1.Abstarct

RFID Based Smart Door Locking System (IOT) is a process for enhancing the quality of resident's life by facilitating a secure environment. Since less alertness worry on door locking system. So, to overcome this problem, this project suggests the use of Internet of Things (IOT) to provide secure access only to the authenticated person then the door will Open and Green Light indication that authenticated person has access the door. The project is aimed at developing an application for the "optimized locking and unlocking a system using mega controller" Smart Door Locker Security System playing a major role which benefits in decreasing a work by managing some technologies. It is used to transmit a signal to door from RFID Card by using wireless system.

The major components of the system are Latest Arduino UNO, Servo Motor and RFID Reader and Card which forms and develops an activity. The open-source Software and Hardware is used to complete a task. In case of unauthenticated person, the door will remain closed.

The aim to build this machine was for security and safety purpose. The crime rate around us as increased a lot and people are suffering due to this. A person cannot leave his/her house without any safety or security. Also, in market such product or machines are at high price. By seeing all this criterion, we thought of making a machine which is compact, Cheap and easy to use so that everyone can afford and no one will afraid of theft and other things

2.Introduction

Security systems play an important role to prevent unauthorized personnel entry into a secured environment, which may include physical and intellectual property. Various door locks such as mechanical locks or electrical locks were designed to attain basic security requirements. Basically, these locks can be easily hacked by unwanted people thereby allowing unauthorized personnel into secured premises.

Speech recognition of the elevator system permits the communication mechanism between the user and also the Arduino primarily based mechanism. Automatic access control system has become necessary to overcome the security threats faced by many organizations in Nigeria.

Several types of access control systems are used in electronic door locks to access the door. The most used access control systems are PIN/Password (Personal Identification Number), fingerprint, and RFID based Electronic door locks systems.

By installing the system at the entrance will only allow the authorized personnel to enter the organization. The system is not restricted to main entrance installation, but can be installed at various entrances within the organization to track personnel movement thereby restricting their access to areas where they are not authorized. There are several automatic access control technologies including barcode, magnetic stripe and Radio Frequency Identification (RFID) applied in security system.

Radio-Frequency Identification (RFID) is an emerging technology and one of the most rapidly growing segments of today’s access control. RFID technology, offers superior performance over other automatic identification systems and is used in many areas such as public transport, ticketing, animal identification, electronic immobilization, industrial automation, access control, asset tracking, people tracking, inventory detection and many more

Arduino is an open-source electronics platform that allows users to create interactive projects by controlling sensors, actuators, and other devices. By integrating Arduino with RFID sensors, it becomes possible to collect real-time data, analyze it, and take appropriate actions to maintain door lock standards.

Use of keys which is old method and by use of RFID technology. In this project discusses the design of an automatic access control system using Arduino microcontroller and RFID system.

The aim is granting access to authorized personnel and denying access to unauthorized personnel by using RFID technology instead of keys. Each person is issued an authorized tag, which can be used for swiping in front of the RFID reader to have access to a secured environment.

Everyone wants the best protection for their home, also with for vacations and come out for work away from home, security is more important than ever. Locks are designed to keep intruders away, but every once in a while, a key gets stuck or mechanism gets clogged. If the wrong key is inserted into a lock, it can get stuck. This can also happen with new keys. Stuck keys can be removed by spraying lubricant into the keyhole.

If this doesn’t work, contact a residential locksmith to help you so you don’t damage the lock. As a lock gets older, it can become loose. In this case, your lock can be easily unlocked by using hairpins or other tools. It’s extremely important to have a locksmith fix this issue right away so the security of your home isn’t compromised.

The RFID Door Lock System is constructed using 4 major components these are Arduino, RFID Redder Module, RFID Card or Key Fob Tag, Servo Motor, and LCD Display. Here I’ll use Arduino Nano as the main microcontroller that controls the whole system. You can use any other type of Arduino board like Arduino Uno or Mega. The RFID Redder Module is used to read the Card or Key Tag value and send the value to the Arduino.

Then the Arduino matches this value with the pre-defined value in the code. If this value is matched then the microcontroller sends a command to the servo motor to unlock the door. The servo motor is used to control the lock mechanism. The IR sensor is used to check whether the door is open or closed. LCD display shows the RFID value reading status (Card correct or wrong) and the door status (open/close).

3.Literature Survey

Title: RFID based systems

Summary:These types of security systems used for digital door lock [17] are utilizing inactive RFID tags (passive). With the help of this, it ensures that only valid person can get entry. Such systems are working in real time basic for opening the door in which user have to place the tag in contact with RFID detector, then the entryway gets opens and in the central server the registration data is stored with necessary data of the users. Attendance and person tracking is possible by using such type of system. RFID Based Gate Access Security System which points out authorized peoples and permits just them was effectively created by K.Srinivasa et. al. [18]. This system ought to have the capacity to minimize the trained or specialized human error during secured door access. Latest RFID based door lock security system are based on arduino platform [19] with audio acknowledgement at the point when card put close to the RFID module, it peruses the card data and it matches with the data stored in the program memory and shows authorize/unauthorized entry. Arduino is also used by many other applications for example A specific Arduino ATMEL processor can be used for sensing and recognition of person [20], another example like ECG Parameter Identification and Monitoring [21] as they have open source platform.

