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VIDUIT:-VIDYARTHIUNIQUEIDENTITYTAG

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ABSTRACT

Vidyarthi Unique Identity Tag (VIDUIT) is an intelligent IoT-based attendance automation system developed to improve accuracy, security,and transparency in educational institutions. The proposed framework integrates geofencing mechanisms with GPS tracking, RFID-based identification, RF wireless communication, and real-time SMSnotifications to verify student presence effectively. The system architecture includes a portable transmitter unit carried by students and a fixed receiver unit installed on campus. The transmitter acquires real-time GPS coordinates and transmits them to the receiver using RF communication. The receiver checks whether the received location lies within thepredefined institutional geofence. Upon successful validation, RFID authentication is performed to uniquely identify the student and attendance is automatically recorded on a cloud platform using an ESP8266-enabled internal connection with website. Faculty members can access live attendance dashboards remotely. Additionally, a GSM module sendsinstant SMS alerts to parents, ensuring student safety, eliminating manual roll calls and preventing proxy attendance.

KEYWORDS: Vidyarthi Unique Identity Tag (VIDUIT), IoT-based attendance system, Geofencing, GPS tracking, RFID authentication, RF communication, ESP8266, GSMSM Salerts, Student monitoring,

INTRODUCTION

Recent progress in embedded technologies, wireless communication, and location-aware systems enables the development of advanced tracking and monitoring solutions. Technologies such as the Global Positioning System(GPS), Radio Frequency Identification (RFID), and geofencing play anessentialrole in applications related to transportation, logistics, and automated monitoring frameworks. Early GPS-based vehicle tracking and control systems enhance monitoring efficiency, however they lack features such asreal-time

data analytics and automated decision-making capabilities **[1].**

Similarly, GPS-based object tracking approaches primarily focus on improving positional accuracy while offering limited system intelligence and automation **[2]**. The introduction of geofencing technology enables automatic actions based on predefined virtual geographic boundaries, reducing manual intervention and improving operational efficiency in fleet and freight management systems**[3]**.

Further advancements extend the use of geofencing to urban-scale monitoring, where sensor-based activity recognition techniques demonstrate effectiveness in managing large-area crowd environments **[4].** Additionally, the integration of geographic information systems supports service-oriented applications by leveraging spatial data to enhance analysis accuracy and decision-making processes**[5].**

METHOD AND MATERIALS

The system collects real-time GPS coordinates from the student transmitter and transmits them wirelessly to the receiver. The receiver verifies the location using geofencing and performs RFID authentication.AttendancedataisuploadedtoacloudplatformthroughWi-Fi,whileSMSalertsaresent to parents using GSM communication.

Materials used:

- **Microcontroller:**ESP8266developmentboard.
- **GPSModule:**GPSpositioningmodule.
- **RFIDSystem:**RFIDtagsandRFIDreader.
- **RFCommunication:**RFtransmitterandreceiver.
- **Wi-FiModule:**ESP8266Wi-Fimodule.
- **GSMModule:**GSMcommunicationmodule.
- **PowerSupply:**RegulatedDCpowersupplyunit.
- **Accessories:**Antennasandconnectingcables.
- **SoftwareTools:**ArduinoIDE,embeddedC/C++.

METHODOLOGY

The proposed system consists of two primary sections: The Transmitter Unit and the Receiver Unit. The transmitter unit employs an ESP8266 microcontroller interfaced with a GPS module to obtain the student's real-time geographical coordinates. The acquired location data is transmitted wirelessly to the receiver unit using an RF communication module. A

regulated power supply ensures stable and reliable operation of all system components. The transmitter unit is compact and portable, enabling continuous tracking of the student within the predefined geofenced boundary while maintaining accurate and uninterrupted data transmission.

The receiver unit functions as the central control module of the system. It receives location data through an RF receiver and processes the information using an ESP8266 microcontroller that interfaces with the RFID reader, GPS module, and LCD display. Upon detecting a valid RFID tag within the geofenced area, the system verifies the student's identity and records attendance automatically. The GSM module sends instant SMS notifications to parents, while the Wi-Fi module uploads attendance records to a cloud server. This IoT-enabled architecture ensures real-time, reliable, and transparent attendance monitoring with minimal human intervention.

