RFID Door Lock System

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Abstract- *This research delves into the exploration of Radio Frequency Identification (RFID) technology, a fundamental and cost-effective tool enabling wireless data transmission. The limited utilization in industrial settings results from historical standardization challenges manufacturing companies. In contrast to traditional network solutions, RFID technology emerges as an efficient and secure alternative, enabling wireless automatic identification by marking objects, locations, or individuals with unique identifier codes in RFID tags. RFID constitutes a comprehensive system with three core components: RFID tags, readers, and a back-end application system, supported by computer networks. Specialized software manages, controls, and maintains user records, finding applications in secure digital door locking systems. This study primarily focuses on passive RFID technology, known for its cost-effectiveness and compact design, offering battery-less solutions that benefit access control and inventory tracking systems.*

Keywords- Inventory tracking technology, Antenna technology, secure access control, Standardization, RFID (Radio Frequency Identification),unique identifier code

I. INTRODUCTION

Radio Frequency Identification (RFID) technology, offering wireless data transmission capabilities, has historically faced limited adoption in industries due to challenges related to standardization. In comparison to conventional network solutions, RFID technology excels in efficiency and security. It operates through the attachment or embedding of unique RFID tags on objects, locations, or individuals, each containing an exclusive identifier code.

This RFID system comprises three essential elements: RFID tags, RFID readers, and a back-end application system with a database, all interconnected via computer networks. Specialized software is pivotal for managing, controlling, conducting transactions, and maintaining records for various users. Digital door locking systems, one of the key applications of RFID technology, rely on RFID readers to authenticate and validate users, granting access upon successful verification and recording check-in and check-out activities. In secure spaces, user authentication is of utmost importance, making RFID an invaluable solution for ensuring swift, secure, and convenient access.

This study delves into the application of passive RFID technology, characterized by its cost-effectiveness and lack of batteries, drawing power from RFID readers. Its compact nature and affordability make passive RFID a favorable choice, especially in inventory tracking technology. The current state of antenna technology further enables the miniaturization of passive RFID tags.

This research paper aims to explore the potential of RFID technology, specifically passive RFID, in revolutionizing access control systems and user monitoring. The study seeks to address previous standardization issues by leveraging the unique advantages of RFID, demonstrating its potential to enhance security and efficiency in a wide range of applications, from secure facilities for inventory management.

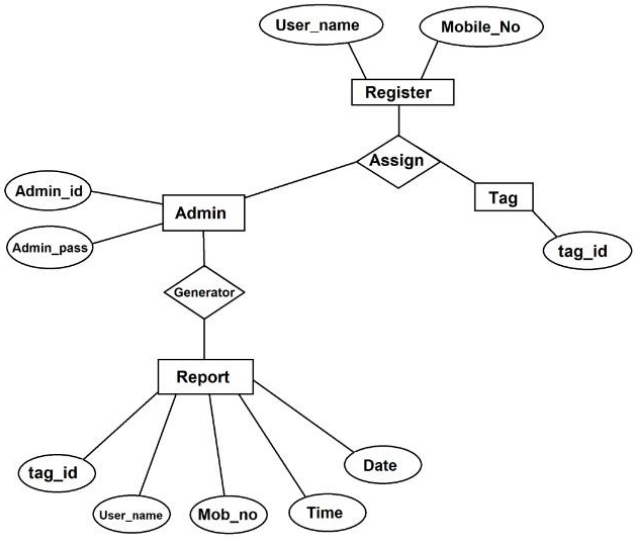

Fig 1. ER Diagram for RFID

II. LITERATURE SURVEY

The dynamic landscape of supply chain management poses substantial challenges, particularly in the domain of warehousing. Warehouses serve as vital junctions, intricately connecting all stakeholders in the supply chain and ensuring the uninterrupted flow of goods. Their role is pivotal as they bridge the gap between upstream production and downstream

distribution partners, significantly impacting warehouse productivity and the broader supply chain dynamics.

