

MONITORING STUDENT ATTENDANCE USING A SMART SYSTEM AT TAIF UNIVERSITY

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ABSTRACT

The university system in the Kingdom of Saudi Arabia is concerned with student attendance for lectures, and it is the responsibility of lecturers to monitor student attendance for each lecture. By the end of the semester, students get an attendance register indicating which lectures the student has attended and it reports the calculated percentage for each student's attendance in each course. Universities have regulated the mechanisms and the acceptable percentages of student absence. The process for a lecturer to manually check student attendance consumes a lot of time and effort, either during the lecture or when in the process of emptying absenteeism and inserting it into the university's electronic system. Therefore, Saudi universities compete to find modern methods of checking student attendance that will avoid the disadvantages of manually taking attendance. For this reason, they have produced electronic attendance systems, for example, using a student's fingerprint, an eye recognition system, or a mobile phone system to read a QR code designed for the same purpose. All of these systems have the disadvantage that they consume a lot of time, as all students have to line up at the fingerprint reader or the eye detector for identification. Therefore, the problem of the consumption of lecture time is still present, even with these modern systems. Therefore, the aim of this research is to propose a smart mobile application that is able to check the attendance of students without having to consume lecture time or require any effort from the lecturer. The system automatically recognizes the attendance of students through their university ID cards. Each lecturer would use his/ her own mobile phone to use the proposed system to check the attendance of students instead of using manual method to register the attendance of students and the students' ID cards that are detected by coming within range of the lecturer reader would represent present students, and missing student ID cards represent absent students

KEYWORDS

Context Awareness, RFID, Monitoring Student Attendance.

1. INTRODUCTION

The main objective of this research is to propose a design for an automatic student attendance system that could be used in schools, universities, or other institutions. The basic infrastructure required by the proposed system includes every classroom should be provided by a device called Turck. That device could be used by lecturers which made their phones able to deal with RFID technology

Student cards will be designed so they can be recognized and readable by the lecturer phone. A mobile application called RFID Based Attendance System had specifically designed for this system. When a lecturer enters a hall, he or she will log in the attendance system; consequently the list of students in the corresponding section will appear. When the lecturer ready he/she can run the attendance system to start working so students enter the hall, their attendance will be registered in the system automatically.

Turck would be distributed throughout the halls. The proposed system would anticipate the presence of lecturers in a classroom based on their schedules. In the case that a lecturer enters a hall by mistake, the proposed system able to recognize and inform the lecturer about that mistake. Once the attendance system has been activated by the lecturer, the phone with Turck reader would automatically start scanning and recording the presence of students by using their ID cards. The reader would scan and read the students' ID cards. The system would record each student's time to classify the students into three categories: present and on time in front of the names of students present at the beginning of the lecture, late in front of the names of students who arrive 15 minutes after the activation of the system by the lecturer, or absent for students whose ID cards were not detected by the reader. Since the reader will work from the time of activation by a lecturer until it is shut down by the same lecturer, the system will record the time of attendance of all students in the section.

1.1 OBJECTIVES OF THE PROPOSED STUDENT ATTENDANCE SYSTEM

- 1 Obtain the percentage of student attendance at the college/university level, the department level, and the course level, while documenting different time periods, from one day to a week to a semester. Studying the statistics for different times may lead to additional research to learn the most appropriate time for students.
- 2 Easily generate lists of good students, students close to reaching a forbidden level, and students forbidden in any section.
- 3 Reduce time spent checking student attendance, requiring little effort from the lecturer

2. LITERATURE REVIEW

[1] Confirmed that RFID using an Android application could replace the traditional method of instructors checking the attendance of students. [2] produced a mobile application that would check the attendance of students and save the attendance data to a teacher's mobile device or in the servers; it could then update parents regarding the attendance of their children via email and SMS. [3] Attendance system used wireless technology to scan student cards that feature unique barcodes used to identify students. [4–8] Presented systems based on the use of biometrics to identify students; all of these systems were designed for the management of attendance students' control. [9–10] Proposed a mobile application intended to check the attendance of students using facial recognition techniques. [11] Produced mobile application called Muffin, consisting of the mobile application, Arduino board, and a PC. Muffin was designed to track the attendance of students in classes. [12] Employed the use of questionnaires and interviews to study the need to develop an electronic attendance system; the academic instructors made useful recommendations. [13] tracked the attendance of students using multiple Kinects. [14] Proposed checking the attendance of students that are able to count the students and work against impersonation cases but it is based on using Arduino devices, face detection systems and face recognition systems to achieve these valuable goals. [15] Proposed an attendance system that would use fingerprints to monitor the attendance of staff and students. [16] Added teaching idea to assist with keeping the attention of students on the lecture by scanning QR codes via their smartphones, then rewarding them, just like what is used for online computer games. [17] Proposed an Internet-of-Things Based Smart Resource Management System that could be used for commercial or educational purposes; included an Arduino system used to scan a user ID and send the data to a cloud server to be retrieved for use in the Android application to check student attendance.

