Smart Id Entry System Using Rfid Technology

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Abstract:

Access control is revolutionized by the Smart ID Entry System, which uses a single RFID card for numerous operations. It facilitates safe access to workplaces, labs, and confined areas and is seamlessly connected with IoT. It guarantees effective control of multiple access points, analogous as garçon room access and croaker movables, through real-time monitoring. This creative approach streamlines processes and offers complete access control in a variety of settings.

The Smart ID Entry system also has a lot to offer in terms of functional effectiveness and convenience.

Organizations can meliorate overall security protocols, minimize administrative exodus, and expedite operations by centralizing access control into a single, intelligent system. This comprehensive approach to access operation offers a strong security architecture that can be adapted to various settings and operations, guaranteeing that all entry points are defended.

To put it compactly, the Smart ID Entry System is a slice-edge system that combines RFID technology with the Internet of Effects to ameliorate security, convenience, and functional effectiveness.

Keywords:

Near-field communication(NFC), radio swells, microchips, frequency, EPC (Electronic Product Law), UHF (Ultra High Frequency), middleware, anthology collision, label collision, RFID label, RFID anthology, antenna, transponder, active RFID label, un resistant RFID label, ESP module, and Wi-Fi.

Introduction:

Exercising RFID technology, smart ID access systems are a revolution in access control that blend practicality, security, and effectiveness to satisfy modern terrain conditions. These spaces include homes, workplaces, seminaries, and other places where access control and security are essential. Electromagnetic fields are used by radio frequency identification (RFID) technology to identify and track electronic labels that are fixed to particulars and that RFID albums may read ever. stoners of the system are also placed on an ID card or pivotal fob, or they are reckoned with RFID. In order to validate a user's credentials, the RFID florilegium scans the marker when they get close to the entrance point and connects with a central database. In utmost cases, the system opens the door and permits admission if the credentials are legit stoners' comfort and hygiene are increased when the procedure is kept as close to them as realizable; this is particularly vital in places with high business or when there are issues with business health, like the spread of COVID- 19. RFID labels, RFID albums, ESP32 microcontrollers, and interfaces with platforms like the Arduino IDE for programming and customisation are among the factors. To ensure dependable and indefectible functioning, an ESP32 microcontroller is demanded to exercise data from the RFID florilegium and communicate with other bias. The device can also automatically record check- heft and check- out times by connecting to online services like Google wastes. Because of this connectivity, extensive access pattern monitoring and analysis are possible, perfecting performance and security.

Using authentication and encryption styles to guarantee that data exchanges between labels, albums, and central data are not interdicted. Secondly, RFID technology offers better functionality. further labels and albums can be added to the current system as a company expands without taking significant variations. Long- term effectiveness earnings for RFID-predicated systems affect from this modification. Automated shadowing makes it possible to track people's movements directly, which is vital for counting people in an emergency and making sure everyone is there. The data collected can also be used for a variety of purposes, including attendance shadowing, resource allocation, and optimizing business performance. In seminaries, for illustration, the system can record pupil attendance, save instructors time, and ensure data delicacy. In marketable services, it can meliorate staff development, reduce water backups during peak hours, and meliorate overall water flux in the installation. Attendance software can be combined with other systems, analogous as payroll and indeed eatery payments, to integrate across a variety of functional conditions. The integration capability demonstrates the advantages of RFID technology and makes it useful in a wide range of operations. RFID systems help reduce the spread of conditions and infections, which has come a major factor in global health competition, considering that they are contactless. This contactless point provides a safe terrain for stoners by reducing the physical impact demanded by traditional access control systems. safe- deposit box and effective demand operation. It meets the conditions of moment's operation operations by combining the advantages of contactless operation, good security, indefectible, scalability and advanced performance. This technology not only increases security and convenience, but also provides useful information and sharing capabilities, making it an important tool for all associations. Organizations looking to ameliorate their access control system

Literature Review:

S.NO	TITLE	METHODOLOGY	METRICS	LIMITATIONS
1	RFID TECHNOLOGY AND ITS APPLICATIONS IN INTERNET OF THINGS (IOT)	Research, Requirements Gathering, System Design, System Design, System Design, Testing, Deployment , Evaluation	Read Range, Latency, Scalability, Cost per Tag	Tag Collision, Security and Privacy Concerns, Data Management
2	SMART ATTENDANCE MONITORING SYSTEM USING IOT AND RFID	Preliminary Assessment, System Design, Hardware and Software Selection System Implementation	Accuracy Metrics, Efficiency Metrics, System Reliability Metrics	System Reliability, Standards and Interoperability, Power Requirements