Title: RFID-Based Digital Door Locking System

Summary:RFID technologies are more proficient and more secure as compare to other networks [5]. RFID technology is used in many areas such as public transport, industrial automation, animal identification, ticketing, inventory detection, electronic immobilization, access control, asset and people tracking, and many more [7]. Gyanendra and Pawan [9] proposed a security system using a passive type of RFID contains a door locking system using an Arduino UNO

Title: Door lock and open system Using Arduino UNO Based Sensors

Summary: Various smart locks are previously available. The majority of them are expensive. In this paper “Arduino based electronic lock using RFID and password” which was proposed by “Ni Ni San Hlaing, San SanLwin”. This digital door lock runs on the technology of audio-frequency identification and passcode-based with the help of an Arduino Uno.

Title: Development of Door lock system Using Arduino UNO

Summary: In another paper named “Smart Lock System Using RFID” was proposed by ShrinidhiGindi, NaiyerShaikh, KashifBeig, AbdealiSabuwala”. Here may be a Room security solution supported IoT using RFID, the system is often monitored from anywhere within the world thanks to the continual updating of the status of the door.

- Summary: Coming to the next paper named “SMART DOOR UNLOCK SYSTEM USING FINGERPRINT” was proposed by K.Rajesh, Asst.Prof. B.VenkataRao, P.AV.S.K.Chaitanya, A.Ruchitha Reddy. In our paper, we apply the fingermark detector to scan one's character to instinctually function the gate of the car, under such situation we prefer to use a MCU for enabling for both opening and closing of the door if both the match for scanned and existing facts are true.

- In the upcoming document termed “DOORWAY ROBOTIZATION network supported by CORDLESS for android Smartphone” was proposed by “Lia Kamelia, Alfin Noorhassan S.R, Mada Sanjaya, and W.S., Edi Mulyana”. In this a tool called a automated door lock with the support of Bluetooth and Android smartphone door locks automation system using Bluetooth-based Android Smartphone's is recommended and prototyped. The equipment structure forthe door lock setup is that a combination with an android.

Title: Smart Door lock system

Summary: A smart door lock is defined as an electronic and mechanical locking device that opens wirelessly with an authorized user's authentication. (Rouse. M, 2017) The existence of a smart door lock began with the smart home automation system. The creation of smart home is where the parts of a home is manipulated and designed to operate wirelessly, where an example of parts of a home is the door.

Title: Internet of Things (IOT) Based Digital Door lock system System

Summary: The term Internet Of Things (IoT) is a well-known term in this modern era. IoT's relationship with smart door lock's is connected through smart home automation. Smart home automation was created to enhance a home's devices to create a wirelessly controlled environment. IoT has been categorized to four applications which are Personal and Home, Enterprise, Utilities and Mobile.

Personal and Home applications focuses more on devices at houses for example, a smart door lock. Another example of enhancement that has been planned to be created is An interesting development will be using a Twitter like concept where individual 'Things' in the house can periodically tweet the readings which can be easily followed from anywhere

Title:IOT-based Real-time Door lock system System using Arduino Microcontroller

Summary: This article proposes a cost-effective design and expansion of a real-time water quality measuring system using the Internet of Things (IOT). The system aims to measure physical and chemical parameters such as temperature, humidity, pH, and turbidity. Water contamination poses a significant threat to sustainable development. Continuous monitoring of water quality is essential to ensure the availability of safe drinking water. This paper presents the development and implementation of a simplified framework for real-time water quality monitoring using IOT.The system consists of multiple sensors capable of measuring various physical and chemical parameters of water, including temperature, pH, turbidity, and humidity.

Title: RFID BASED DOOR LOCK WITH AUTOMATIC DOOR OPEN AND CLOSE

Summary:This paper presented a diagram on RFID development. RFID development has a noteworthy potential to end up inescapable within the near future. Today it is currently successfully used in store organize the officials to pursue beds of things. Following grants better coordination and control in the age cycle. Directly the business is pushing towards thing level naming to construct the control altogether further. Regardless, that moreover makes concerns, most fundamental assurance concern, yet also other security related issues. The paper showed possible circumstances how security can be risked by RFID names yet likewise a couple of answers for guarantee against it. Since RFID advancement ends up being progressively typical, strikes against the structure itself start to appear. This paper recorded the most outstanding, start from standard sniffing and tuning in over renouncing of organization to new RFID contaminations. The paper in like manner showed that there is an entire other world to RFID than basically store organize the administrators. The paper covers instruments that allow finding or following a conceivably moving article. To wrap things up the paper additionally reviews.

4.Project Requirements

4.1 Hardware Requirements Specifications

- **Microcontroller (e.g., Arduino Uno):**
  Arduino is an open-source electronics platform consisting of a microcontroller board and a development environment. Its user-friendly IDE simplifies code writing, compilation, and uploading, utilizing a variant of C/C++. This accessibility makes it popular among beginners and experts alike, enabling the creation of diverse projects, from simple LED displays to intricate robotics. Supported by a vibrant community, Arduino offers extensive online resources, including tutorials and forums, facilitating collaborative learning and troubleshooting. Its versatility allows for applications in home automation, IOT, robotics, and more, with a wide range of sensors, actuators, and shields available for customization. Affordable and easy to use, Arduino democratizes electronics, empowering hobbyists, students, and professionals to innovate and prototype efficiently.

- **RFID Sensor:**
  RFID (radio frequency identification) is a form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person.

