MANJARA CHARITABLE TRUST
RAJIV GANDHI INSTITUTE OF TECHNOLOGY, MUMBAI

A Synopsis Report

ON

SECURITY ACCESS USING RFID

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CERTIFICATE

DEPARTMENT OF INFORMATION TECHNOLOGY

This is to certify that

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Have satisfactory completed this synopsis entitled

SECURITY ACCESS USING RFID

Towards the partial fulfilment of the

BACHELOR OF ENGINEERING

IN

(Information Technology)

as laid by University of Mumbai.

Guide

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DECLARATION

We declare that this written submission represents our ideas in our own words and where others ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academics honestly and with integrity and have not misrepresented or fabricated or falsified any idea/data/fact/sources in our submission. We understand that any violation of the above will be cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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(Signature)

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ABSTRACT

The Internet of Things (IoT) is the network of physical objects or “things” embedded with electronics, software, sensors and network connectivity, which enables these objects to collect and exchange data. The concept of IoT is used for various creative applications to be applied to real world problems. Student verification is one such problem. This process requires asset scanning either using RFID or Barcode. The assets need to be brought to the scanner for verification. There has been rising demand for secure system that must be dependable and quick respond for the industries and company. To secure industries and companies this concept is helpful. RFID (Radio Frequency Identification) is one of the consistent and fast means of identify the material object. In the long ago the barcode’s are more preferable as compared to RFID because of their cost but now a day’s RFID are easily available and are more convenient to use. Research has made some drastic changes which makes its programming a lot shorter and easier is because of replacing microcontroller with Arduino. Arduino makes the circuit and programming a lot easier to understand. This project is based upon security access and control system using RFID and Arduino. Security access system is very convenient to use at home, office and commercial buildings and college campus.

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Chapter 1

INTRODUCTION

1.1 An introduction to RFID :

RFID is an acronym for “radio-frequency identification” and refers to a technology whereby digital data encoded in RFID tags or smart labels (defined below) are captured by a reader via radio waves. RFID is similar to barcoding in that data from a tag or label are captured by a device that stores the data in a database. RFID, however, has several advantages over systems that use barcode asset tracking software. The most notable is that RFID tag data can be read outside the line-of-sight, whereas barcodes must be aligned with an optical scanner.

1.2 Working of RFID :

Systems that make use of RFID technology are typically composed of three key elements:

1. An RFID tag, or transponder, that carries object-identifying data.
2. An RFID tag reader, or transceiver, that reads and writes tag data.
3. A back-end database, that stores records associated with tag contents.

Each tag contains a unique identity code. An RFID reader emits a low-level radio frequency magnetic field that energizes the tag. The tag responds to the reader’s query and announces its presence via radio waves, transmitting its unique identification data. This data is decoded by the reader and passed to the local application system via middleware. The middleware acts as an interface between the reader and the RFID application system. The system will then search and match the identity code with the information stored in the host database or backend system. In this way, accessibility or authorization for further processing can be granted or refused, depending on results received by the reader and processed by the database.

Chapter 2

AIMS AND OBJECTIVES

2.1 Aim :

This project aims in designing a completely automated security access system for domestic and industrial applications. Here we aim for security access system for the college campus. Security is the bigger concern for an individual or a firm. Recognizing the need of security we develop an automated security access system with user friendly access.

2.2 Objectives :

1. RFID based authentication system.
2. Automatic opening of door when RFID tag matches.

Chapter 3

LITERATURE SURVEY

In this project we have implored the use of both hardware and software to bring about the entire project. The hardware components are solely coordinated by Arduino while the C programming language is used to program the controller.

This project proposes Arduino based Security System is a design that applies automated security system in homes, industry, military, etc. This Project will be based on Arduino and other electronic design to achieve the above stated purposes.

The conventional method allowing access to employee inside an educational campus is by showing photo I-cards to security guard is very time consuming and insecure, hence inefficient. Radio Frequency Identification (RFID) based security system is one of the solutions to address this problem. This system can be used to allow access for student in school, college, and university. It also can be used to take attendance for workers in working places. Its ability to uniquely identify each person based on .security access easier, faster and secure as compared to conventional method. Students or workers only need to place their ID card on the reader and they will be allowed to enter the campus. And if any invalid card is shown then the buzzer is turned on.

