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SUSTAINABLE AND NO CONTACT ATTENDANCE SYSTEM

(RFID BASED)

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Abstract— The sustainable and no contact attendance system with door unlocking using RFID and LCD screen is a novel approach to address the challenges posed by traditional attendance systems that involve physical contact and paper-based record-keeping. With the COVID-19 pandemic, it has become essential to maintain social distancing and minimize contact between individuals. This system provides an efficient and secure way to monitor attendance without requiring physical touch. The system operates by using RFID technology to read the unique identification number of student or employee ID cards. The LCD screen displays the attendance information, and the door unlocking mechanism allows authorized personnel to access designated areas. The use of RFID technology in the system ensures that attendance data is accurate, and the LCD screen provides real-time updates on attendance status. Moreover, the door unlocking feature adds an extra layer of security, restricting access to authorized personnel only. Overall, the system is a valuable addition to educational institutions and workplaces, providing a safe, efficient, and sustainable way to monitor attendance.

Index Terms— sustainable, efficient, proxy attendance, authorized personnel, physical contact. *(key words)*

I. INTRODUCTION

The COVID-19 pandemic has brought to light the necessity for fresh approaches to reduce physical contact and uphold social distance in workplaces and educational settings. Traditional attendance systems that rely on manual interaction and paper records are no longer workable in the present environment. Furthermore, the confidentiality and accuracy of the attendance data may be jeopardized by faults in these systems like proxy attendance or forgeries of signatures.

The development of a sustainable, no-contact attendance system with RFID and LCD screen door unlocking has been made in response to these problems. The system uses RFID technology to scan student ID cards and employee ID cards without having to physically touch them. The system then shows real-time attendance data on an LCD panel. A door unlocking mechanism is also part of the system, enabling authorized employees to enter specific areas.

The environmentally friendly and contact-free attendance system with RFID and LCD screen door unlocking has many benefits over conventional attendance systems. The approach encourages social distance, lowers the possibility of mistakes, and improves security by doing away with physical contact and paper-based recordkeeping. By minimizing paper use, the system also fosters sustainability, saving money and benefiting the environment.

The system's efficacy and potential for wide adoption have been shown by its successful implementation in companies and educational institutions. The setting and background of the sustainable and no contact attendance system with RFID and LCD screen door unlocking illustrate the need for creative solutions that advance security, precision, and sustainability in attendance monitoring.

The speed and precision of RFID technology in attendance systems are two of its main benefits. RFID technology allows real-time tracking of attendance data with little error, in contrast to conventional paper-based attendance systems that are prone to mistakes and can be time-consuming to administer. Furthermore, RFID attendance systems may be combined with other programs, including payroll and access control programs, to offer an effective and simplified solution for managing and monitoring attendance.

II. Literature Survey

Most educational institutions and companies currently use electronic systems like biometric systems, barcode scanners, or magnetic swipe cards to track attendance, in addition to more conventional paper-based approaches. The conventional paper-based approach is manually recording attendance by having students or staff sign a register or piece of paper. Due to the possibility of lost or forged attendance records, this approach is time-consuming and error-prone. On the other hand, electronic attendance systems provide a more effective and precise option for tracking attendance. For identification and tracking purposes, biometric systems employ iris scans, face recognition, and fingerprints. While magnetic swipe cards use the magnetic stripes on the cards to store and retrieve data, barcode scanners read the barcodes on ID cards.

Electronic attendance systems have several benefits over paper-based ones, but they also have some drawbacks. For instance, privacy issues can arise with biometric systems, and the devices' accuracy may be impacted by things like lighting and skin condition. Magnetic swipe cards and barcodes can be destroyed or misplaced, and the systems can be expensive to set up and maintain.

Overall, the shortcomings of the present attendance systems reduce their effectiveness and efficiency. A more secure, precise, and effective method of managing and recording attendance is the sustainable, no-contact attendance system with RFID and LCD screen door unlocking. The approach encourages social distance and lowers the danger of illness transmission by doing away with the requirement for physical contact.

III. Problem Statement

For many years, traditional attendance-based methods have been employed extensively in both companies and educational institutions. These systems use manual procedures including roll calls, name calling, and attendance marking on spreadsheets or paper. There is now a need for more sophisticated and effective attendance management systems due to a number of the constraints that current systems have.