  RFID tags are made up of an integrated circuit (IC), an antenna and a substrate. The part of an RFID tag that encodes identifying information is called the RFID inlay.
  There are two main types of RFID tags:
  Active RFID. An active RFID tag has its own power source, often a battery.
  Passive RFID. A passive RFID tag receives its power from the reading antenna, whose electromagnetic wave induces a current in the RFID tag's antenna.
  There are also semi-passive RFID tags, meaning a battery runs the circuitry while communication is powered by the RFID reader.

- **Jumper wires:**

Jumper wires are essential components in electronics, consisting of insulated wires with connectors at each end. They come in various lengths, colors, and connector types, such as male-to-male, male-to-female, and female-to-female. Jumper wires facilitate easy and temporary connections between electronic components on breadboards, prototyping boards, and circuit modules, enabling rapid prototyping and experimentation without the need for soldering. They are commonly used to connect microcontrollers, sensors, LEDs,and other electronic modules, allowing for quick assembly and modification of circuits. Male-to-male jumper wires are typically used to connect pins on components, while male-to-female wires bridge connections between male pins and female headers. Female-to-female jumper wires are useful for extending connections or creating jumper cables with custom lengths. Their flexibility and versatility make jumper wires indispensable tools for electronics enthusiasts, hobbyists, students, and professionals engaged in prototyping, testing, and debugging electronic circuits and projects.

- **I2C LCD display:**

An I2C LCD, or Inter-Integrated Circuit Liquid Crystal Display, is a type of LCD screen that utilizes the I2C communication protocol for interfacing with microcontrollers and other devices. It consists of a standard LCD display module with an integrated I2C interface adapter, typically based on an I2C serial backpack module. This setup simplifies the connection of the LCD to a microcontroller by reducing the number of pins required for communication. The I2C LCD module typically includes a small onboard EEPROM for storing configuration data and custom character patterns. It also features a contrast adjustment potentiometer and backlight control for adjusting display brightness.
Communication between the microcontroller and the I2C LCD module occurs over the I2C bus, which uses a two-wire serial interface comprising a clock (SCL) and data (SDA) line. This allows multiple devices to communicate with each other using a single pair of wires, making it ideal for applications with limited I/O pins.

- **Servo motor:**

  A servo motor is a type of electric motor that can rotate or move to a specific position, speed, or torque based on an input signal from a controller.

  The term servo comes from the Latin word servus, meaning servant or slave. This reflects the historical use of servo motors as auxiliary drives that assist the main drive system.

  2 types of servo meter

  1. AC Servo Motors:

  AC servo motors are electric motors that operate on alternating current (AC). They have a stator that generates a rotating magnetic field and a rotor that follows the field.

  2. DC Servo Motors

  DC servo motors are electric motors that operate on direct current (DC). They have a permanent magnet stator that generates a fixed magnetic field and a wound rotor that rotates when a current is applied.

  The basic working principle of a servo motor involves the controller receiving two types of input signals:

  - A setpoint signal: This is an analog or digital signal that represents the desired position, speed, or torque of the output shaft.
  - A feedback signal: This is an analog or digital signal that represents the actual position, speed, or torque of the output shaft measured by the sensor.

- **Connector:**

  The Arduino Nano utilizes a USB cable for programming and power supply. It typically employs a mini-USB or micro-USB connector on the board's end, allowing users to connect it to a computer or a USB power source. The USB cable serves as the primary means of uploading sketches (programs) to the Nano and facilitating serial communication with the Arduino IDE for debugging and monitoring. Additionally, the USB connection provides power to the Nano, eliminating the need for an external power supply in many applications. Users can choose between using a USB cable with a type-A connector on one end for connection to the computer or a USB power adapter, and a mini-USB or micro-USB connector on the other end for connection to the Nano. Overall, the USB cable is a crucial component for programming, powering, and communicating with the Arduino Nano, making it a versatile and convenient tool for electronics projects.

- **Foam Board**:
  Foamcore, foam board, or paper-faced foam board is a lightweight and easily cut material used for mounting of photographic prints, as backing for picture framing, for making scale models, and in painting.

SOFTWARE REQUIREMENTS:

- Arduino IDE

4.2 Software Requirements Specifications

4.2.1 Arduino IDE:

The Arduino IDE (Integrated Development Environment) is a software platform used for writing, compiling, and uploading code to Arduino microcontroller boards. It provides a user-friendly interface for programming Arduino boards, making it accessible to beginners and experienced developers alike. Here's an overview of the Arduino IDE:

Code Editor: The IDE includes a text editor where you can write your Arduino sketches (programs). It features syntax highlighting, automatic indentation, and other useful editing tools to help you write code efficiently.

Compilation: Once you've written your code, you can compile it using the Arduino IDE. The IDE translates your sketch into machine code that can be understood by the Arduino microcontroller. Compilation checks for syntax errors and other issues in your code.

Upload: After compiling your code successfully, you can upload it to your Arduino board using a USB connection. The Arduino IDE handles the communication between your computer and the Arduino board, transferring the compiled code to the board's flash memory.

Serial Monitor: The IDE includes a built-in serial monitor tool that allows you to communicate with your Arduino board via the serial port. You can send and receive data between your Arduino sketch and your computer, which is useful for debugging and interacting with your projects.

