SMART IoT-BASED LATECOMER / DEFAULTER PREDICTION SYSTEM FOR EDUCATIONAL INSTITUTIONS

S. Amutha¹, G.Ananthi², J. Raja Sekar³

Assistant Professor (Senior Grade)¹,², Associate Professor³
amuthavasan@mepcoeng.ac.in¹, ananthi@mepcoeng.ac.in², jrsekar@mepcoeng.ac.in³

ABSTRACT - In current scenario, educational institutions insist the learners to be punctual. Usually students who are late to their classes are being monitored manually. It is not feasible to monitor regularly since there is a need for manpower at a particular time to register the students those who are late. In such cases there is a need for an automated system to monitor the late comers. This is implemented by acquiring input information from sensors. Passive Infrared Sensor is used to detect the motion of the object whereas RFID is used to retrieve the student details which can be mapped from their unique Id. Along with this, a camera module is used to capture the images of the unidentified entries those does not wear ID cards. The activation of the monitoring system can be customized with the help of the application deployed at a local server. The system can be made active in particular duration with the various time specified. As part of the automation process, an alert mail will reach the respective authority with the list of latecomers and the images those who are unidentified by RFID. By these methods the identification of the late comers will be automated and makes an easier way to track the late comers.

Key words: Object detection, RFID, Latecomer identification, Defaulter prediction

1. INTRODUCTION
In current era late comers are detected manually ie., a person has to monitor the late comers. It is not feasible to do the monitoring manually. So there should be an automated system to detect the late entries of the students. Without manpower, the process has to be done. For such cases, sensors are used to detect the presence of an object initially for this we use PIR (Passive Infrared Sensor). After the detection of any object a time delay has been set to respond from the Passive RFID reader. If there is no response from the Passive RFID reader, camera module will get activated and capture the image of the Object that is detected. Else the response from the Passive RFID reader will be sent to the gateway server.

The received data from the server is then updated as a late comer entry and then scheduled at a time to write the entries in a Excel sheet and mail to the respective authority. Also the images captured will be sent to the respective authority.

2. RELATED WORK
Urfaligl et.al. in 2008 [1] proposed a modified passive infrared radiation or pyroelectric infrared (PIR) sensor to classify 5 different human motion events with one additional event. Event detection enables new applications in environments hosting dynamic processes. Typical event detection applications are based on audio or video sensor data. Given a data stream, often the task is to find or classify specific dynamic processes. Most of the applications for the monitoring of human activities in an environment are based on video sensor data. As an alternative or complementary approach, low cost PIR sensors can be used for such applications. The classification is done by a Bayesian approach using conditional Gaussian mixture models (CGMM) trained for each class. It was shown in experiments that using PIR-sensors, different human motion events in a room was successfully detected.
A wireless system to detect and maintain the attendance of a student and to locate a student was developed by Aamir Nizam et al. in 2011 [2]. The students ID (identification) card is tagged with an Radio-frequency identification (RFID) passive tag which is matched against the database and once it is finalized, his / her fingerprint is verified using the biometric fingerprint scanner. The guardian is intimated by a sms (short message service) sent using the GSM (Global System for Mobile Communications) Modem that the student has reached the university or not on a daily basis. In the present day every guardian is worried whether his child has reached safely or not. In every classroom, laboratory, libraries, staffrooms etc. a RFID transponder is installed through which the location of the student and staff is detected. There is a website through which the student, teacher and the guardians can view the status of attendance and location of a student at present in the campus. Locating a person is done by two means that is via the website or by sending the roll number of the student as a sms to the GSM modem which will reply by taking the last location stored of the student in the database.

YeopSabri et al. [3] proposed for Smart Home Automation technique with Raspberry Pi using IoT and it is done by integrating cameras and motion sensors into a web application. To design this system, we are using a Raspberry Pi module with Computer Vision techniques. Home appliances connected through a monitor based internet are controlled through this strategy. Raspberry Pi operates and controls motion sensors and video cameras for sensing and surveillance. For instance, it captures intruder's identity and detects its presence using simple Computer Vision Technique (CVT). Whenever motion is detected, the cameras start recording and Raspberry Pi device alerts the owner through a SMS and alarm call.

The authors concentrate totally on the present generation life how they can get security to their home or office and control the devices by using android app just by using internet in their smart phones. The main security is provided by camera module which captures the images and uploads into the internet and also stores the same images in Raspberry pi module SD card. Raspberry pi acts like a small minicomputer which is totally a Linux platform. WI-FI module is used to control the devices from remote location also by getting the status of the devices into smart phone android app.

3. PROPOSED WORK

The system is implemented with the objective of automating the process of students’ attendance entry. This system is applicable for all educational institution and IT industries which expect their employees to be punctual. The system is mainly focused on the students who are late to the classes are monitored and alerted via mail to the respective authority.

