

E-Attendance System using Waterfall Software Development Life Cycle Simulation

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Abstract - This study provides a unique insight to computerization of attendance registration system with the exploitation of Waterfall Software Development Life Cycle technology. The development of this software originated from the importance of records of students' attendance that influences academic accomplishments in higher institutions of learning. The traditional way of storing and accumulating records is always liable to different degrees of difficulties in accessibility, unsafe, maintenance discrepancy, human errors and frauds. The recommended software overcomes the inadequacy challenges of the work-intensive manual system in registering students' attendance records. In this application, Hypertext Pre-processor and My Structure Query Language were used as back-end design, while Hypertext Markup Language, Bootstrap Cascading Style Sheet, and JavaScript were exploited as front-end tools. The web system was connected with database of the records inherent in the remote server. The web system also allowed the application to be mobile-responsive, thereby making it easier to explore for both lecturers and the students. It spontaneously calculated the percentage of students in attendance. The application is not only secured, fast in process, very efficient and reliable, but also reduced pen and paper consumption in comparison with the unsecured manual approach.

Keywords: apache server; manual paper-related; lecturers students' records; web-based.

I. INTRODUCTION

Online attendance system is a web application which runs seamlessly on desktop and mobile computers. It gives an effective ways in which teachers will have attendance records of students on their phones and computers. Practical indication had illustrated the major relationship relating to academic ability and students' attendance [1]. It is reported that students whose attendance records are always low generally have reduced information retention instructed during the lecture [2]. [3] described that students' attendance records of a course of study can show the students' attitudes towards that course, and this could be exploited to determine their ability and dedication to that course. The two manual ways of taking attendance are calling out the names of students and the students writing their names on the paper themselves using papers and pen [4] [5]. The attendance paper is usually circulated round for the students in the classes for registration. This exercise is time wasting and stressful. The paper approach for marking students' attendance and records are processed and conserved physically by the lecturers to recognize the students that are either absent or present in a particular class. The main problem was that most students abet their friends in signing the attendance in proxy. The lecturers have to repeat attendance marking whenever attendance sheets were lost or if the absentees were to register on the fresh attendance sheets [6].

This approach apart from being tasking for the teacher, it will also have a negative influence on

students and the lecturers as significant time is exhausted on registering, authenticating and acquiescing the records on the attendance sheet physically. Therefore, an online application development which aids the lecturers to mark student's attendance not only easily but also saves time and stress-free is necessary [7] [8]. In the online application, the attendance of the students are controlled and managed by the software which spontaneously evaluates all data, while the labour-intensive computations of attendance records are eliminated [4]. Software statistical analysis is necessary for working out the students' percentage that attended a particular class automatically unlike the traditional method of laborious manual calculations [9]. Record of the attendance using paper is unproductive, as it involves invaluable filing system by the institutional management. Due to these restrictions, there is a necessity to improve from the traditional approach to process reports and students' records.

In [10], the list of all registered students will automatically be displayed anytime the lecturer runs the application. The registration of students' attendance is performed by clicking on the checkbox and thereafter clicking on the register button which automatically marks their presence. This is a human tracking attendance. Other solutions to attendance are Radio Frequency Identification (RFID)-based student attendance application. The challenge associated with RFID-based system is that there is need for RFID cards and the RFID detectors are to be installed [4] [11]. The use of biometric system for application of attendance system is integrated with wireless communications [12]. [13] employed biometric system with the use of a palm-print method to register the employees. [14] also developed a biometric approach for attendance monitoring and examination screening in Yaba College of Technology, Nigeria. This technique ensures that imitation does not occur during examinations. The authors further stated that invented biometric devices decreased impersonation rate and student cannot forge, steal or misuse the other student's biometric identity. Programmers designed a record in a database that consists of timely mannered information of the Tag's Exit or Enter. From the record, the complete Stay-In time of students in each class is computed. If the calculated time is identical to the expected time (with the criteria fixed by the Administration) the student will be marked "Present" or else marked "Absent" [15] [16]. [17] also invented a camera of "plug and play" fixed at the entrance of every class, whereby students entering into the class will be captured by the camera and will then be compared with the image stored in the database, if it matches, the person will be counted as present in the class. By the means of local binary outline of the camera, the face will be recognized and the sums of the absentees are then calculated. All students with their respective faces were stowed in the raspberry pi, similar to a Personal Computer. Using max232, the details of the absentee will be transferred via the mobile device to the concerned parents and the Departments [18].

[19] reported that the student information tracking application with Android is capable of managing attendance of students on mobile devices. This application permitted the lecturers to mark attendance, edit attendance records, access student's bunks, send necessary pdf documents consisting time table for the examination, and question banks. It makes lecturing of the students more efficient. This web system is platform independent and may be set up on any iOS and Android device. The major problem however, is that whenever the web system is developed primarily for Android devices, it cannot work on iOS or on any other mobile operating system. Also, it is time wasting to mark the attendance on mobile devices. [20] on the other hand, developed an attendance system that can mark attendance through Bluetooth using lecturer's mobile device. Installed software assists in examining the student's mobile phone through the Bluetooth. Each time the Media Access Control manages the lecturer's mobile device, the attendance of the students can be enhanced.