Library Manager: Arduino libraries are pre-written code that you can use to extend the functionality of your sketches. The Arduino IDE includes a library manager that makes it easy to install, update, and manage libraries directly from within the IDE.

Board Manager: Different Arduino boards require different configurations and settings. The IDE includes a board manager that allows you to select the type of Arduino board you're using and install the necessary drivers and board definitions.

Cross-Platform: The Arduino IDE is available for multiple operating systems, including Windows, macOS, and Linux, making it accessible to users regardless of their preferred platform. Overall, the Arduino IDE provides a beginner-friendly yet powerful environment for programming Arduino boards, enabling users to bring their electronic projects to life with ease. Additionally, it supports a vast community of developers and enthusiasts who share their knowledge and contribute to the ecosystem of Arduino-compatible hardware and software.

Embedded programming:

Embedded programming involves writing software specifically tailored to run on embedded systems, which are dedicated computing devices with limited processing powerand memory. These systems are typically designed for specific tasks and applications,such as controlling machinery, monitoring sensors, or managing electronic devices. Embedded programming languages like C, C++, and sometimes assembly language are commonly used due to their efficiency and direct control over hardware. Programmers must consider hardware constraints, such as memory limitations and processing speed, when developing embedded software. Embedded programming often involves tasks like interfacing with hardware peripherals, implementing real-time functionality, and optimizing code for performance and resource usage.

4.2.2 Communication protocols:

Communication protocols are standardized sets of rules and conventions used for transmitting data between devices or systems. They define how data is formatted, transmitted, received, and interpreted, ensuring reliable and efficient communication.These communication protocols play crucial roles in enabling seamless data exchange and interoperability between devices in various applications, ranging from simple sensor networks to complex distributed systems. Understanding their characteristics and capabilities is essential for designing and implementing efficient and reliable communication solutions in embedded systems and IOT devices.

4.2.2 Remote monitoring system:

Remote monitoring software allows users to observe and manage devices, systems, or processes from a remote location via a computer or mobile device. It typically provides real-time access to data, alerts, and status updates, enabling proactive monitoring and troubleshooting. Remote monitoring software often includes features such as customizable dashboards, data visualization tools, and notification mechanisms to keep users informed of critical events or anomalies. Some platforms offer advanced analytics capabilities, allowing users to analyze historical data, identify trends, and make data- driven decisions. Security features, such as encryption, user authentication,
and access controls, are essential to protect sensitive information and ensure data integrity.

4.3 Functional and Non- Functional Requirements

- **Functional Requirements**

4.3.1 Remote configuration:

Through this requirement it is possible to configure some parameters of the stations remotely, namely the frequency sampling of each sensor.

4.3.2 Update Information:

The system must allow inquiry into stations in order to attain current data. This will allow information of the status of any station and its sensors in real-time.

4.3.3 Monitoring stations status:

One efficient strategy to reduce the risk of problems in water supply is by better controlling aspects such as the level and quality of the water. Monitoring the stations brings two major benefits, namely real-time analysis of these parameters and using the data to produce statistical reports.

- **Non-Functional Requirements**

4.3.4 Performance:

The system response time depends on how sophisticated the sensors are. If the sensors are rough (level sensors), the system will be cheaper but not so accurate when using sophisticated sensors (ultra-sonic).

4.3.5 Flexibility:

The system must be flexible in order to allow the user to insert, remove or edit elements, such as new stations, more sensors or adding mobile phone numbers to deliver alerts.

4.3.6 Usability:

A friendly interface, flexible, with strong graphical capabilities and succinct and clear messages can raise the system efficiency.

4.3.7 Power supply:

In order to solve the problem of remote stations located in isolated places, with difficult access, and without power supply, all these stations need to be equipped with a solar panel and a battery.

4.3.8 Reliability:

The system should exhibit high reliability, with minimal downtime and robust error handling mechanisms. It should be resilient to hardware failures, network disruptions, and power outages, ensuring uninterrupted monitoring and data collection.

4.3.9 Accuracy:

Accuracy in measurement and analysis is paramount for a water quality monitoring system. The sensors and analytical methods employed should yield precise and reliable results, minimizing false positives or negatives in detecting contaminants or anomalies.

4.3.10 Security:

Given the sensitivity of water quality data, the system should incorporate robust security measures to protect against unauthorized access, data breaches, and tampering. This includes encryption of data transmissions, authentication mechanisms for user access, and secure storage of historical data.

4.3.11 Interoperability:

Interoperability with existing infrastructure and data standards is essential for seamless integration with other environmental monitoring systems, data management platforms, or regulatory reporting systems. Standardized protocols and APIs enable interoperability and data exchange across heterogeneous systems.

4.3.12 Data Tracking

Because an employee carries an RFID card with her, a smart-card system records her movements throughout her working day. The computerized system matches the smart card information against its own database, identifies the card holder and logs information into another database.
For example, when she enters a locked storeroom with the card, the system notes the person, the date and time, and the activity. In an emergency, the security team can quickly determine if people are still in the building and find their locations. A smart-card-enabled copy machine can automatically deduct copying costs from the cardholder's department account.

4.3.13 Easy of use

Ease of Use An RFID card is just as useful in your pocket or clipped to your shirt. Because the RFID system uses radio waves, the card's proximity to the reader triggers the system. Unlike a magnetic stripe card, an RFID smart card doesn't need to make physical contact with the reader. This adds convenience when you're carrying an armload of boxes and want access to a locked room.

