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DESIGN AND IMPLEMENTATION OF A UNIVERSITY SMART ATTENDANCE TRACKING SYSTEM USING GEO-LOCATION AND IOT.

Gertrude A. Fischer ^{a, *}, Victor Ojong ^b, Eyo Inameti^c ^a Department of Electrical/Electronics Engineering, University of Cross River State, Nigeria

¹University of Cross River State (UNICROSS), <u>gertrudefischer@unicross.edu.ng</u>
² University of Cross River State (UNICROSS), <u>victorojong78@gmail.com</u>
³ University of Cross River State (UNICROSS), <u>evoinameti@yahoo.co.uk</u>

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Abstract:

In educational institutions, keeping track of attendance is a crucial duty that frequently requires manual methods, which can be time-consuming and error-prone, in order to automate and improve the accuracy of attendance tracking at universities and colleges, this project describes the design and implementation of a University Smart Attendance Tracking System (USATS). USATS makes use of the geolocation and Internet of Things (IoT) technologies. The IoT and geolocation-based University Smart Attendance Tracking System improves the efficiency, accuracy, and transparency of attendance tracking, thereby enhancing the quality of education at universities and colleges. For tracking users' current locations, this app makes use of Geolocation API. The terms "geolocation" and "longitude" are used to describe a location's position in space. This browser tool for tracking the student's current location is very helpful in the creation of an attendance tracking system. Geofencing is the process of creating an algorithm that compares the current location data with that of the classroom where a class is anticipated to take place within a given amount of time. This research demonstrates how IoT and geolocation technologies have the potential to change conventional administrative procedures in the educational sector. Using precise geolocation technology, instructors are always present in the classroom, avoiding proxy attendance.

Keywords: University, Smart rollcall, Geo-Location, authentication, biometrics, IOT

1. Introduction:

Monitoring student involvement, evaluating academic progress, and guaranteeing accountability have all long been reliant on attendance tracking in educational institutions. However, conventional methods of taking attendance, which sometimes require hand-written logs or sign-in sheets, take a lot of time and are prone to errors and abuse. The need for smart attendance tracking system has become eminent in the university as it enforces students to be present in class and on time. In other to fill the above-mentioned gap, the function of the smart attendance software is to address the problem associated with real-time attendance reporting, verification and documentation of attendance records in the university community. By

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doing this, we shall have resuscitated our education system and increased the overall performance of students in class engagement and academic performance by over 70%. The management of attendance in universities will be transformed through the design and implementation of a University Smart Attendance Tracking System (USATS), which makes use of geolocation and Internet of Things (IoT) technology.[1] The integration of Geo-location and IoT technologies into the attendance tracking process presents a promising solution. Geo-location services, including GPS and Wi-Fi positioning, enable precise determination of a student's location, ensuring that attendance records reflect their physical presence in the classroom. Additionally, the GUI was built to make attendance tracking easier for end users and includes crucial functions like building new databases, Geo-Location, and attendance tracking. Performance and usability of the system were examined in order to offer suggestions for future improvements. In a study, [2] Proposed a system framework with a growing desire for more effective, precise, and automated attendance monitoring systems that can change to meet the changing needs of contemporary education exists in the digital era of today. Most of these systems are limited in their operation as they are unable to capture users' Bio Data' and geospatial data in realtime. Also, the combination of biometrics verification with hashed database passwords makes this system more reliable and secure. IoT devices, such as RFID scanners or Bluetooth beacons, provide the means to automatically detect and identify students as they enter or leave specific locations, eliminating the need for manual data entry. By combining these technologies, the USATS can offer real-time attendance tracking, data analytics, and enhanced security. [3] simply defined the context, stated the key problems and imply some sense of what solutions in terms of their focus by considering the representation of basis for further discussion to argue the point that new technologies have both disruptive and synergetic effects, particularly on forms of social organisation that are required for future forms of governance and community action as well as business arrayed for the Future of Information Communication and Technology (ICT). The development of online and mobile forms of participation. In which the citizenry is massively engaged in working towards improving the alongside planners and designers from citv government and business. Decentralised notions of

governance and community action is central to these new forms of participations which use extensive ICT. [4]. The modern educational environments require building an integrated system for provisioning of educational resources in all forms, as well as pay attention to the way to access them this is where smart attendance comes in. The goal is not to force the student to attend, but rather to ensure the presence of students and their acquisition of the rich knowledge for his/her own good and to build the country. [5] Additionally, the Smart-Class enables geo tracking, environmentally friendly energy conservation, and comprehensive session management of multiform learning. It is intended to develop and implement features gradually. [6] This study has demonstrated how the usage of mobile technology has affected the way that students are taught and how they learn. The institution can also use it to enhance the academic management system, which can end the issues with cheating and fraud among the students. [7, 8, 9, 10] Additionally, mobile attendance systems that use QR codes which has greatly streamlined the process of enrolling students in classes quicker and easier. These studies have successfully created a portable attendance system that enhances academic administration system. presented the use of RFID technology to manage student attendance in the classroom through the integration of ubiquitous computing platforms. RFID technology has the potential to be a potent tool for managing student attendance during the course of a typical school day while also enhancing safety in the classroom. [10, 11, 12, 13]. When it is necessary to automatically record students' movements and positions in a classroom or other school or university setting, RFID technology has been used to find solutions. In a school or university setting, a real-time intelligent system is put into place along with RFID hardware to keep track of students' attendance at lectures and labs. [14, 15,16].

