

Practical work 3

Topic: Implementation of identification/authentication through RFID system

Objective: To acquire the skills to implement identification/authentication processes through an RFID system .

Theoretical part

and receiving signals and a chip that contains information about the object to which it is attached. RFID is an intelligent system that is essential for the operation of any system. It does not require a username, but does require the user to optionally enter a PIN or password. An RFID reader is a device that is connected to a network that can be portable or permanently connected . It uses radio waves to transmit signals that activate the tag. Once activated, the tag sends a wave to the antenna , where it is translated into data. The transponder is in the RFID tag itself. Using RFID for inventory management requires a scanner that uses radio waves to communicate with the RFID tag. The tag itself contains a microchip that allows the reader to read data and write data to the tag for real-time updates.

As RFID has grown in popularity over the past few years, so has its reputation as a highly versatile way to add value to a business . An RFID tag reader can be integrated with other tracking systems, such as barcodes, to create a truly customized solution. While most people familiar with RFID may associate it with inventory and asset tracking, RFID is used for many other creative purposes.

RFID types:

1. By type of power supply

- There are two main types of transponders - active and passive.

Active RFID transponders have their own power supply system, for example, a built-in battery , and can transmit data over long distances (up to 100 m).

Passive RFID transponders derive energy for data transmission only from the electromagnetic field of the RFID reader-writer.

is also an intermediate type represented by semi-active or semi-passive transponders , which on the one hand have their own power source, but do not act as a transmitter themselves. The RFID transponder is powered by a battery and therefore does not have to rely on the properties of the electromagnetic field, but the response is generated by modulating the field, which does not further amplify the field.

2. By type of memory used

- RO (Read Only) - these tags are written to only once . They are very convenient to use for one-time identification.
- WORM (Read Once Write Many) - contains a write-once memory block that can be read many times.
- RW (Read and Write) - transponders that can be written and read multiple times.

This freely available bandwidth is characterized by low transmission rates and short transmission distances. In most cases, these systems are inexpensive, easy to operate, and do not require registration or additional fees. RFID transponders use nearby electromagnetic waves and receive energy through inductive coupling. The advantage is that RFID transponders in this frequency range are relatively resistant to metals or liquids, making them suitable for use in animal and human identification. These transponders are characterized by collisions - one-time errors in the transmission of information in a common environment.