3. DESIGN OF THE PROPOSED CHECKING ATTENDANCE SYSTEM

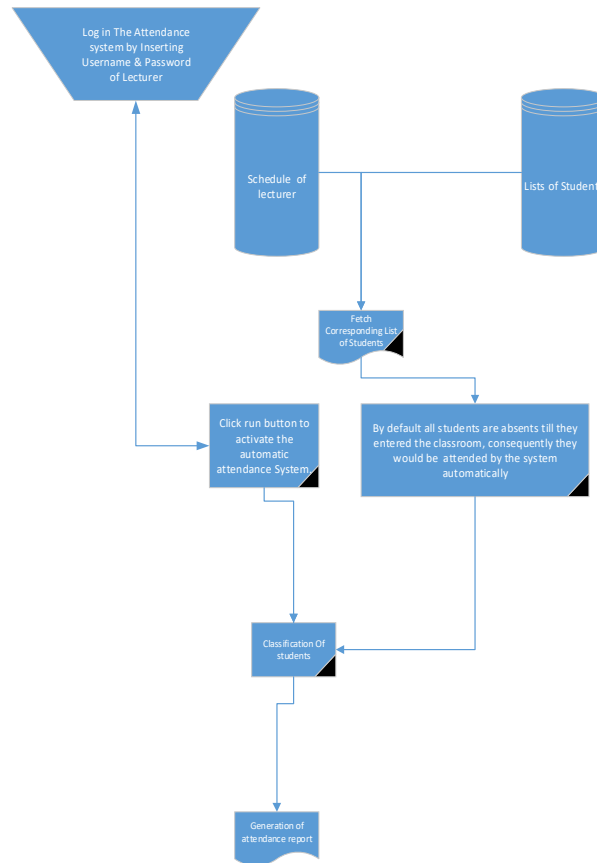


Figure 1. Flowchart of the structure of the proposed checking attendance system

The main goal of this research is to propose a smart system that will track student attendance for the applicable lectures, without requiring much effort from the lecturer or time from the lecture in order to implement. The other significant benefit of the proposed system is that it does not require students to line up in front of the reader to register their attendance; the smart system is able to recognize students by detecting their IDs automatically when students enter the classroom. Students are only required to pass within 3 meters of the teacher’s desk to be within range of the reader, and registered as present as a result.

As shown in Figure. 1, the lecturer only needs to turn on the attendance system using his or her smartphone; consequently, the system would do the task automatically by itself until it generates the attendance report. Once the lecturer logs into the Attendance system, it will fetch the list of students in the corresponding section from the database in the university’s system based on the consistency of the time and the section number of the lecturer’s schedule. Then, once the lecturer activates the attendance application, the RFID reader system will monitor the attendance of students who pass within its range. Figure. 2(a) shows the RFID reader that would attach to a lecturer’s cell phone. The RFID tags in Figure. 2(b) represent students’ identification cards. Therefore, those student ID cards detected by the reader represent students who are present, and undetected student ID cards represent absent students. One significant feature of the proposed system is its ability to detect and register the arrival time for each student in the section, so present, late, and absent students is easily recorded.

4. TESTING AND EXPLORING THE RELEVANT COMPONENTS

4.1 THE PROPOSED RFID TECHNOLOGY

Any RFID system contains two main components, a reader and tags. The lecturer's phone represents the reader, and the students' identification cards represent the tags. The teacher's desk in every classroom must have a TURCK device so lecturers can use their phones for the attendance system. The TURCK device allows a system to detect and record the circumstances of each student in the corresponding section by reading their ID cards. The system reads a unique identification number that corresponds to the RFID tag found on each student's ID. The system records the arrival time for each student when the student enters the range of the reader; an absence is noted for students whose ID cards were not detected by the RFID reader.