RFID Based Systems :

These types of security systems used for digital door lock 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. 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 with audio acknowledgement at the point when card put close to the RFID module, it perusesthe card data and it matches with the data stored in the program memory and shows authorize/unauthorized entry.

Chapter 4

EXISTING SYSTEMS

- Long ago the barcode's applications were more as compared to RFID because of their cost. In those days these barcode's were available for low cost and they were popular in those days. The barcode gets scanned by barcode reader and it displays the stored information, thus it provides security. The Bar code should be placed nearer to the reader when compare to RFID tags.The sensor in the barcode scanner detects the reflected light from the illumination system and generates an analog signal that is sent to the decoder.The decoder interprets that signal,validates the barcode using the check digit ,and converts it into text.

Limitations:

- These are very slow than the RFID readers.
- These are inconsistent and inefficient.
- Barcodes were designed such that they scan one at a time.
- Barcode system needs to maintain their line of sight with each code.
- The type and volume of data on barcodes is more limited as compared to RFID tag.
- Barcodes don't support for allowance of accurate inventory in adverse conditions.
- They don't really support for an optimized solution for real world situations.

Chapter 5

PROBLEM STATEMENT AND SCOPE

5.1 Problem Statement:

All of the door opening system use traditional ways such as lock and keys, latches, passcode or password locks .It encounters number of limitations that is , access is not time based and id based.

Due to this we are following drawbacks.

1) No Time Limitations

   Persons having access enter at any time they want and exit at anytime they want. This causes lack of master's eye on ongoing activities and entries.

2) Anyone Can Enter

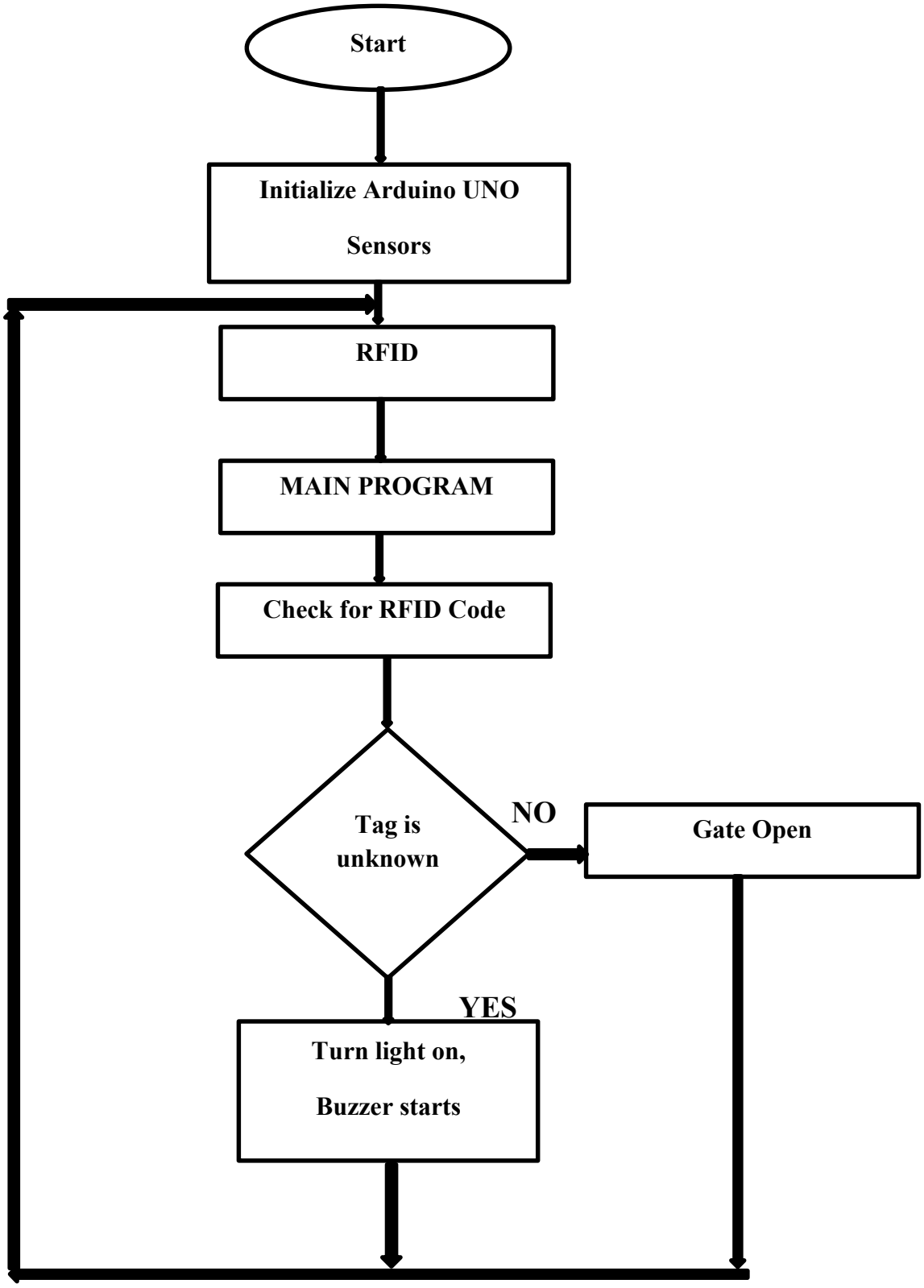
   In traditional systems there are no limitations on who can enter only manual control (security guards) are available.