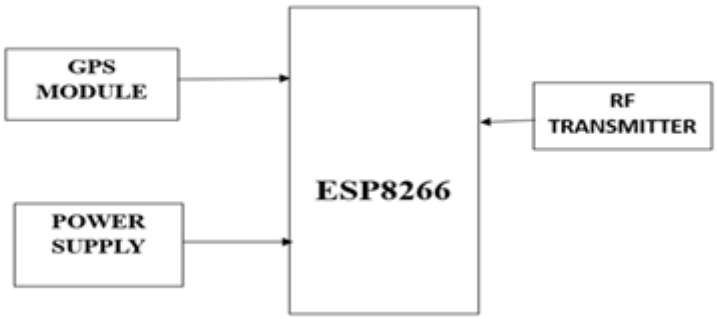

Figure1Blockdiagramoftransmitter.

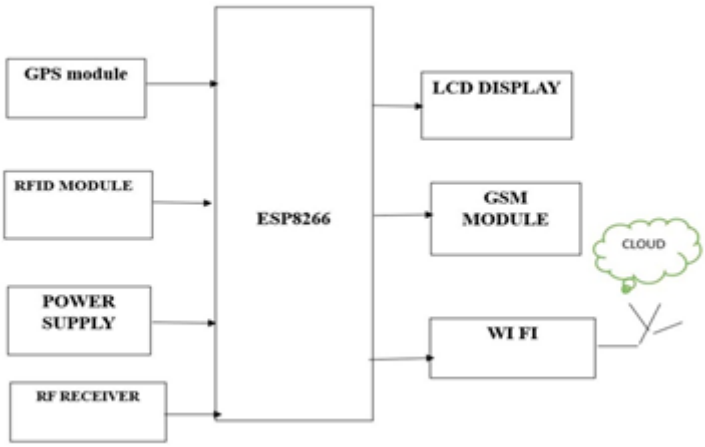

Figure2BlockDiagramofReceiver.

Table1.HardwareRequirements.

Sr.No.	Component	Specification
1	Microcontroller	ESP8266MicrocontrollerUnit
2	GPSModule	GPSPositioningModule
3	RFIDSystem	RFIDTagsandRFIDReader
4	RFCommunication	RFTransmitterandReceiver
5	PowerSupply	RegulatedDCSource
6	Wi-FiModule	ESP8266Wi-FiModule
7	GSMModule	GSMCommunicationModule
8	Accessories	AntennasandConnectingCables

RESULT AND DISCUSSION

TheproposedVIDUITsystemissuccessfullyimplementedandevaluatedthroughhardwareintegration and a cloud-based attendance management platform. The transmitter and receiver modules operate reliably, as demonstrated by theblock diagrams,ensuring accurateacquisition and transmission of GPSlocation data using RFcommunication. The receiver unit effectively validates geofence conditions and authenticates students using RFID before recording attendance.

The web-based dashboard results confirm real-time synchronization between the hardware unit and cloud server. The login interface ensures secure access for administrators, while the student management module displays RFID-linked student records with date-wise attendance logs. The system supports dynamic timetable configuration allowing administrators to modify attendance periods without hardwareintervention.

Day-wise and monthly attendance summaries clearly differentiate present and absent students with automated percentage calculations. The monthly reports visually present attendance statistics, enablingquick analysis of student participation. SMS notifications are triggered instantly for attendance events, ensuring transparency and parental awareness.

Overall, the experimental results demonstrate that the proposed system provides accurate, automated, and tamper-resistant attendance monitoring. The integration of IoT, geofencing, and cloud technologies significantly reduces manual effort, prevents proxy attendance, and enhances operational efficiency,making the system suitable for real-world academic deployment.

