

A Mobile Web Application for Attendance Management Using Geolocation

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Abstract

Attendance Management is the art of managing the attendance of students in the class to minimize loss due to productivity and student absence. The most common method of attendance taking is the paper method such that students fill in their name and matric number and then sign using their signature, this is one of the most inaccurate and time-consuming methods and it is still being used in almost all universities. Therefore, due to all these factors mentioned above, an alternative solution was worked on to reduce or eliminate these problems by bringing about a cost-effective, efficient, and more accurate solution using geolocation. The system only allows you to be able to take attendance only when you are within the location of the venue through your mobile phone. This is a web application that works on mobile phones. It was developed using the visual studio IDE, Geolocation API, (HTML 5, CSS, JAVASCRIPT, JQUERY, BOOTSTRAP) for frontend and (PHP, XAMP server and MYSQL) for the backend. The application used bootstrap mainly for the user interface and HTML 5 for texts on the web app and for form validation, CSS is the main tool used for the styling and design of the app, JavaScript and jQuery were used for event handling at the frontend. For the backend logic, PHP was used, and MySQL was used for the database and XAMP was used to host the web app locally. The attendance system was validated using User Acceptance Testing (UAT) and Quality Assurance Testing (UAT).

Keywords: Attendance Management; Geolocation; University; Sensors; Database; Frontend

1.0 Introduction

Keeping track of who takes part in an event or takes part in an activity is of high importance to correctly evaluate their performance. Attendance management is imperative to the sustenance and growth of every organization and setting; it is one of the major factors that determines how successful such organization will be [1], [2]. One of the herculean challenge staring at several tertiary institutions is how to

effectively manage student attendance during lecture periods; putting in place structures to compute attendance percentage becomes a major task because manual intervention over the years have produced high error rate and as well, wastes a whole lot of time[3]. The prevalence of manually capturing attendance gives room for possible manipulation, wrongly marking individuals up or down and several other human errors[4]. At some point, attendance taking was automated using tools like MS Access and with

this, a whole lot of tasks were made easier, like searching for a name, adding up the number of days attended and so on. However, the digital provision seems not to solve the issue of having to spend hours entering the data, only replacing paper and pen with the computer; there were always the challenge of preventing proxies or false input[5]. Aside the high tendency for error in input of attendance record, there are other attendant issues such as loss of attendance register book or manually fake data inserted through unknown and unauthorized recourses. Quite several works have been carried out in the area of issue under review using different approaches and methodologies which has brought varying results and level of efficiency in taking attendance in different sectors. Kalaisankaran (2013) did a mini project on student attendance management which has the capability to generate the attendance of the student on basis of presence in class and reports are generated on weekly basis for the sole aim of consolidation.

Adewole et al. (2017) carried out a work on stepwise biometric procedures for managing attendance in higher institutions of learning. The research focused on reducing to the barest minimum, instances of impersonation and the system capable of distinguishing between an authorized person and an impostor than the traditional methods such as passwords or calling

out of names in class. The author opined the need for automated attendance system that involves stepwise biometric procedures for managing students' attendance for both lectures and examinations. The system developed include enrollment, fingerprint matching and attendance management. The results show that the system can reduce students' impersonation during lectures and examination in higher institutions. In the work of Oyebola et al. (2018), an automated approach to attendance management was implemented through biometric technology embedded with a window application. The developed system includes timekeeping system that will register every student in a database. The database is to be managed by the department so that reports, either individual or collective can be issued whenever they are needed on both physical and electronic format. The solution can as well be used to generate statistics and further help the growth of the academic process.