[21] proposed a web based attendance application employing Near Field Communication (NFC) technology, and named it "Touch In System". In this software, Peer to Peer approach (similar to an android beam) and Reader / Writer approach (similar to a smart poster) are utilized. Each class consists of NFC reader linked with the lecturers' computers associated with the institution's network. Nevertheless, the student NFC supported phone is important to take attendance for a class. [3] invented a Biometric attendance management system which utilizes wireless ZigBee technology and consisting attendance reports that can be forwarded to the corresponding class representatives or Heads of Departments once in every 15 days. The outcome of the reports may also be sent to their parents' e-mail. According to these aforementioned, this study designed an automating attendance registering system utilizing Waterfall Software Development Life Cycle (SDLC) model with the aim of developing application that is mobile-responsive and simple for both lecturers and students.

II. METHODOLOGY

The design methodology employed for this paper is the SDLC technique and n also be denoted as Linear Sequential Life Cycle. This technology is utilized in building, designing and preserving information on industrial systems and computer softwares. It is very common and the oldest software development architecture. This approach is very easy to comprehend and mostly employed for minor projects in which their requirements are well-recognized. It involves series of phases in which the output of one phase provides the input to the next phase. In the requirement phase, the end users, students and lecturers are interrogated to discover their aim and objectives, requirements, and expectations from the system. In the second phase (design phase), the system is designed to meet the end

user's requirements. This entails the data flow diagram, context diagram and the use case diagrams. In the implementation phase, the graphical user interface of the system was designed with Hypertext Markup Language, Bootstrap Cascading Style Sheet, and JavaScript were used as front-end tools, while Hypertext Pre-processor and My Structure Query Language were employed as back-end design. The system interconnects with the database located on a remote server. It is to make sure that the software is mobile-responsive so as to make it easier for both the lecturers and students to use the application. In the testing phase, the work of each component of the application designed was tested and is integrated into a system. Finally, we developed the system to accommodate changes for continuing the system after deployment.

III. CONCEPTUAL DESIGN OF THE SYSTEM

Conceptual design of the system offers a framework of the design carried out by using the use cases diagram, flow chart, and data flow diagram. Data flow diagram illustrated in Fig. 1 shows the relationship in the various entities of the system.

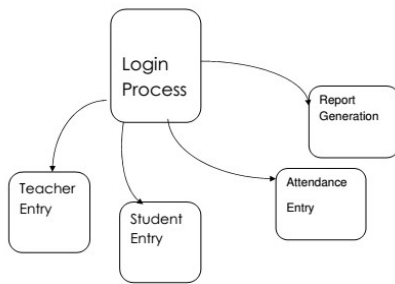


Fig. 1. Data flow diagram for the Attendance System.

The Flow Chart in Fig. 2 shows the interaction among administrator, lecturers and students.

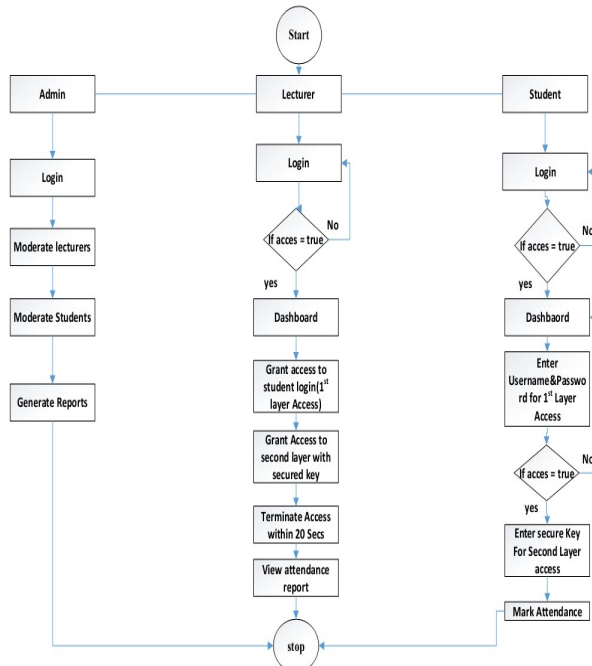


Fig. 2. Flow chart of the system.

The use case diagrams provide for two actors of the system; lecturer and student.

A. Student's module

In the student module as revealed in Fig. 3, the student will go through a two authentication stage before being allowed to mark attendance on a lecture basis. The initial stage is the authentication of the student after registration on the platform, while at the second stage; the lecturer moderates the system by ensuring login through the use of a password to authenticate the attendance of the student. The International Mobile Equipment Identification (IMEI) number on each phone hinders another student for impersonating. The second login platform will allow access for the student to mark their attendance.

