The idea is to make the whole system as portable as possible by adding as few numbers of peripherals as possible. In the near future it is hoped that by limiting the number of peripherals and by seeking out the best peripherals in terms of optimization of cost and effectiveness the whole attendance system can be improved. Any tampering of the whole attendance system would not be of any use as the result would be immediately made available online.

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