Gatete & Harubwira (2022) developed an online student attendance management information system which creates daily attendance, mark online attendance of students during class and reduce manual work, display the current timetable of the ongoing module, class level, specialization, period, and lecturer's name. With the solution, lecturer can track and manage student attendance by displaying them by list and by class. The new system is reported to be

efficient in speeding up daily attendance process, as these services are provided efficiently and cost effectively. An attendance management software designed to track and manage attendance in any strenuous situation was done by [10]. With the use of the software, the school authority can ensure a considerable fall in absentee number; thus, the staff members will no longer be required to keep an eye on the students' attendance tracking. The software has capacity for periodic report generation for the sole aim of business intelligence and performance evaluation. [11] developed a system using location as a proof of attendance and proposed a new time and attendance system based on location. Some of the devices used to get the system up and running include mobile phone, GPS watch among other things. [12] proposed a smart geolocation based real-time attendance tracking system which was implemented on an android platform. The staff's location is the key to the attendance management in the paper. For real-time tracking of the staff, RFID technology was proposed. Unique ID is provided to each staff member who will be scanned by the employee. A unique integration of GPS and RFID technology for a smooth and precise attendance management system.

A model for Geofencing Based Attendance Monitoring system was developed and implemented for monitoring and tracking

attendance of students essentially in large classes using geofencing [13]. An automatic attendance detection system, where students can use smart phones to present their presences in parallel was proposed by [14]. The identity of a student is verified in collaboration with a fingerprint and position in real-time. There are various forms of presence systems, such as the ERP system, RFID cards, and the biometric assistance system where fingerprints are considered the best and the fastest method. The presence is monitored by matching the fingerprints and the position to improve the old method of recording presences. This research is aimed at solving problems of attendance issues in Nigerian universities using geolocation therefore eliminating instances of dishonesty among students and enhancing ubiquitous learning in the post-covid 19 era.

2.0 Methodology

This system is a responsive web application that performs the functions of taking daily attendance of students and recording them efficiently to give easy access to lecturers and to have maximum control over the attendance of their students for accurate grading system through the platform. The system uses geolocation through the GPS on mobile devices to take attendance. The system focuses more on how the venues of the classes or lecture halls can be located and if the scanned location of the

student matches the required location for that lecture, then attendance will be taken. The architecture of the system is as shown in figure 1. HTML and CSS were used to design the user interface while JavaScript was used to program front-end logics and activities. PHP was used to program the backend logic of the web application. Data collected from users of the application was stored on the SQL database

while location API from Google was used to track the exact location of the user. The solution is cost effective as no external device is needed to be used, only individuals' mobile device is required and data to access the web application. There is increases information accuracy i.e. Students cannot take attendance for friends, which brings about a more accurate attendance grading system.