The main contributions for the proposed system are

1. The object detection which is used to identify the motion of the object using smart sensors.
2. Person identification is done to retrieve the details and capturing image for the unidentified user.
3. Predicting latecomers / defaulter details using frequency count technique.
4. Administrative Tasks for database update

Figure 1 depicts the architecture diagram of the proposed system. The data acquisition system is implemented using the RFID and Raspberry Pi board. Object detection is done with the support of passive infrared sensor. Once the motion is detected, the RFID reader starts capturing the images and identifies the latecomer. If there is no valid RFID value (i.e., if the person doesn’t wear id card), then image is captured for the unidentified entries. The acquired data is communicated to the local server where the entire automation control resides. The data are updated for the users and a report is generated for the future reference. And finally the reports are mailed to the respective authority.
A. Object Detection

This module is used to detect the motion of the object. Detecting the object on motion with the help of PIR sensors which detects the object up to 10m long and 120° angle. The sensors are set to be active on four different times with a constant duration and motion are detected during this time. The time can be customized through the gateway server. Time delays are set in between the motion detection. PIR sensor is placed first in order to detect an object.

B. Capturing Image

This sub module is used to capture the image of the facing object or person. When the PIR sensor provides a signal to the Passive RFID reader the reader waits for the time delay for the detection of the card. If there is no detection up to the time delay the camera module gets activated and captures the image of the unidentified person.

![Architecture Diagram](image)

**Fig. 1: Architecture Diagram**

C. Person Identification

This module is used to retrieve the details of the person. As Passive RFID reader can be detected only at the line of sight, the range of detection is only up to 60mm. The RFID reader is set after the PIR sensor. Time delay of 1min is set for the detection of the card. Once the card is read by the reader the information in the card is retrieved. The information may be a unique ID of the person. The unique ID is then sent to the gateway server for further processing.

D. Defaulter Prediction

This module makes the local gateway server to receive the results from the acquisition device and it is also responsible for the administrative tasks like latecomer entry summarization, users update and alert communications.

This module is used to alert the entries through email. The Data are written to a excel sheet and it contains multiple sheets separated by departments. The images captured are sent to the server and stored. The filename of the image will be stored followed by the current date. Both the excel sheets and the images of the current day will be sent through email to the respective authority.

This module provides a local gateway server for the customization of time, email. Also it provides way to perform action in the database. The gateway server consists of two parts admin part and user.
part. **Admin part** contains the time setting i.e., the time can be customized here. When there is a need to update the time the admin can trigger the time setting and send a signal to the system.

The data stored at the local server is used for further defaulter prediction and summarizing the reports based on the user requirements.

### 4. IMPLEMENTATION AND HARDWARE INTERFACING

The System implementation is done with the Raspberry Pi. The Raspberry Pi is interfaced with the PIR, RFID, Web Cam and this acts as a system now. The System is booted up with the Raspbian operating system and the system starts when it receives the request from the server.

![Hardware Interfacing Diagram](image)

**Fig. 2: Hardware Interfacing**

The figure 2 depicts the interfacing of the following sensing devices with the computing device (Raspberry Pi):

1. Passive Infrared sensor
2. RFID reader
3. Camera module

### 5. EXPERIMENTAL RESULTS

The table 1 summarizes the number of late comer entries for a day, month and per department. This data can be used to identify the frequent latecomers and alert them to be punctual. The same is communicated to the concerned higher authorities also.
6. CONCLUSION AND FUTURE ENHANCEMENT

The Sensor Based Late comer Identification System is developed to identify the late comers automatically. The system is developed to make the students to be punctual to their classes. The late comer entries are written on a excel sheet and the unidentified entries are captured using the webcam and these results are mailed to the respective authority. The System provides time customization and various start time are given with a duration and the system runs only on that duration and waits for the next start time. The Reports are generated to view by day-wise, month-wise, department-wise on the site for later use.
In future the system can be developed by interfacing the Raspberry with Active RFID which detects the person on motion and need not be at line of sight. The image obtained for unidentified entries can be processed using image processing techniques by comparing the obtained image with the image in database and the information of that obtained person can be written in the excel sheet.

7. REFERENCES
[1]. O. Urfaliglu, Emin B. Soyer, B. UgurToreyin, A. Enis Cetin, "PIR-sensor based human motion event classification", IEEE Signal Processing, Communication and Applications Conference, September 2008
[2]. AamirNizam, ArundhatiNavada, SanchitAgarwal, SiddharthPatil., "Automation of attendance system using RFID, biometrics, GSM Modem with .Net framework" International Conference on Multimedia Technology, 2011.
[3]. YeopSabri, M.K. Abdul Aziz, M.Z.A. Mohd Shah, M.S.R. AbdKadir, M.F., Smart Attendance System By Using RFID, Applied Electromagnetics, 2007.
[4]. Vamsikrishna Patchava, HariBabu Kandala, P Ravi Babu, "A Smart Home Automation technique with Raspberry Pi using IoT", International Conference on Smart Sensors and Systems (IC-SSS), 2015
[5]. https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/how-pirs-work
[6]. https://www.raspberrypi.org/
[7]. Z ZAIN, “High Speed And Lowpower Gdi Based Full Adder”, Journal of VLSI Circuits And Systems, 1 (01), 5-9,2019
[8]. Pb Agus Ristono*,”Design Of Reliable And Efficient Manchester Carry Chain Adder Based 8-Bit Alu For High Speed Applications”, Journal Of VLSI Circuits And Systems, 1 (01), 1-4,2019