Traditional attendance-based systems' time-consuming nature is one of their key drawbacks. Manually taking attendance can be time-consuming for teachers or administrators, especially in settings with many students or employees. As a result, the learning or working process may be delayed or interrupted, which will lower productivity and efficiency.

The possibility of mistakes exists with traditional attendance-based systems. Human mistake, such as misreading names or wrongly recording attendance, can result in false data when attendance is taken manually. This may result in disagreements and difficulties when computing grades, paying employees, or keeping track of attendance.

As a result, traditional attendance-based systems have a number of drawbacks that may compromise privacy, accuracy, and productivity. Therefore, more sophisticated and effective attendance management solutions are required to get over these constraints. Modern attendance management systems, such RFID-based attendance system can provide a more precise, effective, and secure method for managing attendance.

IV. Proposed Methodology

Every time a student or staff member inserts his tag or card on the device, the biometric system's internal mechanism examines the data. It then uses the data from the RFID tag to match it with the data from the employee's system. The goal of this project is to use Arduino to create an RFID Technology-based Attendance System that automatically records a person's attendance when they swipe their card or bring it close to the scanner.

The reader recognises the ID card when the RFID tag is brought close, and it sends the specific card number to the Arduino via serial port. The data that the Arduino collected is compared to the data that is already saved in the Arduino or any database with the aid of appropriate programming.

If any of these numbers match the card number that was received, the associated name is then recorded in that number, and the attendance for the name is indicated in the Excel Sheet.

When the tag is brought near to the RFID Reader, the tag gets hit by the radio waves produced by the reader and gets activated. After being activated the data stored in the tag is takenby the reader and then compared with the stored data, if the data is matched the attendance willbe recorded in the Excel sheet along with the arrival and departure time, else, it shows that the data isn’t matched or present.

V. DESIGN SPECIFICATIONS

Hardware Components :

Arduino Uno :

Arduino UNO is a microcontroller board based on the ATmega328P. It contains 6 analogue inputs, a 16 MHz ceramic resonator, 14 digital input/output pins (six of which may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. Everything required to support the microcontroller is included; all that is required to get going is the insertion of a USB cable, an AC-to-DC converter, or a battery. For everyone interested in building interactive things or settings, including artists, designers, enthusiasts, hackers, and novices, the Arduino hardware and software was created. Buttons, LEDs, and motors can all be controlled by Arduino. Beginners that are capable of using this board for programming and electronics projects often utilize the Arduino Uno.

RFID Reader :

A radio frequency identification (RFID) reader is a tool that extracts data from an RFID tag, which is used to track certain items. The RFID reader is a network-connected gadget that may be carried about or fixed to a surface. It uses radio waves to transmit signals that activate the tag. The tag transmits a wave back to the antenna after activation, where it is converted into data.

RFID Tag/Card :

These radio waves send information from the tag to the reader, which then sends it to the RFID computer program. In addition to being attached to things, RFID tags may also be used to track animals, persons suffering from Alzheimer's disease, automobiles, and even other products. Applications requiring access control or the need to track or identify personnel often use RFID cards.

Cards currently use a variety of RFID frequency bands, including 860-960 MHz ultra-high frequency (UHF), 13.56 MHz high frequency smart card, and 125 kHz low frequency proximity.

USB cable and Connecting wires :

A straight line is used to symbolize a connecting cable. It is frequently made of copper and includes insulation to act as an electrical connector between two locations.. Since copper is such a good conductor of electrical, electricity may move freely through it. It is therefore used to create wire connections. When used as a connecting wire, copper has a very low electrical resistance. frequently used to simplify the process of connecting the parts of a breadboard or other prototype equipment without soldering.

Utilizing a USB cable type A/B Standard USB 2.0 cable, Arduino is linked to the computer or laptop. Any standard host device (computer, hub, or controller) may connect to any standard peripheral (printer, scanner, external drive) with the Data Pro USB A to B connector. A USB type 'A' to 'B' (host to device) cable is what the 1594 series is.