5.Analysis and Design

Pin diagram:

Arduino to LCD display connections:
The circuit diagram the 16×2 LCD display module with I2C is powered by connecting 5V and GND of Arduino Nano to VCC and GND of LCD display module. And I2C pins SDA and SCL of LCD display are connected to A4 and A5 respectively.

The sensors are connected to specific pins or input channels on the microcontroller, allowing for the acquisition of analog or digital signals representing the measured parameters. For example, pH sensors may utilize analog pins for voltage readings, while digital sensors such as turbidity sensors may communicate via protocols like I2C or SPI. Additionally, the microcontroller may incorporate built-in analog-to-digital converters (ADCs) to digitize analog sensor outputs for further processing.

In addition to sensor inputs, the microcontroller typically features output pins for controlling peripheral devices and communication interfaces. These output pins may be used to trigger alarms or indicators based on predefined thresholds for specific water quality parameters. For instance, if the pH level exceeds a certain limit indicating acidity or alkalinity, the microcontroller can activate a buzzer or LED to alert operators.

Furthermore, the microcontroller interfaces with communication modules to transmit the collected data to external devices or networks for monitoring and analysis. Common communication interfaces include UART, SPI, I2C, Ethernet, Wi-Fi, or GSM/GPRS modules, depending on the application requirements and connectivity options. These modules enable the water quality monitoring system to communicate with supervisory control systems, data

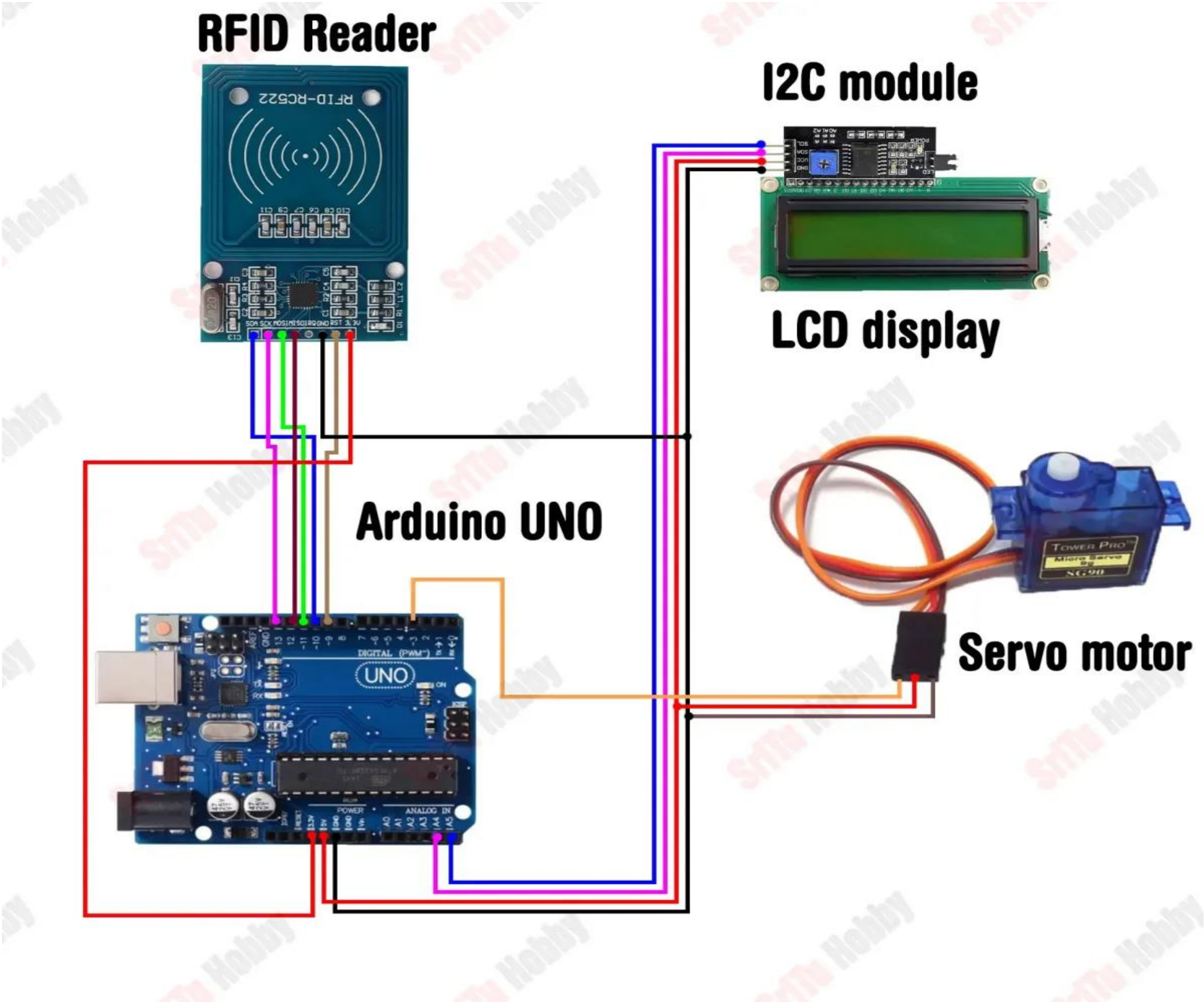

Fig.5.1: Pin diagram of RFID Door Lock System

5.1 System Design:

Designing a system for an RFID door locking system involves several components and considerations. Here's a high-level overview of the system design:

1. RFID Reader: Choose an RFID reader compatible with the RFID tags you plan to use. The reader will communicate with the RFID tags and send the tag's unique identifier to the microcontroller.