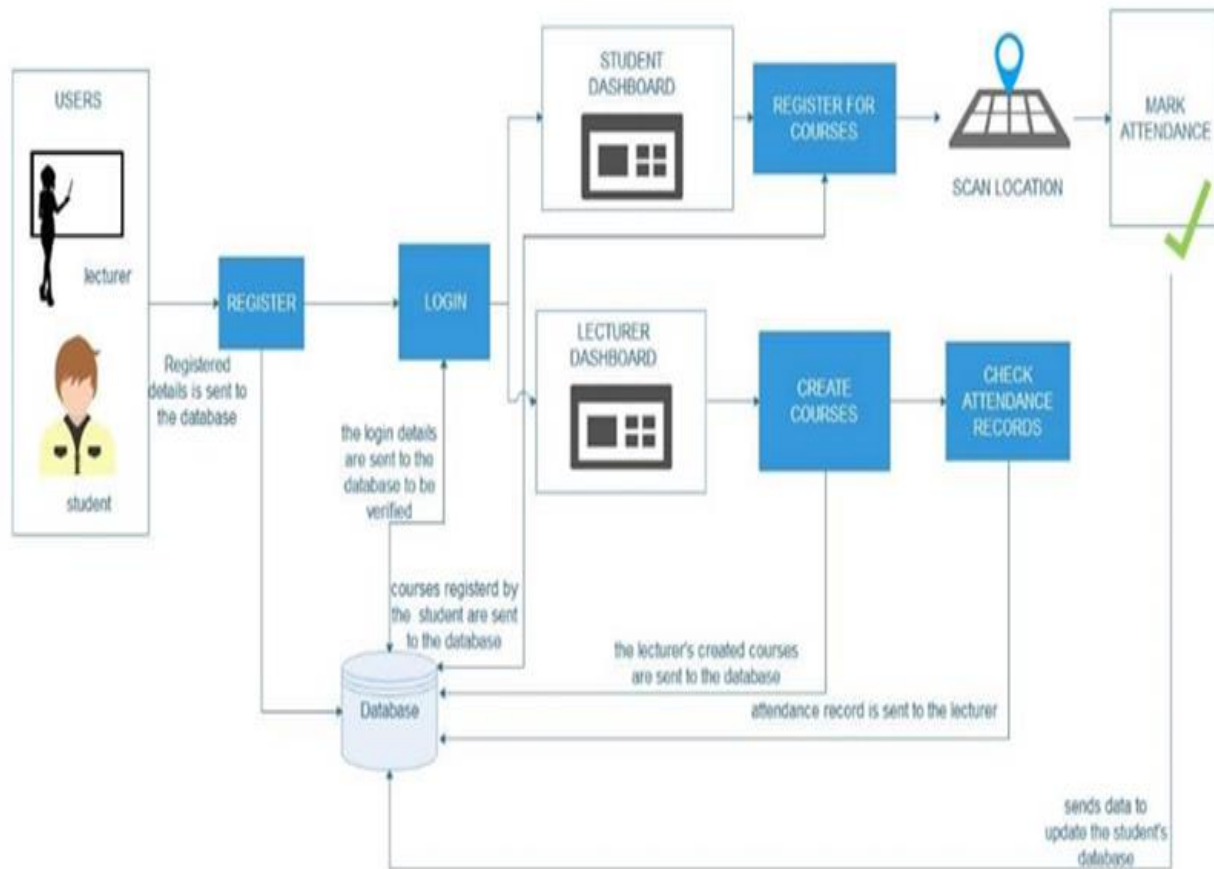


FIGURE 1: SYSTEM ARCHITECTURE

Pseudo Code of the Solution

STEP 1: Scan and get the current location of the student

STEP 2: Check for venue chosen by the lecturer

STEP 3: Compare current student location with the class venue

STEP 4: If the current location is equal to the class venue

STEP 5: Enable mark attendance button

STEP 6: Else do not enable mark attendance button

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The application used bootstrap mainly for the user interface and a little for responsiveness, HTML 5 for texts on the web app and used for form validation, CSS is the main tool used for the styling and design of the app, JavaScript and jQuery were used for event handling at the front end. For the backend logic PHP was used and MySQL was used for the database then XAMP was used to host the web app locally.

3.0 Results and Discussion

The aim of this work is to provide a platform that helps ease attendance marking using modern technology to provide a more accurate and reliable attendance system for universities in Nigeria. Some of the features of the application include using student's location to mark attendance, interface displaying the overall summary of attendance activities by student, manual marking of attendance in a situation where student does not have the required device and students' access to their attendance records. The application is a web application that is made responsive to work perfectly on mobile phones it is developed using the visual studio IDE, Geolocation API, (HTML 5, CSS, JAVASCRIPT, JQUERY, BOOTSTRAP) for frontend and (PHP, XAMP server and MYSQL) for the backend. To achieve the set objectives, economic, technical, and behavioral feasibility was carried out. The economic feasibility revealed that the application is economy friendly as it only requires an android phone or any other device with GPS that can access internet. In terms of the technical feasibility, an internet connection is needed and a device that is GPS enabled needs to have web browsers that are compatible with Google geolocation services. The device was deployed and tested using a DELL SATELITE PC and

Mozilla Firefox responsive layout was used for the mobile view. The application was designed to work on all screen sizes because most devices that will be used to access it are mostly mobile

devices, but it can also work on desktops too. The various interfaces of the application are as shown in figures 2 to 5 below.