Software Components :

Arduino :
Any programming language with compilers that generate binary machine code for the target processor may be used to create a program for Arduino hardware. AVR Studio (older) and Atmel Studio (newer) are the development environments offered by Atmel for their 8-bit AVR and 32-bit ARM Cortex-M-based microcontrollers.

IDE:
The Arduino integrated development environment (IDE) is a Java-written, cross-platform program available for Windows, macOS, and Linux. It came from the IDE for the programming languages Wiring and Processing. It offers a code editor with features including text replacement, automatic indenting, brace matching, syntax highlighting, and text copy and paste. Additionally, it provides simple one-click tools for developing and uploading Arduino programmes. There is also a toolbar with buttons for common activities, a message area, a text terminal, and a hierarchy of operational menus. The release of the IDE's source code is governed under the GNU General Public License, version 2.

IDE 2.0:
The beta preview, now known as IDE 2.0, was released later, on March 1st, 2021. The system still uses the Arduino CLI (Command Line Interface) despite improvements like a more expert programming environment, auto completion assistance, and Git integration. The Eclipse Theia Open Source IDE serves as the foundation for the application frontend.

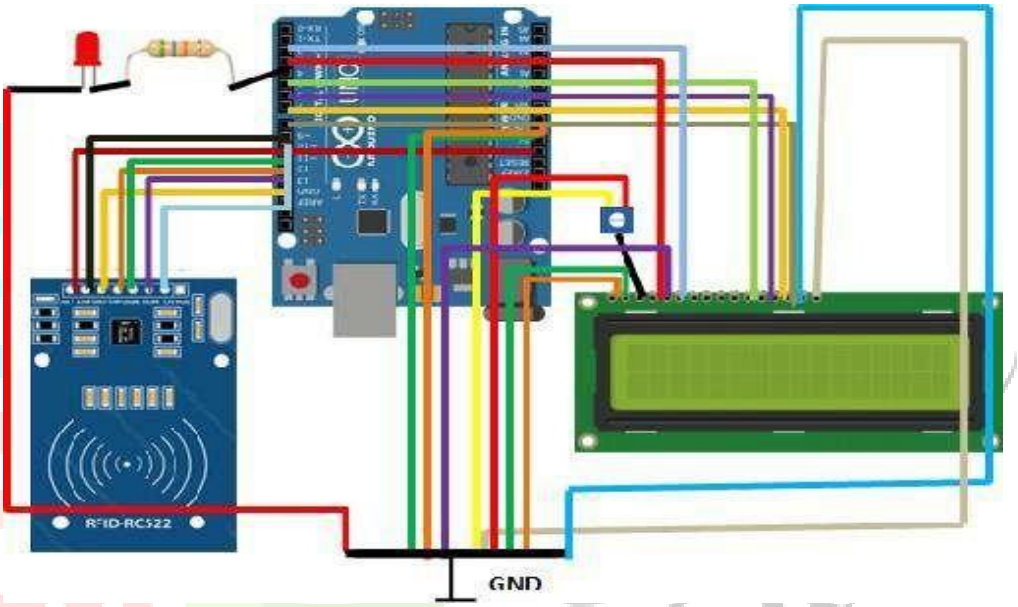
PLX-DAQ :
The Parallax Data Acquisition Tool (PLX-DAQ) software is an add-in for Microsoft Excel can gather data from up to 26 channels and arrange it into columns as it comes in when used with any Parallax microcontroller. Simple sensor analysis in the lab, field data spreadsheet analysis, and real-time equipment monitoring are all provided by PLX-DAQ. A Microsoft Excel add-on tool for Parallax microcontroller data collection is called PLX-DAQ. Now, data can be sent straight into Excel from any of our microcontrollers attached to any sensor and the serial port of a PC.

VI. WORKING AND PROCEDURE

Every time a student or staff member inserts his tag or card on the device, the biometric system's internal mechanism examines the data. It then uses the data from the RFID tag to match it with the data from the employee's system. The goal of this project is to use Arduino to create an RFID Technology-based Attendance System that automatically records a person's attendance when they swipe their card or bring it close to the scanner. The project's operation is described below.