2. RFID Tags: Select RFID tags that will be attached to authorized users' keycards or badges. Each tag contains a unique identifier that the RFID reader can recognize.

3. Microcontroller: Use a microcontroller such as Arduino, Raspberry Pi, or a dedicated microcontroller with sufficient processing power and input/output capabilities to control the system. The microcontroller will receive input from the RFID reader, process the data, and control the locking mechanism accordingly.

4. Locking Mechanism: Choose a locking mechanism suitable for your application, such as an electronic door lock or an electromechanical lock. Ensure that the locking mechanism can be controlled by the microcontroller, either directly or through additional circuitry like relays.

5. Power Supply: Provide a stable power supply to the system components, including the RFID reader, microcontroller, and locking mechanism. Depending on the application, you may use batteries, AC power adapters, or a combination of both.

6. User Interface: Consider incorporating a user interface for system configuration, status indication, and user feedback. This could be an LCD display, LED indicators, or a simple buzzer to signal successful or failed access attempts.

7. Communication Interface (Optional): If the system requires remote monitoring or control capabilities, you may include a communication interface such as Wi-Fi, Ethernet, or GSM/GPRS. This allows you to communicate with the system over a network or send notifications/alerts when unauthorized access attempts occur.

8. Data Logging (Optional):Implement data logging functionality to record access events, including timestamps and RFID tag IDs. This data can be useful for security auditing, access control management, and troubleshooting.

9. Security Measures: Incorporate security measures to prevent unauthorized access and tampering. This may include encryption of communication protocols, physical tamper detection mechanisms, and secure storage of sensitive data.

10. Integration with Existing Systems (Optional): If the RFID door locking system needs to integrate with existing security or access control systems, ensure compatibility and interoperability with those systems.

11. Testing and Calibration: Thoroughly test the system to ensure proper functionality and reliability under various conditions, including different RFID tags, environmental factors, and user scenarios. Calibrate the system as needed to optimize performance.

12. Installation and Deployment: Install the RFID door locking system at the desired location, following any applicable safety regulations and installation guidelines. Provide user training and documentation for proper usage and maintenance of the system.

By following these guidelines and considering the specific requirements of your application, you can design and implement an effective RFID door locking system to control access to a secured area or facility.