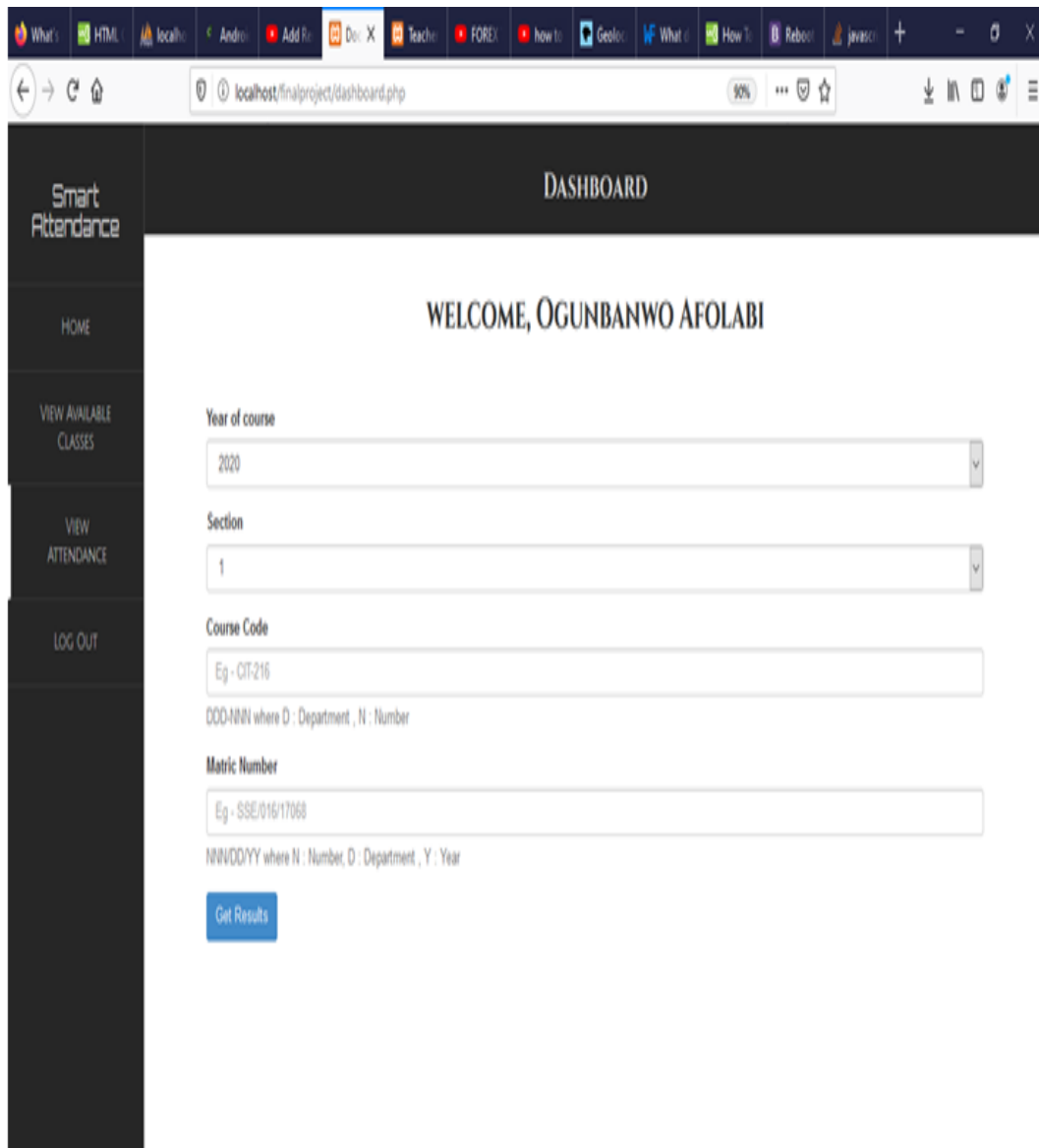


FIGURE 2: VIEW ATTENDANCE SECTION



FIGURE 3: GRAPHICAL REPRESENTATION OF STUDENTS' ATTENDANCE RECORDS

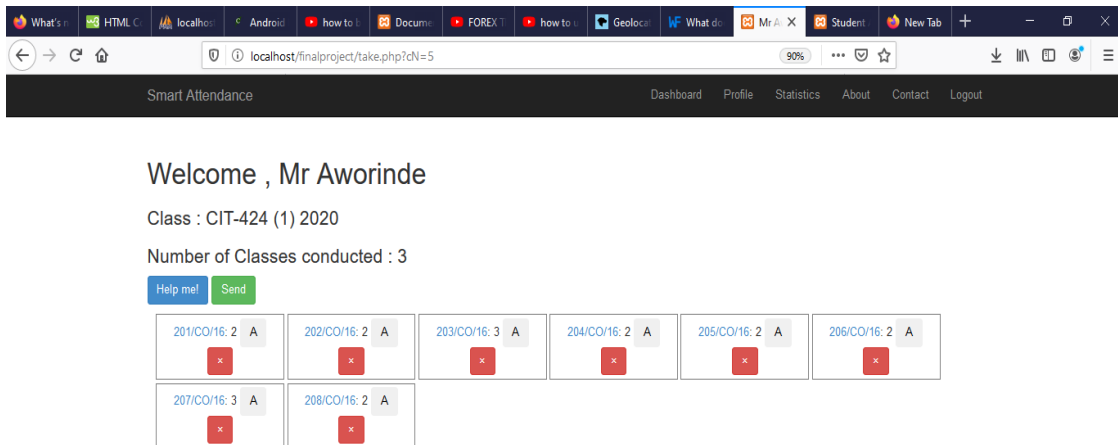


FIGURE 4: PROVISION FOR MANUAL ATTENDANCE MARKING BY LECTURER

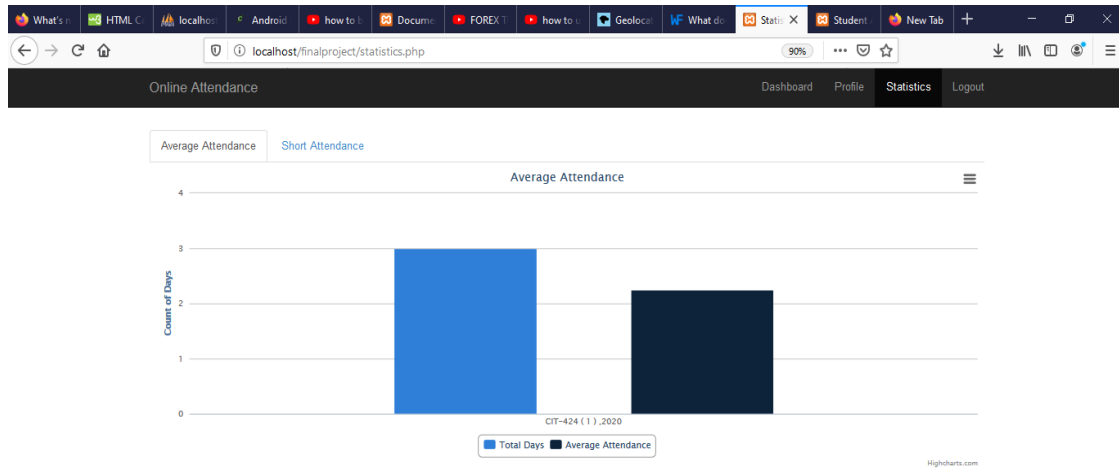


FIGURE 5: GRAPHICAL REPRESENTATION OF OVERALL ATTENDANCE ACTIVITIES OF STUDENTS

4.0 Conclusion

The system has proven to be easier, faster, and more efficient than the previous attendance management system as it has improved attendance taking for students as well as attendance recording for lecturers. However, it can be improved upon by perfecting the geolocation feature used by the app and adding stricter security features to improve its reliability and accuracy.