The LCD will initially display the phrase "Please Bring your Tag near" when the circuit is turned ON. The reader recognises the ID card when the RFID tag is brought close, and it sends the specific card number to the Arduino via serial port. The data that the Arduino collected is compared to the data that is already saved in the Arduino or any database with the aid of appropriate programming. If any of these numbers match the card number that was received, the associated name recorded in that number is displayed on the LCD display and the attendance for that name is noted in the Excel Sheet.

The tag is struck by the radio waves emitted by the RFID Reader when it is brought close to it, activating it. The reader reads the information from the tag once it has been activated and compares it to the previously stored information. If the information matches, the attendance will be entered in the Excel sheet along with the arrival and departure times; otherwise, it indicates that the information isn't matched or present.



VII. Result

Recently, it was believed that one of the most crucial aspects or problems with paying salaries was the employees' attendance. Radio frequency identification (RFID), among other automated identifying technologies, has gained popularity. Numerous studies and other applications have been created to make the most of this technology and address some issues. In order to categorise and route items using radio waves, RFID is a wireless device that involves data transfer from an electronic tag, also known as an RFID tag, or label. The current study intends to suggest an RFID-based attendance system, as well as a system of information services on academic domains, in addition to programmable logic circuits like Arduino.

The suggested system aims to control staff attendance systems that use RFID tags or cards to link to an Arduino UNO RFID Reader module. In order to save and retrieve data in real time, the Arduino UNO receives authentication data, which is subsequently delivered through the module to Excel Spreadsheets. The timestamp, card key, and columns on the API table make the attendance system non-paper and organised. One of the most important responsibilities at a school, college, or university is managing attendance. Teachers can monitor their pupils' activities thanks to daily student attendance. Additionally, it helps parents determine whether their kids are paying attention in class and are frequent attendees.

However, it might be difficult for teachers to keep track of thousands of pupils' attendance each day. Traditional methods of recording daily student attendance can lead to mistakes and a lot of manual labour. As it automates the kids' attendance process and empowers instructors and parents, an RFID-based attendance system might be a fantastic way to tackle such difficulties.

VIII. Conclusion

The objective of developing an RFID-based attendance system was finally fulfilled. This project has provided a practical approach of attendance marking in terms of performance and efficiency compared to the traditional methodology of attendance system.

However, there are still several modifications that may be made to this RFID to increase its dependability and effectiveness. The system can have an LCD panel to provide information about any scanned cards that are not registered. This system can incorporate an IP camera to detect behaviour like buddy punching, in which one cheats by looking for another person. Last but not least, this attendance system may be made better by including a function that alerts teachers and administrators when a student is running late for work or class, as the case may be.

This low-cost system offers superior comfort, tactical and surveillance capabilities, and can survive any terrain or environment. Positively, RFID technology promises to raise the efficacy and efficiency of corporate and administrative procedures. Through the use of this article, it has been successfully demonstrated how to build and execute an automatic attendance system based on RFID technology. The system created transforms the paradigm towards a digital and contactless environment and offers a precise, easy-to-use, cost-effective way to track attendance at educational institutions. Additionally, the system is much more convenient to deploy as and when needed due to its mobility and compactness.

IX. Future Scope

1. Investigating the potential of integrating RFID-based attendance systems with other systems, such as access control, security, and payroll systems, to streamline processes and improve efficiency.

2. Conducting a life cycle assessment of different types of RFID tags and readers to identify areas for improvement in terms of energy efficiency and sustainability.

3. Exploring the potential of using renewable energy sources, such as solar or wind power, to power RFID-based attendance systems, to reduce their environmental impact and improve their sustainability.

4. Assessing the effectiveness of different types of RFID tags, such as active and passive tags, in different environments and applications, to determine the most suitable type for different scenarios.

5. Investigating the potential of using advanced analytics, such as machine learning and AI, to analyze attendance data and identify patterns and trends, to optimize workforce management and improve decision-making.

6. Conducting comparative studies of different types of RFID technology, such as HF vs. UHF tags or active vs. passive tags, to evaluate their performance in different scenarios.

7. Investigating the impact of environmental factors, such as metal objects or electromagnetic interference, on the performance of RFID technology, to determine the optimal conditions for using RFID-based attendance systems.

By conducting research in these areas, organizations can gain a better understanding of the potential of RFID-based attendance systems and identify areas for improvement and innovation.

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