Figure 2. (a–b): The system components (RFID reader and tag)

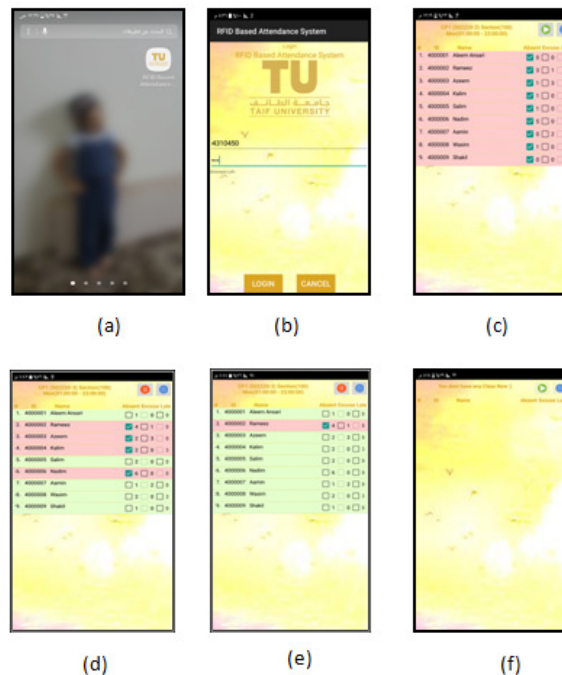


Figure 3. (a-f): Screenshots of the Attendance system

4.2 TESTING THE PROPOSED CHECKING ATTENDANCE- APPLICATION

What follows are the real-world tests of the proposed system. The screenshot in Figure. 3(a) shows a proposed icon for the application. Figure. 3(b) presents the login page of the system, which requires the authorized lecturer to enter his/her username and password to access the system. Consequently, the system will fetch and produce a list of students in the corresponding section, and registers all students absent by default, as seen in Figure. 3(c). The lecturer will click the run button to start checking the attendance of students before requesting that students enter the classroom with only their ID cards in their hands, for easy detection by the reader. As shown in Figure. 3(d), students had their cards scanned and their states changed from absent to present based on their arrival time. Student No. 2 in Figure. 3(e) did not attend the lecture, and this absence is indicated by that student’s unchanged state, unlike the states of the student’s classmates.

The proposed system registers students as late when they arrive 15 minutes after the start time of the lecture. Additionally, in case the lecturer does not have a lecture at that time, the system recognizes this mistake based on the classroom number and time found in the lecturer’s schedule and warns him or her of this error, as seen in Figure. 3(f).

5. SAMPLE ATTENDANCE REPORTS GENERATED BY THE PROPOSED SYSTEM

5.1 ATTENDANCE STATISTICS OF STUDENTS BY SECTION

The system will generate attendance statistics for all students from one section. In this case, Figure. 4 represents the attendance of 10 students from section 100. Here, 4 sessions have been conducted. The graph shows that student 4000004 has not missed any sessions, and is the most punctual student. Student 4000005 has not attended any sessions and student 4000006 has attended half of the sessions.