5.2 Scope:

The focus is on implementation of arduino based door unlocking system with real time control and implementing security system to avoid illegal and wrong time access. The hardware implementation would enable the project to be used in real time practical condition.

Chapter 6

PROPOSED SYSTEM



The central database contains all the information of the authorized users say their names, occupation, age and the serials which are written within their RFID cards or tags. The users are uniquely identified by the server by the serial assigned to card. When a new user is first registered to the system new serial is generated randomly and is burnt to the new card using RFID reader. Next time when this user approaches to enter through door the new serial is processed in the same manner as it is already included in the central database. When a user comes to entry point only the serial number is fetched from the card and it is checked that whether the serial is an authorized one or not. If the serial is authorized the entry request is accepted by the server. Accordingly, the door at that particular entry point is unlocked and after a specified time delay it is locked again giving some time to the user to enter. But if the serial is unauthorized access to that door is denied with an alarming sound. This allows the in charge of the system to monitor the check-in activities of the users as well as to control the status of each and individual door even when the person is out of station or out of that zone.

Chapter 7

DETAILS OF HARDWARE AND SOFTWARE

9.1 Hardware details:

Following are the components which are used in the project:

1. Arduino Uno :

Fig 1.1: Arduino Uno Board

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery.

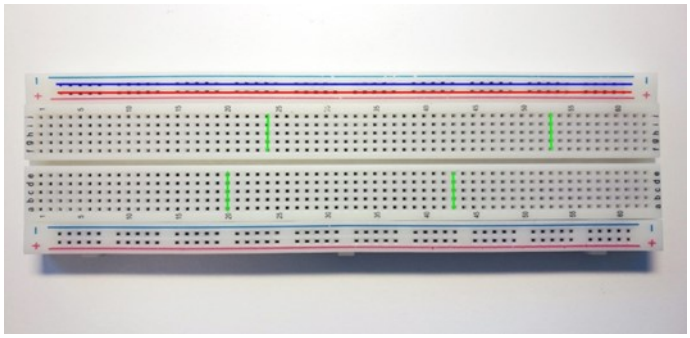
2. RC522 – RFID READER / WRITER :

2.1 RFID READER / WRITER

Description:

- RC522 - RFID Reader / Writer 13.56MHz with Cards Kit includes a 13.56MHz RF reader cum writer module that uses an RC522 IC and two S50 RFID cards.
- The MF RC522 is a highly integrated transmission module for contact-less communication at 13.56 MHz. RC522 supports ISO 14443A/MIFARE mode.
- RC522 - RFID Reader features an outstanding modulation and demodulation algorithm to serve effortless RF communication at 13.56 MHz.
- The S50 RFID Cards will ease up the process helping you to learn and add the 13.56 MHz RF transition to your project.
- The module uses SPI to communicate with microcontrollers.
- The open-hardware community already has a lot of projects exploiting the RC522 – RFID Communication, using Arduino.