Fig – 1:Literature Review

Radio frequency Identification(RFID) is an advanced automated technology that greatly improves object identification, metadata recording, and shadowing of individual targets using radio swells. RFID technology allows machines or computers to communicate with RFID labels attached to objects, easing indefectible identification and shadowing. When connected to Internet stations, RFID albums can identify, track, and cover tagged objects encyclopedically, automatically, and in real time, furnishing a robust result for a variety of operations.

In educational institutions, RFID technology is revolutionizing attendance shadowing by replacing traditional, time-consuming styles. conventional attendance styles analogous as manual call or punch cards are error prone, time consuming and hamstrung. By integrating RFID technology, seminaries and universities can automate and streamline attendance processes, greatly perfecting delicacy, effectiveness and security.

scholars who use an RFID- grounded attendance system wear RFID markers that are included into their ID cards. These markers are scrutinized by RFID compendiums that are deposited at entrance points, like classroom doors, as scholars enter.

After also, the data is moved to a central database, where real-time attendance shadowing is done.

By barring the need for homemade check- heft, this automated procedure lowers mistake rates and guarantees correct attendance records. directors can track pupil attendance trends and spot issues beforehand with the system's capability to give reports and analytics.

S.NO	TITLE	METHODOLOGY	METRICS	LIMITATIONS
3	SMART TRANSPORTATION SYSTEM USING RFID	Preliminary Evaluation, IoT Gateway Setup, Monitoring and Maintenance	Efficiency, System Reliability, Operational Metrics	Interference and Attenuation, System Reliability, Standards and Interoperability
4	RFID-BASED ATTENDANCE SYSTEM	System Design,Software Development, Integration, Data Preprocessing, Testing and Calibration	Accurate Rate, System Uptime, Read Rate, Preprocessing Speed, Data Security and Maintenance Frequency	Security Concerns, Cost,Interference, Read range limitations, Dependency on power supply

Fig – 2: Literature Review

RFID and IoT integration The merging of two significant technical trends—the Internet of Things (IoT) and RFID technology—offers more capabilities and a wider range of applications. Through the Internet of Things, objects can exchange data and communicate with one another, forming a network of interconnected devices. This network gains additional strength when RFID is included, allowing for the real-time tracking, management, and observation of tagged things.

An IoT-enabled RFID system at a school can transmit real-time attendance data to cloud platforms. Transparency and communication are improved because to this integration, which enables administrators, parents, and teachers to view attendance records remotely.. IoT can also make it easier to integrate RFID with other educational technologies, such payment processing, access control, and library administration, resulting in a more complete and effective ecosystem. The transportation industry will be greatly impacted by the combination of RFID and IoT technology, especially in the areas of smart parking and digital challan systems. These programs offer improved user experience, cost effectiveness, and automation. Assisting in increasing government operations' transparency and productivity. RFID and IoT are used by smart parking systems to address urban parking issues. Vehicles are equipped with RFID tags, and RFID scanners are positioned at the parking lot's entrances and exits. The RFID reader reads the tag and logs the entrance time when the car pulls into the parking lot. In order to cut down on the amount of time spent looking for parking, the system can then direct the driver to open spots. Upon the vehicle's departure, the parking cost is computed by the system and can be automatically billed to the driver's account. The reader records the time of departure.

By dwindling delay times and enhancing convenience, this automated procedure not only enhances the stoner experience but also boosts parking operation effectiveness. Smart parking systems give megacity officers useful information on how parking is used, which they can use to more organize and maintain civic areas. Authorities can more allocate parking spots, control peak hours, and indeed modify pricing programs to balance demand by assessing this data. Business figure administration and allocation are streamlined by digitalized challan systems that make use of RFID and IoT. RFID markers are installed on vehicles, and business cameras have RFID compendiums erected in. The technology incontinently creates a digital challan(forfeiture) upon discovery of a business contravention, which is also transferred to the listed address or mobile device of the auto proprietor. The RFID scanner identifies the offending vehicle. This system improves business operation's responsibility and openness. It makes sure that contraventions are precisely recorded and instantly handled, and it lessens the chance of corruption and mortal error when forfeitures are issued. also, real- time data on business contraventions is handed by digitalized challan systems, which helps law enforcement point problem areas and apply focused interventions to increase road safety. RFID- grounded attendance systems operations and advantages RFID technology is used by an RFID-grounded attendance system to automate and streamline monitoring attendance. By furnishing real-

time attendance records, dwindling mistake rates, and substituting electronic data gathering for homemade check- in procedures, it improves delicacy, effectiveness, and security.