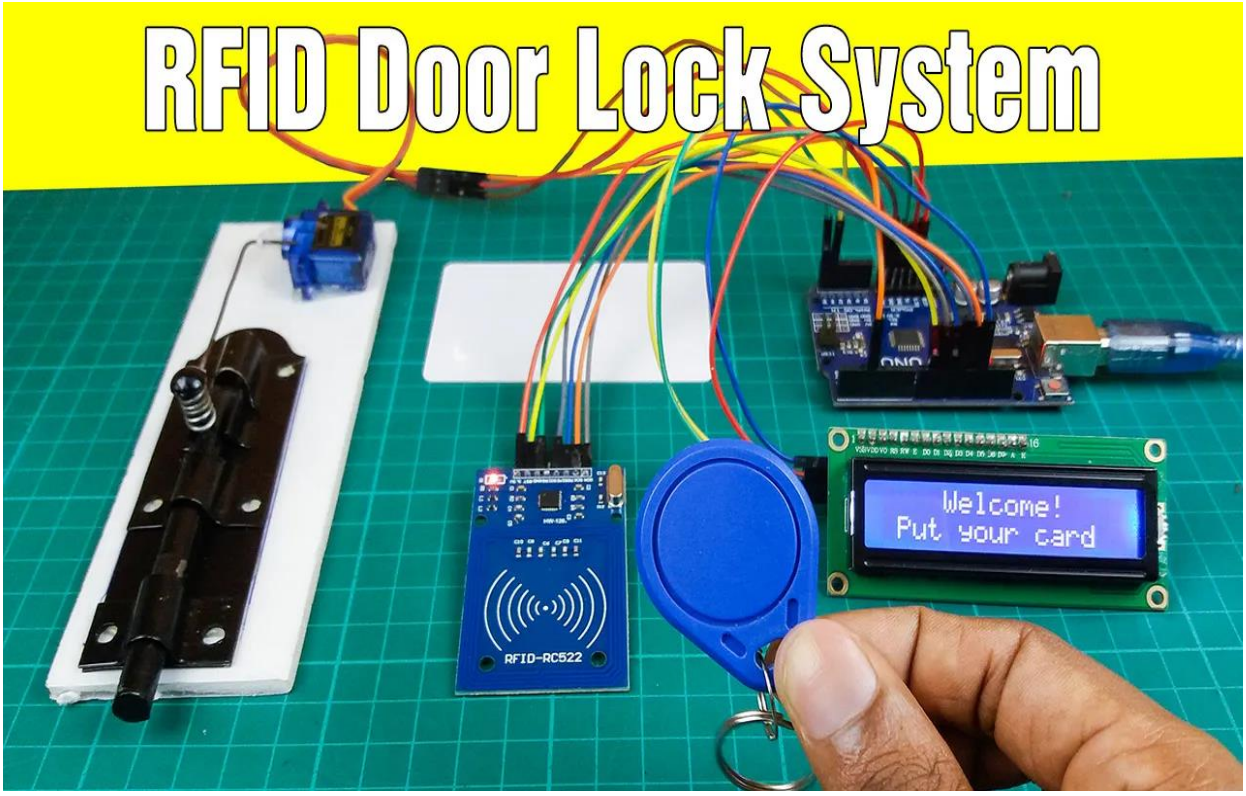

Fig.5.2: System design of Digital Door lock system

5.2 DataFlowDiagram:

A data flow diagram (DFD) for a water quality monitoring system illustrates the flow of data between various components and processes involved in monitoring water quality. At its core, the system revolves around the collection, processing, analysis, and presentation of quality data to facilitate decision-making and ensure the safety.

Starting with the inputs, the DFD depicts data sources such as An RFID reader sends Radio Frequency (RF) signals via an antenna. The antenna radiates the RF energy, and it is absorbed by the RFID tag attached to a good or material. The tag uses the absorbed energy to “power up” and return data from the embedded chip.

The sensor data is then transmitted to a central processing unit, represented in the DFD as a data processing node. This node, typically a microcontroller or a data logger, receives, aggregates, and stores the incoming sensor data. It may perform additional functions such as data validation, normalization, and filtering to ensure data integrity and accuracy.

From the data processing node, the DFD illustrates the flow of processed data to various downstream processes and components. This includes communication modules responsible for transmitting the data to external systems or stakeholders for monitoring and analysis. Communication interfaces such as Ethernet, Wi-Fi, GSM/GPRS, or LoRaWAN enable remote access to the foam board data, facilitating real-time monitoring and decision-making.

Additionally, the DFD depicts data storage components, where processed data is archived for historical analysis, reporting, and regulatory compliance purposes. Data storage may involve local databases, cloud-based platforms, or data repositories integrated with external monitoring systems or regulatory agencies.

