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Study on Implementing Automated Classroom Performance System for Recording Student Attendance

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Abstract: We explore and study the implementation of an automated classroom performance system for recording student attendance. Classroom attendance is closely linked to student success. The traditional method of recording student attendance by signing on paper or by calling students names is time consuming and since it has the human intervention element it is insecure and hence inefficient. This paper introduces the replacement of manual registry system with automated computer based smart tag and reader. These customized tags and receivers are used to register a student's presence in class. This information is later passed on to the administrator's for admin follow up. The collected and stored data can be analyzed along with other student data using predictive analytics methodologies to predict student's success in the program and also intervene at an earlier stage to help towards the success of the student.

Keywords: Automated attendance, student journey, Predictive analytics, monitoring attendance

1. Introduction

There is a strong connection between student attendance and their achievement. Absenteeism affects student performance and its ripples on to their educational journey. Sudheer et al. (2010) agree that from a teacher's perspective, recording and collating student's attendance for weeks to gather and analyse is a herculean task. In this project we intend to streamline the attendance register process and also change it from a manual process to automated computerised process.

The concept of using the IoT technology involves the use of sensors that can be tracked by base stations or readers positioned at strategic locations. Students and teachers will be issued with name badges that are smart and embedded with sensors that can be recognized by readers. The readers help to identify and track the presence of individuals at specific locations. This concept can be used for recording attendance of students in classes. Kassem et al. () have conducted a similar project, however their RFID tag does not monitor the attendance of students for the entire period in class, which means students could log in and walk out of the lecture.

Technologies available today for this application can be classified into two categories. (1) Scanning technologies and (2) Unobtrusive, Behind the Scenes technologies. Technologies that involve scanning the individual's ID or badge at a scanning station form part of the former group while technologies that involve unobtrusive sensing of the individual's presence in a location form part of the later. Examples of Scanning technologies include Bio-Metric Sensors, Bar Code Readers and Finger Print Readers. Examples of Unobtrusive, Behind the Scenes technologies work on sensors that are Blue Tooth, Wi-Fi, GSM or GPS enabled. These involve sensors that can be recognised automatically by readers. Also using a camera to scan individuals and recognising them using image recognition is part of this category of technology. RFID can belong to both categories depending upon how it is implemented. An RFID reader installed at the gate will automatically recognise an individual carrying an RFID tag. Alternatively, the individual can scan or touch his RFID tag on to a scanning device to register presence. Unobtrusive, Behind the Scenes technology has the advantage of detecting the continuous presence of an individual at a location. This will be particularly suited for recording student attendance. It requires minimum infrastructure changes as it can operate wireless.

2. Automated Attendance Model

In this section, we describe how this concept can be put to work for attendance recording. Each course has its own login. The faculty will be able to see all the students registered for the course. As students enter the class and occupy seats, their presence is sensed by the reader installed in the class room and the student's attendance gets automatically recorded. Students present in the class will have a green blob besides their names and all other students will be in red. The system will also record the entry and exit times. Multiple entry and exit times can also be recorded. The attendance data can be automatically sent to a central administrator for further processing, reporting and storing. The attendance data collected can be used for multiple purposes including tracking student performance, identifying weak students with a view to providing them with more resources and guidance as well as guiding staff to tweak / change their teaching methods to make students more interested in attending class.

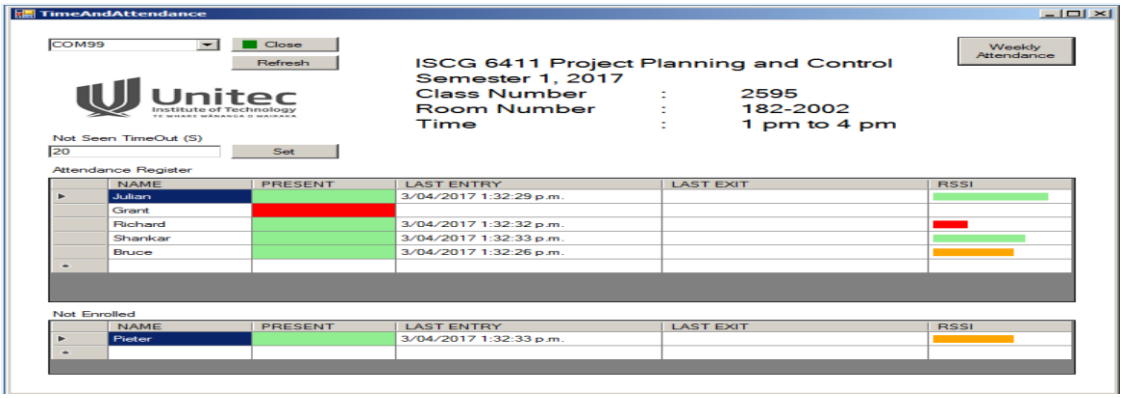

Figure 1.