Proposed system

In this project, an RFID reader, an ESP32 microcontroller, and the Arduino IDE are used to construct an RFID-based access control system that is divided into two main sections: access control and data registration. A thorough process for both sections is provided here, with an emphasis on setup, programming, data storage, and important implementation details.

Registration of RFID data Conditions: RFID reader (such as the MFRC522) Arduino IDE, Serial monitor, ESP32 microcontroller

Method: Hardware connections: Join the ESP32 microcontroller and the RFID reader. The SDA, SCK, MOSI, MISO, IRQ, GND, and RST pins of
the RFID reader must typically be connected to the matching pins on the ESP32 in order to accomplish this. Configuring software: Launch the Arduino IDE, then add the required ESP32 and RFID libraries. For RFID scanners, the MFRC522 library is frequently utilized. Use the Arduino Library Manager to install it.

Initial Code: To configure the ESP32 and RFID reader, write the initial code. This involves configuring the serial monitor for communication and initializing the RFID reader. Read the data from an RFID tag: To read data from RFID tags, implement code. Utilize the MFRC522 library's capabilities to read each RFID tag's unique ID. User Data Entry: To ask the user for information like name, phone number, address, and student ID, utilize Serial Monitor. This can be accomplished by capturing the input with Serial read String (). Data formatting: Prepare the data that has been entered and save it on the RFID tag. Make sure the information is organized, perhaps by dividing distinct fields with delimiters.

Ask for Details: The system ought to ask the user for the necessary information whenever a new tag is scanned. Save your identifying information: Utilizing operations from the MFRC522 library, write identification information to the RFID tag. Verify that data is entered accurately and securely. Unique User Data: To avoid duplication and guarantee precise identification, make sure every RFID tag has unique user data. Robust error handling and data validation should be used in order to ensure that legitimate inputs are received and to stop inaccurate data from being recorded on labels. For instance, confirm that IDs are unique and phone numbers are numeric. RFID authorizing Conditions: RFID reader LCD display (such as a 16x2 or OLED display) ESP32 microcontroller link to the internet Google Sheets

Hardware connection: Join the ESP32 microcontroller with the RFID reader and LCD display. For data transfer, an LCD normally needs a power connection, a ground connection. Configure the ESP32 to establish a connection to a wireless network. In the Arduino code, this also includes configuring the Wi-Fi credentials. Set up Google Sheets: To record access information, create a Google Sheet. Activate the Google Sheets API and obtain the required credentials (OAuth 2.0 credentials, APIkey).

To read the data from an RFID tag, write code and scan the tag. putting the loaded info on show on the LCD panel. Display User Data: For simpler LCD manipulation, when a valid tag is scanned, display user data on the LCD by utilizing the LiquidCrystal_I2C library. Implement a feature to determine whether the RFID tag being scanned is permitted. In order to do this, the tag ID must be compare to a list of approved IDs kept in the system. Google Sheets Integration: API Settings: Send access data (such as username, ID, and timestamp) to Google

Sheets via the Google Sheets API. In order to do this, the Arduino code must configure the HTTP client and structure the data appropriately for the API call. Update the Google Spreadsheet instantly each time a tag is scanned by having the machine do so. This entails contacting the Google Sheets API endpoint via HTTP POST requests that provide pertinent data Validation: Check the RFID tags' permission status. Give access and show a welcome message on the LCD if the tag is approved. If not, refuse entry and present an error message. Several Users: Make sure the system can accommodate several users and keep accurate logs of all inputs and outputs.

Important points

Instantaneous Updates for Google Sheets: To ensure you have a precise record of all inputs and outputs, make sure Google Sheets updates are made in the real-time.