3. Breadboard :

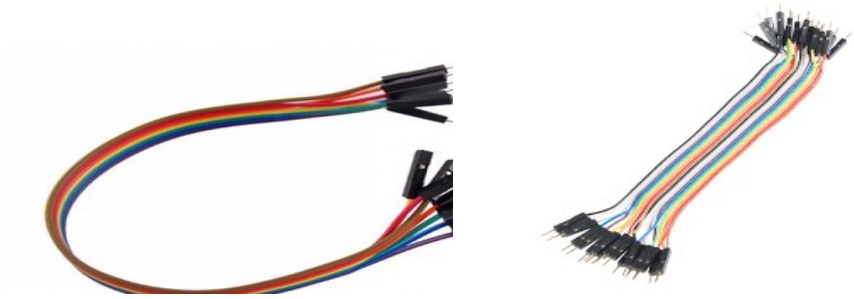


3.1 Breadboard

Description:

- A breadboard is a solderless device for temporary prototype with electronics and test circuit designs.
- Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.
- The breadboard has strips of metal underneath the board and connect the holes on the top of the board. The metal strips are laid out as shown below.
- Note that the top and bottom rows of holes are connected horizontally and split in the middle while the remaining holes are connected vertically.

4. Connecting Wires :



4.1 Connecting Wires

Description:

- Connecting Wires and Cables (male-to-male) (male-to-female) (female-to-female) Set of 30.
- A jump is an electrical wire, or group of them in a cable, with a connector or pin at each end which is normally used to interconnect the components of a breadboard or other prototype or test circuit or power supplies, internally or with other equipment or components, without soldering. Use of these cables increase reliability.
- Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

5. Servo Motor :

5.1 Servo Motor

Description:

- A **servomotor** is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.

- It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.
- Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.
- Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

6. Buzzer :

6.1 Buzzer

Description:

- A **buzzer** or **beeper** is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (*piezo* for short).
- Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

9.2 Software Implementation:

Following are the software :

1. Arduino IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

a) Sketchbook:

The Arduino Software (IDE) uses the concept of a sketchbook: a standard place to store your programs (or sketches). The sketches in your sketchbook can be opened from the File > Sketchbook menu or from the Open button on the toolbar. The first time you run the Arduino software, it will automatically create a directory for your sketchbook. You can view or change the location of the sketchbook location from with the Preferences dialog.

b) Tabs, Multiple Files, and Compilation:

Allows you to manage sketches with more than one file (each of which appears in its own tab). These can be normal Arduino code files (no visible extension), C files (.c extension), C++ files (.cpp), or header files (.h).

c) Libraries:

Libraries provide extra functionality for use in sketches, e.g. working with hardware or manipulating data. To use a library in a sketch, select it from the Sketch > Import Library menu. This will insert one or more #include statements at the top of the sketch and compile the library with your sketch. Because libraries are uploaded to the board with your sketch, they increase the amount of space it takes up. If a sketch no longer needs a library, simply delete its #include statements from the top of your code.

There is a list of libraries in the reference. Some libraries are included with the Arduino software. Others can be downloaded from a variety of sources or through the Library Manager. Starting with version 1.0.5 of the IDE, you do can import a library from a zip file and use it in an open sketch.

d) Language Support:

Since version 1.0.1 , the Arduino Software (IDE) has been translated into 30+ different languages. By default, the IDE loads in the language selected by your operating system. If you would like to change the language manually, start the Arduino Software (IDE) and open the Preferences window. Next to the Editor Language there is a dropdown menu of currently supported languages. Select your preferred language from the menu, and restart the software to use the selected language. If your operating system language is not supported, the Arduino Software (IDE) will default to English.