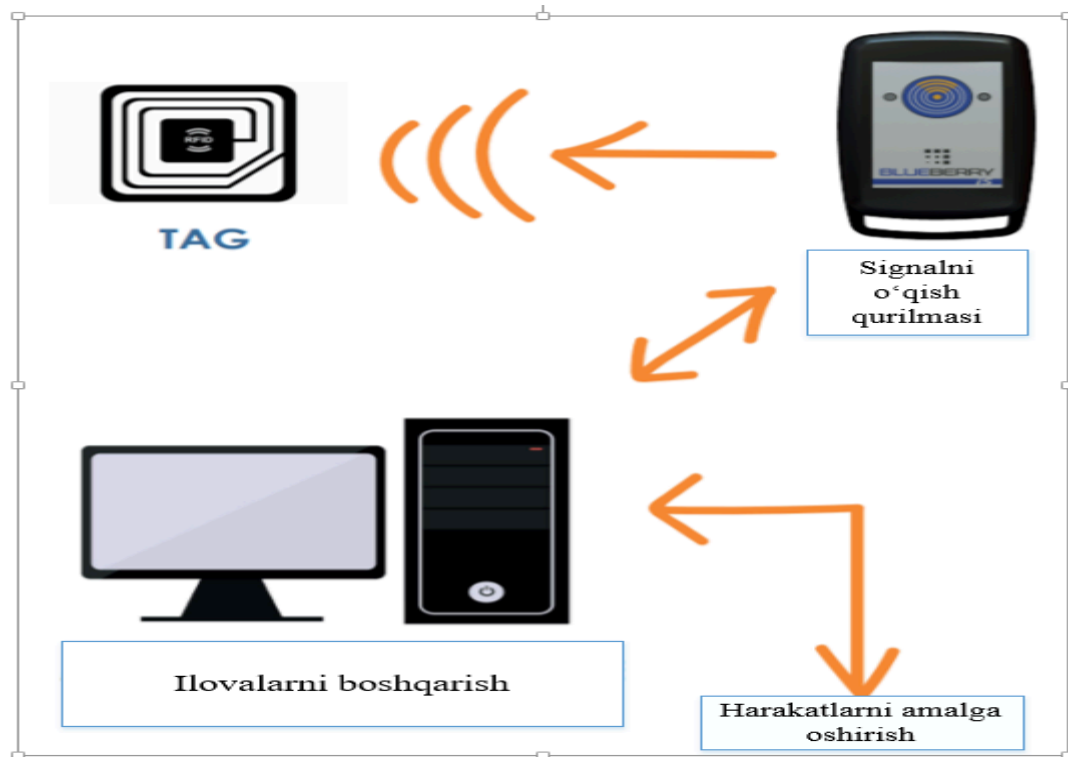


Figure 3.1. RFID system structure

Practical part

In this work, a simple access control system is developed. In this case, user identification is carried out through an electronic key (Tag). The RFID assembly is carried out based on a controller, server motor, RFID, point-to-point board, point-to-point wire, diode, signal activator, USB cable, and magnetic cards. The figure below shows the state of the assembly of these details.

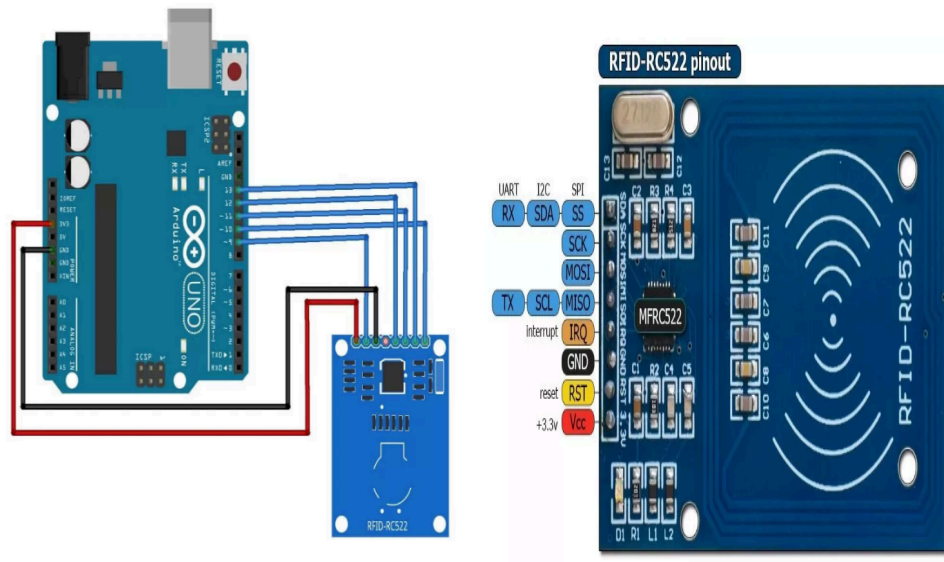


Figure 3.2. RFID configured state

Inputs on the SPI interface:
 SDA – select slave;
 SCK - synchronization signal;
 MOSI – transfer from master to slave;
 MISO – transfer from slave to master;
 reset (reboot) ;
 IRQ – interrupt input ;
 GND – ground;
 Vcc – 3.3 source.

Table 3.1

RFID- The RC522 module connects to the Arduino as follows:

MFRC522	Arduino Uno	Arduino Mega	Arduino Nano v3	Arduino Leonardo / Micro	Arduino Pro Micro
RSD	9	5	D9	RESET/ ICSP-5	RSD
SDA(SS)	10	53	D10	10	10
MOSI	11 (ICSP-4)	51	D11	ICSP-4	16
EXAMPL E	12 (ICSP-1)	50	D12	ICSP-1	14
SCK	13 (ICSP-3)	52	D13	ICSP-3	15
3.3V	3.3V	3.3V	Stabilizer 3.3V	Stabilizer 3.3V	Stabilizer 3.3V
GND	GND	GND	GND	GND	GND

To connect an alarm, which will sound when the key is pressed and the lock is opened, and a second alarm when the lock is closed, connect the alarm in the following sequence.

Table 3.2

Configuring Arduino and Buzzer to hear the alarm sound

Arduino	Buzzer
5V	VCC
GND	GND
pin 5	IO

A servo drive is used as the unlocking mechanism. Any servo can be selected depending on the required dimensions and the forces the servo can generate.