In this context, effective data sharing and precise location tracking of warehouse resources, including stock-keeping units (SKUs), pallets, equipment, and personnel, have become indispensable. These measures are critical for streamlining manufacturing processes, reducing surplus inventory, and minimizing costs related to order processing, storage, and transshipment, thereby enhancing overall warehouse productivity.

To address these challenges, warehouse management systems (WMSs) have been implemented for resource management and operational oversight. Nevertheless, a substantial disparity exists between these systems and the real-world complexities of warehouse operations, with WMSs often falling short in providing real-time resource status and location information. Further inaccuracies arise from manual data entry and error-prone barcode systems.

Hence, the imperative is to embrace real-time data collection and sharing techniques within warehouses, facilitating precise resource tracking and efficient warehouse operations. This step is essential for effectively navigating the evolving landscape of modern supply chain management.

III. PROPOSED WORK

The envisioned research entails the development and implementation of an RFID door locking system, with a central objective to establish a robust and user-friendly access control mechanism. This system harnesses the capabilities of Radio Frequency Identification (RFID) technology, utilizing RFID tags or cards as access credentials. These credentials are pivotal in regulating access to specific areas, such as doors, gates, and rooms, contingent upon the successful authentication of RFID data.

The core components of the proposed work encompass the creation and deployment of an RFID-based authentication system, responsible for determining access privileges. This research will extensively explore the technical architecture of the system, encompassing the infrastructure of RFID readers and the seamless integration of RFID tags or cards. Furthermore, the study will prioritize the fortification of system security and performance assessment in real-world settings, thereby shedding light on the efficacy of RFID technology in enhancing access control. This research endeavor seeks to provide valuable insights into the potential applications of RFID technology, offering secure and efficient access control solutions applicable across diverse domains, from home security to corporate access management.

Essential Elements and Operations of a typical RFID door lock system:

- RFID Reader: It's positioned at access points, such as doors and gates, where they detect and read RFID tags or cards presented by individuals to request access
- RFID Tags or Cards: Individuals granted authorization are issued RFID tags or cards, each featuring a unique identifier. RFID readers scan these tags/cards to ascertain access rights.
- Access Control Unit functions: It’s the central hub of the system, responsible for receiving and processing data from RFID readers to verify access requests. Upon receiving data from the readers, the Access Control Unit initiates a validation process, cross-referencing the information in the database to ascertain the access rights of the person presenting the RFID credentials.
- Database: The Database stores information about authorized users and their access rights. It is typically managed by access control management software.
- Authentication Process: Upon presenting their RFID tag or card to the RFID reader, the unique identifier is sent to the access control unit for authorization. If approved, the unit triggers the door/gate unlocking.
- Security Features: The RFID door lock system has the capacity to integrate added security measures like encryption, safeguarding communication between RFID reader and access control unit to prevent unauthorized credential interception or cloning.
- Integration and Management: The RFID door lock system facilitates integration with diverse security or building automation systems, enabling centralized access control management across various areas or structures.

The proposed model was coded using Arduino Uno, fronted is created using html CSS, javascript and bootstrap and database connectivity is given using MySQL.

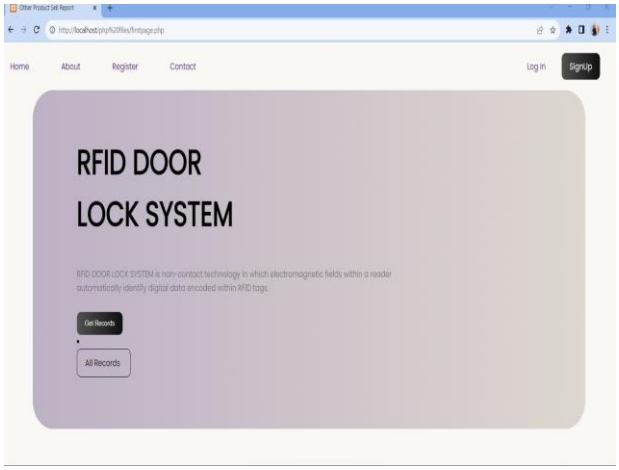

Fig 2. Front page

You can also register to system by entering the details mentioned in the below:

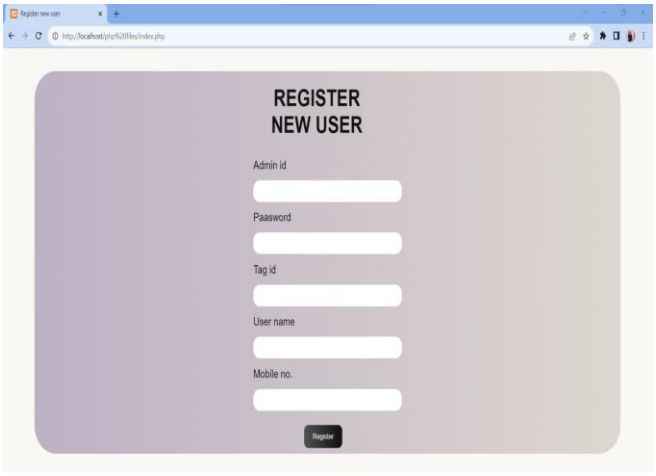

Fig3. Register Page

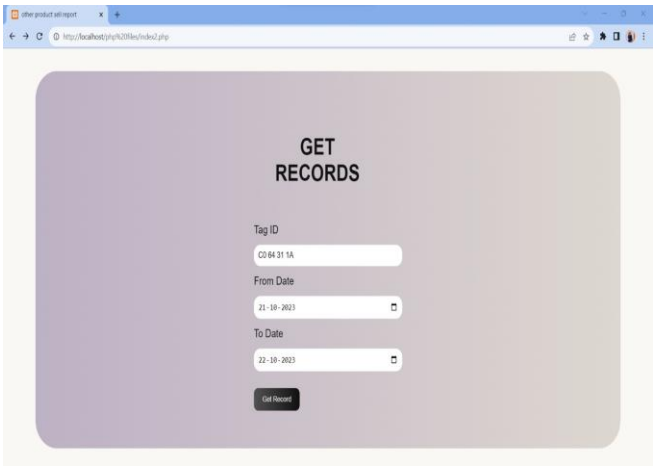

Fig4. Get Records

Fig 5. Displayed records

First, we scan the RFID tag ID on the RFID reader, then the reader reads the RFID tag and sends the scanned ID to Arduino UNO. To create the text file of scan ID we have used coolterm application which store tag ID value. This file is called as Arduino.txt file. To read this Arduino.txtwe can use fileWatcher() method of java which monitors changes ad updates of the text file.

If scan tag ID is present inside the register table, then it will display the “ID exist” and the record will inserted in the report table with date and time and it will open the door.

If scan tag ID is not present inside the register table, then it will display the “ID does not exist” and the record will inserted in the report table with date and time and it will not open the door.

Fig 6. Hardware connectivity

IV. CONCLUSION

In conclusion, this research has shed light on the immense potential of Radio Frequency Identification (RFID) technology in revolutionizing access control and secure data transmission. Historically hindered by standardization issues in industrial applications, RFID stands out as a cost-effective, efficient, and secure alternative to traditional network solutions. Its capacity for wireless automatic identification through unique RFID tags has profound implications, particularly in applications like digital door locking systems and inventory tracking. The utilization of passive RFID technology, with its cost-effectiveness and compact design, exemplifies its wide-ranging impact, further cementing its importance in the modern technology landscape.

V. FUTURE SCOPE

RFID locker locks provide versatile access options, enabling entry through cards, mobile devices, or Bluetooth Low Energy (BLE) technology. This adaptability, as opposed to traditional mechanical locks, enhances convenience and efficiency. Users can utilize various detectors such as magnetic cards, barcodes, fingerprints, or computer-generated alphanumeric codes. These electronic locks not only secure doors but also streamline accounting and attendance tracking. For businesses, RFID locker locks and RFID Mobile Access Locks have become essential tools for employee safety and company security.

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