Unauthorized tags: Notify users by identifying and blocking access to unauthorized tags, and by showing relevant notifications on the LCD. correct Records: To effectively manage numerous users and guarantee seamless system functioning under load, maintain correct input/output records.

Error Handling: To guarantee that the system stays dependable and safe, provide strong error handling for network problems, invalid tag reads, and other unforeseen difficulties.

In summary Using the ESP32 and Arduino IDE, you may create a reliable RFID-based access control system by following the preceding methods. With its seamless interaction with Google Sheets and real-time data tracking, this system guarantees effective and safe access control.

Block Diagram:

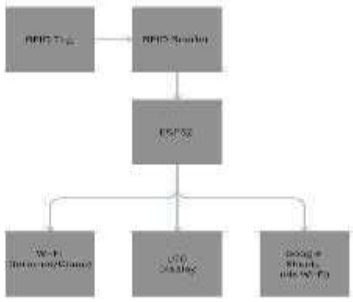

Fig – 3: Block Diagram for Smart ID Entry System Using RFID TECH.

The relationships between the main parts of the RFID-based access control system—RFID tags, RFID readers, ESP32 microcontrollers, LCD displays, and Google Sheet are in the block diagram. RFID Tag to RFID Reader: To read or write data, the RFID tag and reader communicate wirelessly. RFID Reader to ESP32: The ESP32 receives data from the RFID reader using communication interfaces such as SPI, I2C, or UART. ESP32 to LCD Display: The ESP32 sends access status and user information updates to the LCD display.

ESP32 to Wi-Fi: To communicate data to Google Sheets, the ESP32 establishes a Wi-Fi connection with the internet.

ESP32 to Google Sheets: The ESP32 updates entrance and exit times in Google Sheets via HTTP queries

Results & Discussion:

Using distinct identifiers for every RFID tag has greatly improved security when implementing an RFID-based entry system. Because of their specificity, tags are particularly difficult to copy or fake, which helps to prevent unwanted access. Strong security measures built into the system guarantee that only people with legitimate RFID tags can enter, lowering the possibility of security lapses. A readily apparent enhancement was the decrease in processing time. The RFID system's automation expedites the admission and leave procedure and reduces wait times and bottlenecks,

particularly during peak hours. This stands in stark contrast to manual systems, which are more prone to human mistake and slower.

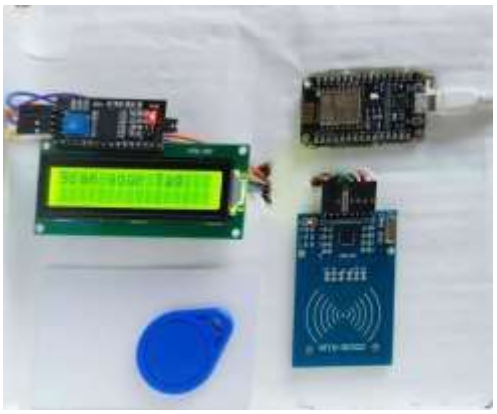

Fig – 4: Real-Time Working Project

The RFID system's quick processing speed improves overall operational effectiveness. One important benefit of the system is its capacity to produce intricate data logs of input and output times. These records make it easy to track movement on the property and enable improved monitoring and auditing. In-depth logs have shown to be quite helpful in spotting possible security problems and examining usage trends. It is easier to react swiftly to any security anomalies or breaches with this degree of data.

References:

[1] RFID TECHNOLOGY AND ITS APPLICATIONS IN INTERNET OF THINGS (IOT) DOI: 10.1109/CECNet.2012.6201508

[2] SMART ATTENDANCE MONITORING SYSTEM USING IOT AND RFID MGT Bharathy, MS Bhavani, T Tamilselvi International Journal of Advances in Engineering and Management (IJAEM), 2021•ijaem.net

[3] SMART TRANSPORTATION SYSTEM USING RFID
Authors: Sim Liew Fong, Amir Ariff Azham bin Abu Bakar, Falah Y. H. Ahmed, Arshad https://doi.org/10.1145/3316615.3316719

[4] SIMPLE RFID SMARTER CIRCUITRY BLOG https://www.circuitspecialists.com/blog/esp-microcontroller-quick-start-guide/

[5] RFID, RTLS BRING DATA TO AI IN THE FACTORY https://www.rfidjournal.com/news/rfid-rtls-bring-data-to-ai-in-the-factory/221289/