Chapter 8

DESIGN AND IMPLEMENTATION

Block diagram:

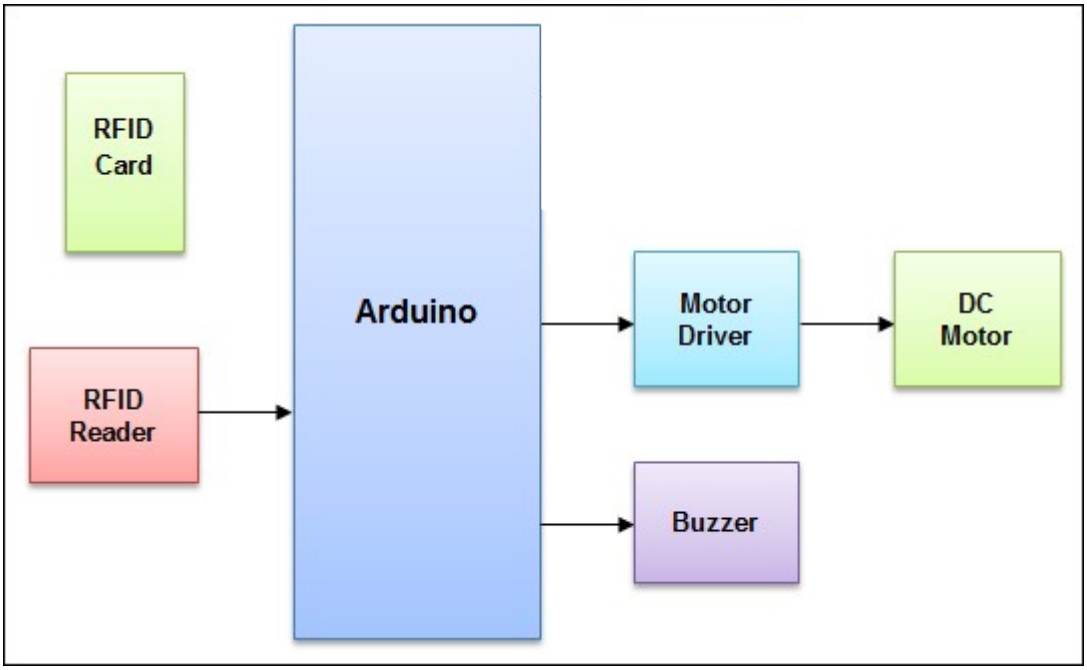


Fig 8.1 : Block diagram of system

Code for reading the RFID card :

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

#define SS_PIN 10
#define RST_PIN 9
#define LED_G 5 //define green LED pin
#define LED_R 4 //define red LED
#define BUZZER 2 //buzzer pin
```

```
MFRC522 mfrc522(SS_PIN, RST_PIN);   // Create MFRC522 instance.
Servo myServo; //define servo name

void setup()
{
  Serial.begin(9600);   // Initiate a serial communication
  SPI.begin();      // Initiate  SPI bus
  mfrc522.PCD_Init();   // Initiate MFRC522
  myServo.attach(3); //servo pin
  myServo.write(0); //servo start position
  pinMode(LED_G, OUTPUT);
  pinMode(LED_R, OUTPUT);
  pinMode(BUZZER, OUTPUT);
  noTone(BUZZER);
  Serial.println("Put your card to the reader...");
  Serial.println();

}
void loop()
{
  // Look for new cards
  if ( ! mfrc522.PICC_IsNewCardPresent())
  {
    return;
  }
  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial())
  {
    return;
  }
  //Show UID on serial monitor
  Serial.print("UID tag :");
  String content= "";
  byte letter;
```

```
 for (byte i = 0; i < mfrc522.uid.size; i++)
 {
   Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
   Serial.print(mfrc522.uid.uidByte[i], HEX);
   content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
   content.concat(String(mfrc522.uid.uidByte[i], HEX));
 }
 Serial.println();
 Serial.print("Message : ");
 content.toUpperCase();
 if (content.substring(1) == "B5 17 E0 B2")
 {
  Serial.println("Authorized access");
  Serial.println();
  delay(500);
  digitalWrite(LED_G, HIGH);
  tone(BUZZER, 500);
  delay(300);
  noTone(BUZZER);
  myServo.write(90);
  delay(5000);
  myServo.write(0);
  digitalWrite(LED_G, LOW);
 }

else   {
  Serial.println(" Access denied");
  digitalWrite(LED_R, HIGH);
  tone(BUZZER, 300);
  delay(1000);
  digitalWrite(LED_R, LOW);
  noTone(BUZZER);
 }
}
```

Chapter 9

Conclusion

RFID cards can add convenience and safety to any transaction of value and data. Evaluation of performance, cost and security that will produce a smart card system that fits today's needs in future, which leads to better business for everybody.

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