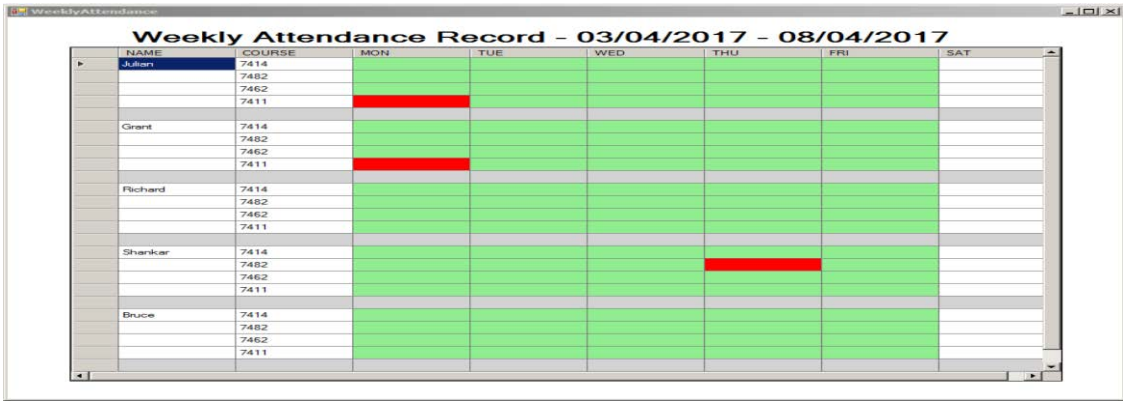

Figure 2.

3. Automated Attendance Benefits

There are several benefits of using this technology for attendance recording:

- Reduction in errors – Risk of human error in recording attendance is reduced considerably.
- Increase in productivity - As the process is seamless and automatic, productivity increases and makes day-to-day operations more efficient and convenient.
- Saves money – Implementing a technology based automatic attendance solution with smart badges and readers will help to reduce labour costs.
- Increase student and staff satisfaction - Removes the drudgery of manually marking attendance for the staff and the students anxiety of ensuring their attendance is recorded.
- Increase in security – the smart badges can be used not only for tracking attendance but also for controlling access to restricted areas such as laboratories and other facilities including equipment such as photocopiers, scanners and printers.

4. Limitations of Automated Attendance Model

The following are two main limitations of this attendance recording model.

- Technical limitations:
  - Battery life – It is important for the battery to last for at least a year. Clever hardware and software design can enable to extend the battery life.
  - Sensing distance – this will usually not be a major limitation for most class rooms as it can be managed using a larger number of sensors or readers cleverly placed inside the class rooms.
  - Sensing of students outside the class room – there is always a possibility of the sensors picking up students who are just outside the class room. However such students can be identified and excluded as (1) they would not be among those enrolled in the course and (2) the detection of their presence would not be continuous and last throughout the duration of the class. Another way of dealing with this issue is through a clever design of the antenna on the sensors / readers which will only sense the tags present in a confined area.
- Non-technical limitations:
  - Students may not have the tags on them all the time. Such situations may be few and far between. In all such instances, a manual back up would be required.
  - Students may feel that they are being tracked. This is a false belief as the system is not tracking the student. It only indicates whether a student is located in a specific area or not at a given time; the area here being the class room.

5. Other systems for Automated Attendance Model

The other systems available for an automated attendance application are Bio-metric scanning, Facial recognition system using camera scans, Finger print reading, Bar code scanning and RFID scanning. All of the above except facial recognition require students to queue up at a scanner and have their badge or some part of their body (eye, finger) scanned. This will be time consuming and if it is a large class room, time spent in the queue would be wasteful. All of the above except facial recognition using a camera will not be able to keep track of the continuous presence of students in the class. They will only be able to track the entry of students into the class. As far as cost is concerned, bar code scanning may be cheaper than the rest.

6. Conclusions and Future Work

Once implemented this system would a) automate the entire process from recording students attendance until following up on non attendance, b) reducing fake attendance marking c)minimize teaching staff's time on admin matters. Future developments could include trialing biometric finger print registry system, real time email notification to students on their absence and their subsequent monthly-customized email to students on their progress. Further study using predictive analytics to analyse student's success along with other relevant student data would enable academics to intervene earlier with a view to help students succeed.

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