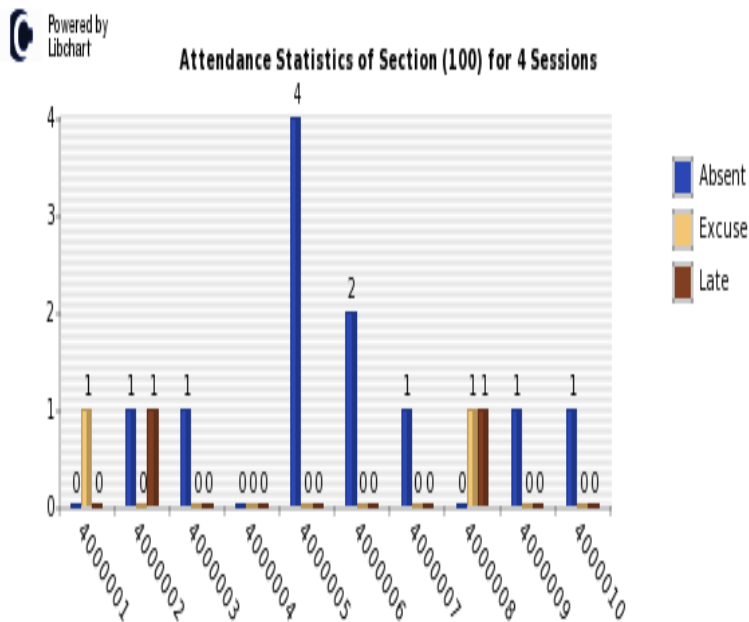


Figure 4. Attendance statistics of students by section

5.2 CUMULATIVE ATTENDANCE STATISTICS OF STUDENTS BY SECTION

Figure. 5 displays the attendance pattern of 10 students in section 100, where 4 sessions have been conducted. For every presence, a student’s slope will rise, and for every absence, a horizontal line will indicate no change in the slope. The chart shows that student 4000004 (yellow) has attended all sessions, as indicated by the steep slope, and is the most punctual student. Student 4000005 (orange) has not attended any sessions and student 4000010 has attended the first 3 sessions.

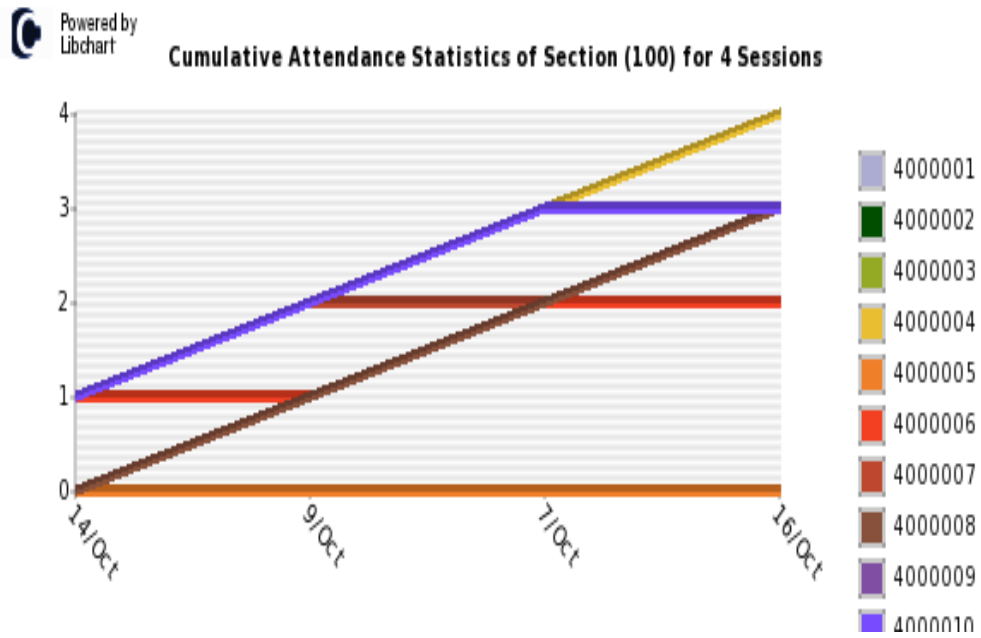


Figure 5. Attendance patterns of all students from one section

5.3 ATTENDANCE STATISTICS OF STUDENT BY DAY

The proposed system could also generate attendance statistics for a student by day. Figure. 6 displays the attendance statistics for student 4000006, who has attended all sessions on Mondays and Tuesdays, but has not attended any sessions on Sundays.