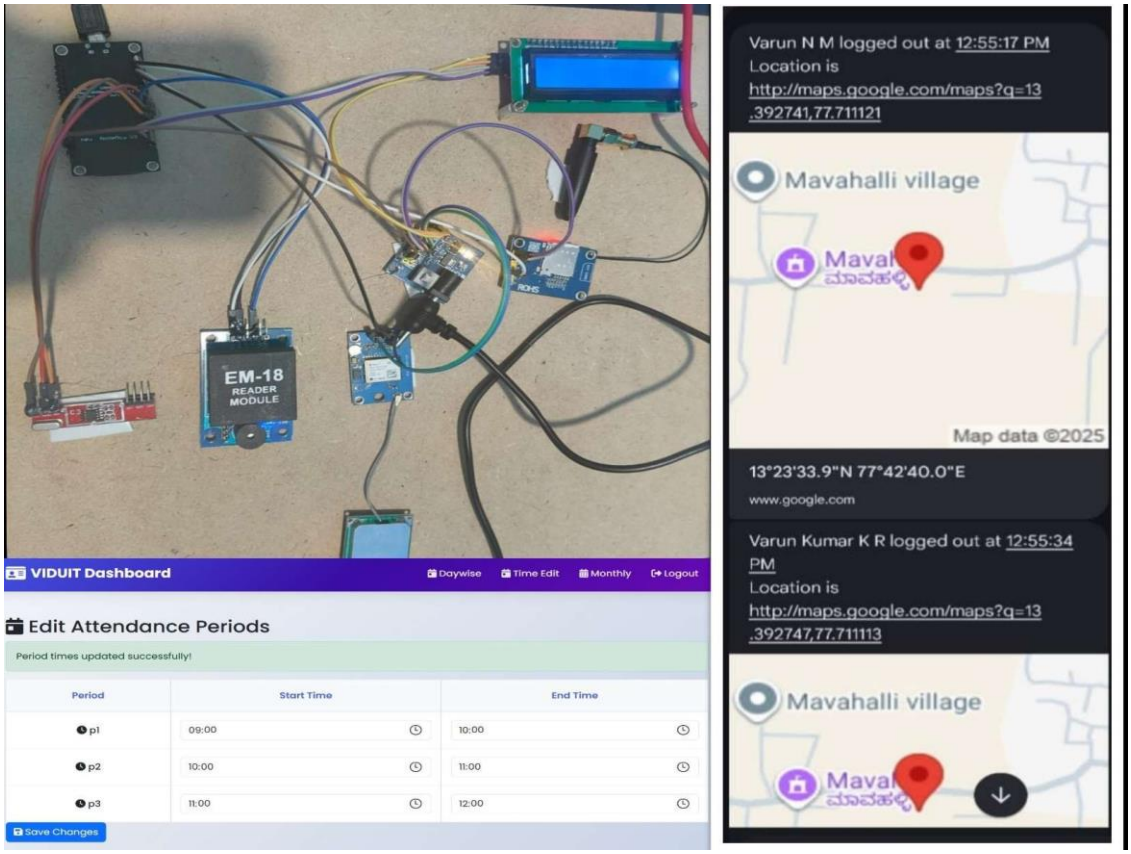

Figure3.Resultofproposedmethodology.

CONCLUSION

The VIDUIT cloud-enabled geofencing attendance system offers a reliable IoT-based solution for automating attendance processes in academic institutions. The framework integrates an ESP8266 microcontroller with GPS tracking, RFID-based identification, GSM communication, and Firebase cloud services to achieve precise, location-authenticated attendance logging. Attendance is recorded exclusively when a student is verified within a predefined geofenced region, thereby improving accuracyandeffectively preventing proxy attendance. Real-time cloud synchronization enables faculty andadministrators to access attendance data remotely through a secure web-based dashboard. Additionally, the GSMmoduledelivers immediate SMS alertsto parents or guardians, enhancing communication and student safety.

The proposed system significantly reduces manual workload and minimizes human errors associated with conventional attendance methods and ensures secure data storage and transmission. Experimentalevaluation demonstrates consistent system performance, prompt data updates, and dependable notification services. Overall, VIDUIT represents a scalable, secure, and intelligent attendance management framework that effectively combines

geofencing and IoT technologies to support modern digital education environments.

CONFLICTOFINTEREST

Theauthorsdeclarethatthereisnoconflictofinterestregardingthepublicationofthispaper.

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