References

[1] G. Singh, R. Dwivedi, and A. Anand, "Attendance monitoring and management using QR code based sensing with cloud based Processing," *Int. J. Sci. Res. Comput. Sci. Appl.*

Manag. Stud. IJSRCSAMS, vol. 8, no. 5, 2019, doi: 10.21276/SJET.2018.6.2.1.

[2] R. Mishra and P. Trivedi, "Student Attendance System Based On Fingerprint Recognition and One-to-Many Matching," no. 107.

[3] "(19) (Pdf) University Student Attendance Management System." https://www.researchgate.net/publication/341643579_university_student_attendance_management_system (Accessed Mar. 29, 2022).

[4] "How Attendance Tracker Can Solve Attendance Problems?" <https://www.myeducomm.com/blog/how-attendance-tracker-can-solve-attendance-problems/> (accessed Mar. 29, 2022).

- [5] “University student attendance management system - Document - Gale Academic OneFile.” <https://go.gale.com/ps/i.do?id=GALE%7CA483829356&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=18434711&p=AONE&sw=w&userGroupName=anon~a69025f3> (accessed Mar. 29, 2022).
- [6] B. Kalaisankaran, “Students Attendance Management System,” Anna University, 2013.
- [7] K. S. Adewole, R. G. Jimoh, O. C. Abikoye, and A. R. Ajiboye, “Stepwise biometric procedures for managing student attendance in higher institutions of learning,” *J. Comput. Sci. Its Appl.*, vol. 22, no. 1, pp. 77–86, Jan. 2017, doi: 10.4314/jcsia.v22i1.
- [8] B. Olalekan Oyebola, K. Oluwabukola Olabisi, and O. Solomon Adewale, “Fingerprint for Personal Identification: A Developed System for Students Attendance Information Management,” <http://www.sciencepublishinggroup.com>, vol. 6, no. 1, p. 1, 2018, doi: 10.11648/J.AJESA.20180601.11.
- [9] M. Gatete and F. Harubwira, “A Development of an Online Student Attendance Management Information System: Case Study ‘University of Tourism, Technology, and Business Studies,’” *Int. J. Sci. Res. Comput. Sci. Eng.*, vol. 10, no. 1, pp. 32–48, 2022, Accessed: Mar. 29, 2022. [Online]. Available: https://www.isroset.org/journal/IJSRCSE/full_paper_view.php?paper_id=2694.
- [10] “Schooberry - School Management Software Mobile App.” <https://www.schooberry.com/modules/attendance-management-system.php> (accessed Mar. 29, 2022).
- [11] M. S. Uddin, S. M. Allayear, N. C. Das, and F. A. Talukder, “A Location Based Time and Attendance System,” *Int. J. Comput. Theory Eng.*, pp. 36–38, 2014, doi: 10.7763/IJCTE.2014.V6.832.
- [12] R. B. E. Gaurav, “GPS based Attendance Management System with RFID Technology Harsh Shinde Sagar Shirke,” Accessed: Mar. 29, 2022. [Online]. Available: www.ijert.org.
- [13] Enikuomehin and Dosumu, “Geofencing Based Attendance Monitoring System,” *Res. Inven. Int. J. Eng. Sci.*, vol. 11, no. 1, pp. 2319–6483, 2021, Accessed: Mar. 29, 2022. [Online]. Available: www.researchinventory.com.
- [14] B. S. Satpute, N. Kakra, P. Kumbhar, R. Bhirud, and P. Kumbhar, “IJARCCE Smart Location Based Student Attendance Management System Using Fingerprint Recognition,” *Int. J. Adv. Res. Comput. Commun. Eng. ISO*, vol. 3297, no. 5, 2007, doi: 10.17148/IJARCCE.2018.7533.