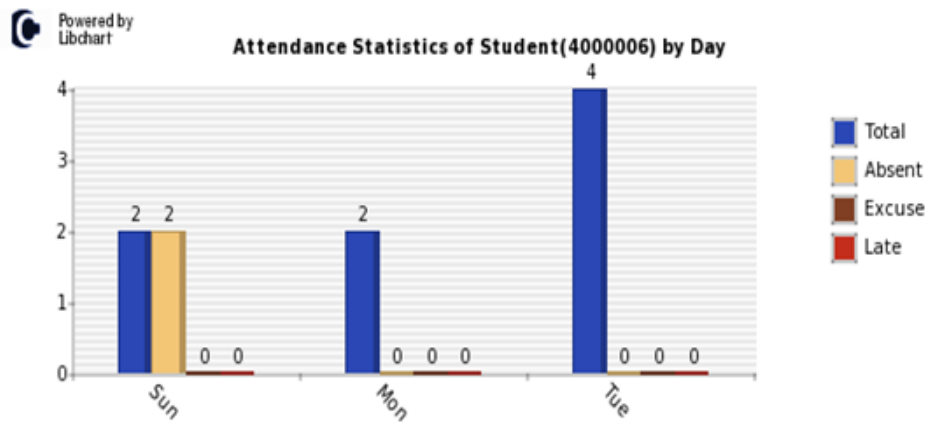


Figure 6. Attendance statistics of a student by day

5.4 ATTENDANCE STATISTICS OF STUDENT BY SECTION

The system can analyze the attendance of students from different sections; similar information could be useful for teachers who care about advising matter. Figure. 7 represents the attendance statistics for student 4000006. This student is enrolled in two sections; he or she has attended 2/4 sessions for section 100, and all sessions for section 200.

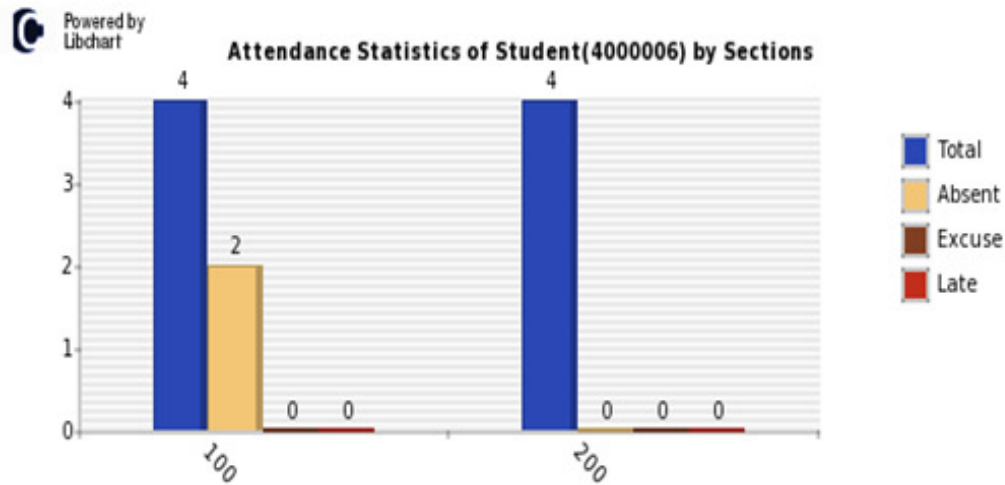


Figure 7. Attendance statistics of a student by section.

Figure. 8 shows the structure of the database as used by the prototype.

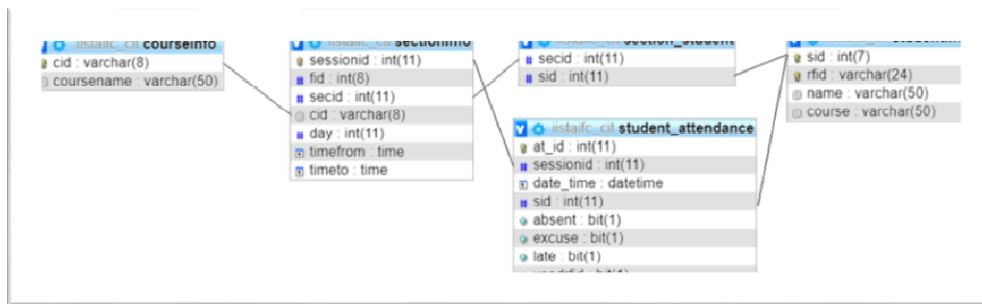


Figure 8. Database structure.

3. CONCLUSIONS

Checking the attendance of students using traditional manual methods consumes a lot of time and effort, particularly for huge classes. However, most available modern solutions have great disadvantages in terms of requiring a high-cost infrastructure or limited functionality. For instance, biometric systems like fingerprint scanners require students to line up in front of the machine for it to be able to serve its purpose, which is not a good solution when considering the lecturer’s time that is consumed. Therefore, this research proposes an attendance-checking system without a high cost and that avoids consuming any time or effort from lecturers or students. Through this proposed mobile app based on RFID technology, a system can monitor the attendance of students at a low cost and without the limitations of other available systems.

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