2. Method:

This research designed and developed a smart attendance tracking system that was used for tracking and monitoring student's attendance and report in real time. The design and development involved the use of agile methodology and software tools such as the IDE Visual Studio Code and Google Chrome browser. For the user facing components of our application, we used languages such as HTML (Hypertext Transfer Markup Language), CSS and JAVASCRIPT. Faecalis's Library was used for the face recognition function of the application. For the database and backend business logic, Node.js and Mongo DB was used to ensure that student's attendance was persisted to the cloud and gracefully saved in a secure database and could be retrieved when needed. With Mongo DB geospatial, we implemented the geo-location and geo-bonding functionality of our application. Ensuring that the students is in the lecture hall at a lecture period in order to mark attendance.

Design of the flowchart for smart attendance tracking system



Fig. 1 Flowchart of Geo-fencing algorithm for the attendance system

3. **Results and Discussion:**

The design and implementation of a University Smart Attendance Tracking System (USATS). development increased class attendance of students by over 80%, saved time of roll call and improved the overall reporting speed of attendance data with high rate of data security. It is secure, safe to use and adaptable, easy to use and adaptable for research and teaching. This software could also be adopted by cooperate organization for efficient staffing. This application was tested and we got the desired results based on the software design architecture. Development of some component parts of the software was quite challenging as it required learning new libraries and tools in order to come up with the exact design model of the application's requirement. The function of the smart attendance software is to address the problem associated with real-time attendance reporting, verification and documentation of attendance records in the university community. The major objective of USATS was to make smart attendance possible for college or university students. Its capacity to recognize each student's specifically depending on them using their Reg. no and Email facilitating more accessibility, quicker security access more secure than before.

The below figures are snapshots of some user interfaces from the proposed USATS prototype built for assessment. Figure 2 shows the home screen for the student to select his/her class. User Interface components for students account activation Figure 3. Shows the User Interface components for student's login. Figure 4 provides the User Interface components for students Dashboard showing ongoing class. Figure 5 shows the User Interface components indicating no class ongoing. Figure 6 shows the interfaces User Interface showing that student is not in class but trying to mark attendance and Figure 7 User Interface showing that student roll-call has been recorded.

	UNICROSS Smart Roll Call!	
	Activate your Account	
REGNO/COURSECODE		
EM	AIL	
PA:	SSWORD	
co	NFIRM PASSWORD	
	Activate	
	Already have an account?	

Fig .2 User Interface components for students account activation.

UNICROS	SS Smart Roll Call!
REGNO/COURSECC	DDE
PASSWORD	
Forgot Password?	
	Login

Fig. 3 User Interface components for student's login.



Fig .4 User Interface components for students Dashboard showing ongoing class.



Fig .5 User Interface components indicating no class ongoing



Fig .6 User Interface showing that student is not in class but trying to mark attendance



Fig .7 User Interface showing that student roll-call has been recorded.

Deployment

A design and implementation of a University Smart Attendance Tracking System (USATS) has been developed to give users a good feel of the application using web-based technologies such as HTML, CSS and JavaScript. The backend logic of the application is built with Node.js and Express server together with mongo dB for database management.

4. Conclusion:

The design and implementation of a University Smart Attendance Tracking System (USATS) leveraging Geo-location and Internet of Things (IoT) technologies mark a significant advancement in the management of attendance in higher education institutions. This innovative system addresses longstanding challenges associated with traditional attendance tracking methods and offers а comprehensive solution that benefits both universities and students. Although there have been existing solutions for attendance tracking, this system is quite unique. It utilizes web-based application programming interfaces (APIs) and third-party libraries, which streamline the design, development, and deployment of the system while ensuring system and database security through the bcrypt hashing algorithms available as a third-party module in the JavaScript programming language. By integrating these technologies, we have successfully enhanced existing platforms in the areas of real-time reporting and document database management.

In conclusion, the University Smart Attendance Tracking System (USATS) offers an innovative solution to the challenges associated with traditional attendance tracking methods in universities. By combining Geo-location and IoT technologies, this system provides accurate, real-time, and data-driven attendance tracking, ultimately contributing to improved student engagement and administrative efficiency in higher education institutions. The University Smart Attendance Tracking System represents a paradigm shift in how universities manage attendance and engage with their students. By harnessing Geo-location and IoT technologies, it not only streamlines administrative processes but also fosters a culture of responsibility and participation among students. The USATS is a testament to the transformative power of technology in higher education, and its successful implementation is a step towards creating more efficient, data-driven, and student-centric learning environments. As it continues to evolve, the USATS has the potential to redefine the way universities manage and optimize their resources for the benefit of both educators and learners. The problems with the current manual systems are addressed by the smart attendance management system. In terms of eliminating the insecurity associated with the present system of taking attendance, eliminating the stress associated with the traditional attendance marking method in University of Cross River State (UNICROSS) and finally to deploy the system in real time as well as model a safe, accurate, and time-saving smart attendance system.

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