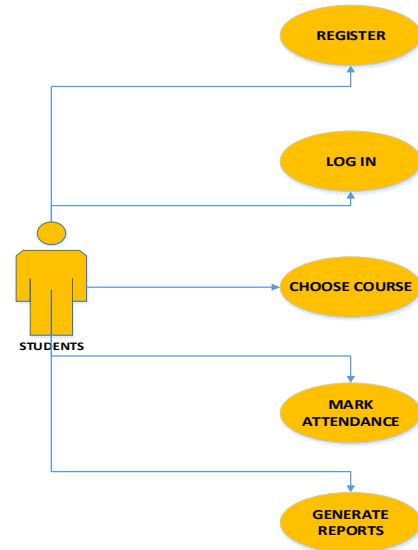


Fig. 3. Use case diagram for the student module.

B. Lecturer's module

The lecturer's module sees to the generation of the attendance passcode for each lecture day to authenticate the marking attendance panel for each of the students as exhibited in Fig. 4.

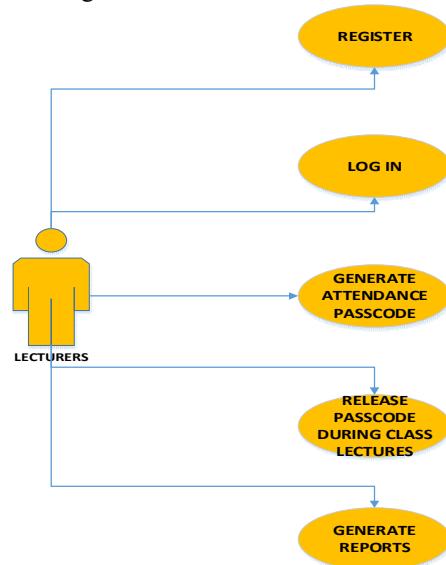


Fig. 4. Use case diagram for the lecturer module.

IV. SIMULATION AND RESULTS

The implementation was simulated on a local host using Apache server for testing the correctness and consistency of the system on the computer. The screen shots below show various interfaces from the system.

A. Staff Login Form

To gain access to the system, each staff must log into the system entering username and password before completing the Registration form as illustrated in Fig. 5.

Fig. 5. Staff login form.

B. Student Login Form

For students to gain access to the system, they must log in using their respective matriculation number, username and password, then register on the Registration Form as displaced in Fig. 6.

Fig. 6. Student login form.

C. Register Course

The “Register Course” interface in Fig. 7 allows the Staff to register the course and select the level he/she desires and generate code for the chosen course.

Fig. 7. Register course.

D. Generate Code

The “Generate Code” interface as depicted in Fig. 8 enables Staff to generate a passcode to be distributed to the students in the class for attendance marking.

Fig. 8. Generate Code.

E. Attendance Codes

This interface presented in Fig. 9 reveals the various codes generated by the lecturer for each of the courses registered for; and this usually expires after 20 seconds.

S/N	Attendance Codes	Course	Allocate to Class
1	QNOKM#	CPS202	<button>Distribute</button>
2	WHqdm#	CMP205	<button>Distribute</button>
3	VKE40#	CPS207	<button>Distribute</button>
4	JVV5H#	CPS309	<button>Distribute</button>

Fig. 9 Attendance codes.

F. Choose Course

This interface indicates the level, courses and the lecturer's names that enable the students to pick the course needed for the attendance as presented in Fig. 10.

S/N	LEVEL	COURSE	LECTURER'S NAME	ATTENDANCE
1	200	CPS205	Afolabi Dare	<button>Mark Attendance</button>
2	200	CPS207	Afolabi Dare	<button>Mark Attendance</button>
3	200	CPS404	Bello Ibrahim	<button>Mark Attendance</button>
4	200	CPS202	Afolabi Dare	<button>Mark Attendance</button>

Fig. 10. Choose course.

G. Mark Attendance

The mark attendance platform as exhibited in Fig. 11 allows the student to enter the "Access Code" distributed by the lecturer at that moment, and expires immediately after 20 seconds.

Fig. 11. Mark Attendance.

H. Attendance Report

The attendance report put on view in Fig. 12 shows the result of the attendance sheet at the end of the semester and could be cross checked by the Staff at any time.

V. CONCLUSION

The web based attendance system developed can mark, check and update student attendance records by the lecturers in both on desktop and mobile computers. The application is not only secured, accurate, process faster, efficient and very reliable, but also reduce pen

and paper usage, compared to the inefficient conventional system.

S/N	Matic Number	Occurrences
1	12/03CS513	13
2	12/03CS519	15
3	12/03CS516	17
4	12/03CS518	17
5	12/03CS521	14
6	12/03CS522	16
7	12/03CS510	9
8	12/03CS515	17
9	12/03CS549	12
10	12/03CS530	16

Fig. 12. Attendance Report.

Further studies are necessary by exploiting short message service alert on the late comers, whereby the students are acquainted with their attendance records sporadically.

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