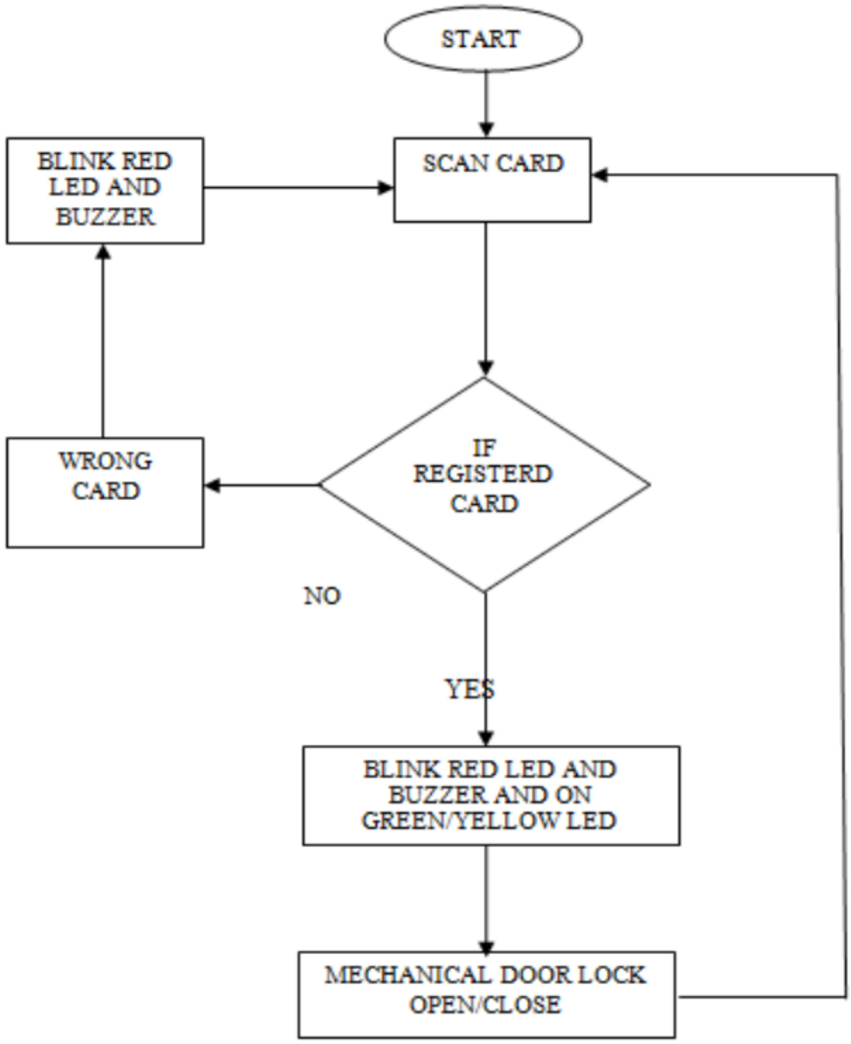

Fig.5.3: Data flow diagram of water quality monitoring

6.Implementation

```
#include <LiquidCrystal_I2C.h>
#include <SPI.h>
#include <MFRC522.h>

#define RST_PIN 9
#define SS_PIN  10
byte readCard[4];
byte a = 0;

LiquidCrystal_I2C lcd(0x27, 16, 2);
MFRC522 mfrc522(SS_PIN, RST_PIN);

void setup() {
  Serial.begin(9600);
  lcd.init();
  lcd.backlight();
  while (!Serial);
  SPI.begin();
  mfrc522.PCD_Init();
  delay(4);
  mfrc522.PCD_DumpVersionToSerial();
  lcd.setCursor(2, 0);
  lcd.print("Put your card");
}

void loop() {
  if ( ! mfrc522.PICC_IsNewCardPresent()) {
    return 0;
  }
  if ( ! mfrc522.PICC_ReadCardSerial()) {
    return 0;
  }
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Scanned UID");
  a = 0;
```

```
  Serial.println(F("Scanned PICC's UID:"));
  for ( uint8_t i = 0; i < 4; i++) {  //
    readCard[i] = mfrc522.uid.uidByte[i];
    Serial.print(readCard[i], HEX);
    Serial.print(" ");
    lcd.setCursor(a, 1);
    lcd.print(readCard[i], HEX);
    lcd.print(" ");
    delay(500);
    a += 3;
  }
  Serial.println("");
  mfrc522.PICC_HaltA();
  return 1;
}
```

7.Conclusion

Numerous safety systems have been suggested in order to protect RFID buildings towards feasible attacks particularly all of us outlined the various software field from the RFID technologies in addition to a few achievable section of its software. We now have set up powerful protection depending on encryption technique. Apart from all of us attempted to maintain much better procedure runtime. Evaluating the suggested program along with current program, we now have satisfied along with each Guideline for example program authentication protection as well as functional runtime. Regarding protection, the machine is actually fairly guaranteed with regard to eliminating the actual biometric program as well as forerunning the actual procedure at the rear of the actual home windows. Regarding runtime, the actual system's needed period is more preferable compared to current.

The RFID Door Lock is a very cheap and affordable design that allows convenience and security for users. The design is relatively small and easy enough to install with jus a couple of screws. The relay supplies the solenoid lock with the power supply if the tag read matches with the saved tag in the microcontroller.
The design is relatively small and easy enough to install with just a couple of screws. Of course there are additional features that can be added in order to improve the system as a whole. However, it is important to note the cost of the improvement should be taken into consideration.

In this paper, an attempt has been taken to make the secure door lock system which provides some effective security measures and also easily accessible for the users. The components that were used can be changed with similar types of components without bringing any major change to the program itself.

In this paper, a smart lock system is presented which is a novel access control system using IOT which includes the online monitoring. The smart lock system provide a convenient way to automate the access control feature thereby enhancing security and enabling the owner of the property care free. It is a low cost, flexible, and a very easy to install system with no overhead like planning, cabling, and construction works.

8.Future Enhancement

RFID is increasingly used with biometric technologies for security. The significant advantage of all types of RFID systems is the non-contact, non-line-of-sight nature of the technology. Tags can be read through a variety of substances such as snow, fog, ice, paint. Hence, this project can be very much useful and can be implemented in real time applications for recording the attendance

Future enhancements for water quality monitoring using Arduino could include:

Integration of Advanced Sensors:
Incorporating advanced sensors capable of detecting a wider range of water parameters, such as heavy metals, pesticides, and specific pollutants, to provide a more comprehensive understanding of water quality.

Wireless Connectivity:
Implementing wireless connectivity options such as Wi-Fi, Bluetooth, or LoRa to enable remote monitoring and real-time data transmission to a central database or cloud platform. This would enhance accessibility to data and enable quicker response to water quality issues.

Data Analysis and Visualization:
Developing software tools or applications to analyze and visualize the collected data, allowing users to identify trends, patterns, and anomalies more effectively. This could involve the use of machine learning algorithms for predictive analysis or anomaly detection.

Autonomous Operation:
Designing Arduino-based systems with autonomous operation capabilities, including self-calibration, self-diagnosis, and automated alerts for abnormal water quality conditions. Thiswould reduce the need for constant human intervention and enhance the reliability of the monitoring system.

Integration with IOT Platforms:
Integrating Arduino-based water quality monitoring systems with broader Internet of Things (IOT) platforms to leverage existing infrastructure and enhance interoperability with other environmental monitoring devices and systems.

Mobile Application Development: Creating mobile applications that allow users to monitor water quality data in real-time, receive notifications of critical events, and access historical data for analysis and reporting. This would increase the accessibility of water quality information to a wider audience.

Community Engagement and Citizen Science: Implementing strategies to engage local communities in water quality monitoring efforts using Arduino-based systems. This could involve educational programs, workshops, and citizen science initiatives to empower individuals to monitor and protect their local water resources.

Energy Efficiency: Optimizing power consumption to prolong battery life in remote or off-grid deployment scenarios. This could involve the use of low-power sensor modules, sleep modes, and energy harvesting techniques such as solar or kinetic energy.

Robustness and Durability: Enhancing the robustness and durability of Arduino-based water quality monitoring systems to withstand harsh environmental conditions and ensure long-term operation in outdoor settings.

Standardization and Interoperability: Establishing standards and protocols for data exchange and interoperability among different water quality monitoring systems, facilitating data sharing, collaboration, and comparison of results across regions and organizations.

By incorporating these future enhancements, Arduino-based water quality monitoring systems can become more advanced, reliable, and accessible tools for safeguarding water resources and promoting environmental sustainability.

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