Table 3.3

Connecting the servo to three pins

Arduino	Servos
5V *	Red wire (to the center)
GND	Connect the black or brown wire (left)
pin 6	White or apple-colored (right) connection

After all the settings are made, the following codes are entered into the Arduino.

```
#include <Servo.h>
#include <SPI.h>
#include <MFRC522.h> // library "RFID".
#define SS_PIN 10
#define RST_PIN 9
MFRC522 mfrc522( SS_PIN, RST_PIN);
unsigned long uidDec, uidDecTemp; // for storing number labels and
decimal format
Servo servo;
void setup() {
  Serial.begin ( 9600 );
  Serial.println( "Waiting for card...");
  SPI. begin ( ); // initialization SPI / Init SPI bus.
  mfrc522.PCD_ Init( ); // initialize MFRC522 / Init MFRC522 card.
  servo.attach (6);
```

```
servo.write (0); // ustanavlivaem servu v zakrytoe sosotoyanie
}
void loop( ) {
// Poisk novoy metki
  if ( ! mfrc522.PICC_IsNewCardPresent() ) {
    return ;
  }
// Choice label
  if ( ! mfrc522.PICC_ReadCardSerial() ) {
    return ;
  }
uidDec = 0;
// Vydacha serial number label.
  for ( byte i = 0; i < mfrc522.uid.size; i++)
  {
    uidDecTemp = mfrc522.uid.uidByte[i];
    uidDec = uidDec * 256 + uidDecTemp;
  }
  Serial.println( "Card UID: ");
  Serial.println( uidDec ); // My device's UID label in console
  if (uidDec == 3763966293) // Sravnivaem Uid metki, esli on raven
zadanomu to serva otkryvaet.
  {
    tone( 5, 200, 500 ); // Delay sound signal, Otkrytie
    servo.write (90); // Turning the servo 90 degrees
    delay( 3000 ); // pause 3 sec i mechanism zapiraetsya.
    tone( 5, 500, 500 ); // Delay sound signal, Zakrytie
  }
  servo.write (0); // ustanavlivaem servu v zakrytoe sosotoyanie
}
```

```

yangli | Arduino 1.8.12
Файл Правка Скетч Инструменты Помощь
Загрузка
yangli
#include <Servo.h>
#include <SPI.h>
#include <MFRC522.h> // библиотека "RFID".
#define SS_PIN 53
#define RST_PIN 5
MFRC522 mfrc522(SS_PIN, RST_PIN);
unsigned long uidDec, uidDecTemp; // для хранения номера метки в десятичном формате
Servo servo;

void setup() {
  Serial.begin(9600);
  Serial.println("Waiting for card...");
  SPI.begin(); // инициализация SPI / Init SPI bus.
  mfrc522.PCD_Init(); // инициализация MFRC522 / Init MFRC522 card.
  servo.attach(6);
  servo.write(0); // устанавливаем серву в закрытое состояние
}

void loop() {
  // Поиск новой метки
  if (!mfrc522.PICC_IsNewCardPresent()) {
    return;
  }
  // Выбор метки
  if (!mfrc522.PICC_ReadCardSerial()) {
    return;
  }
  uidDec = 0;
  // Вывод серийного номера метки.
  for (byte i = 0; i < mfrc522.uid.size; i++) {
    uidDecTemp = mfrc522.uid.uidByte[i];
    uidDec = uidDec * 256 + uidDecTemp;
  }
  Serial.println("Card UID: ");
  Serial.println(uidDec); // Выводим UID метки в консоль.
  if (uidDec == 4099160874 or uidDec == 3840107306 or uidDec == 1173143842 or uidDec == 4180874426) // Сравниваем Uid метки, если он равен заданному то серва открывает.
  {
    tone(4, 200, 500); // Делаем звуковой сигнал, Открытие
    servo.write(90); // Поворачиваем серву на угол 90 градусов (Открываем какой либо механизм: задвижку, поворачиваем ключ и т.д.)
    delay(3000); // пауза 3 сек и механизм закрывается.
    tone(4, 500, 500); // Делаем звуковой сигнал, Закрытие
  }
  servo.write(0); // устанавливаем серву в закрытое состояние
}

```

Figure 3.3 . To Arduino included codes window

Card UID (labels) to know magnet the card to arduino you write , above described the scheme your collection and the console your opening When you bring the tag to the RFID, a number will be displayed on the console , this the number you change or additional again add possible .

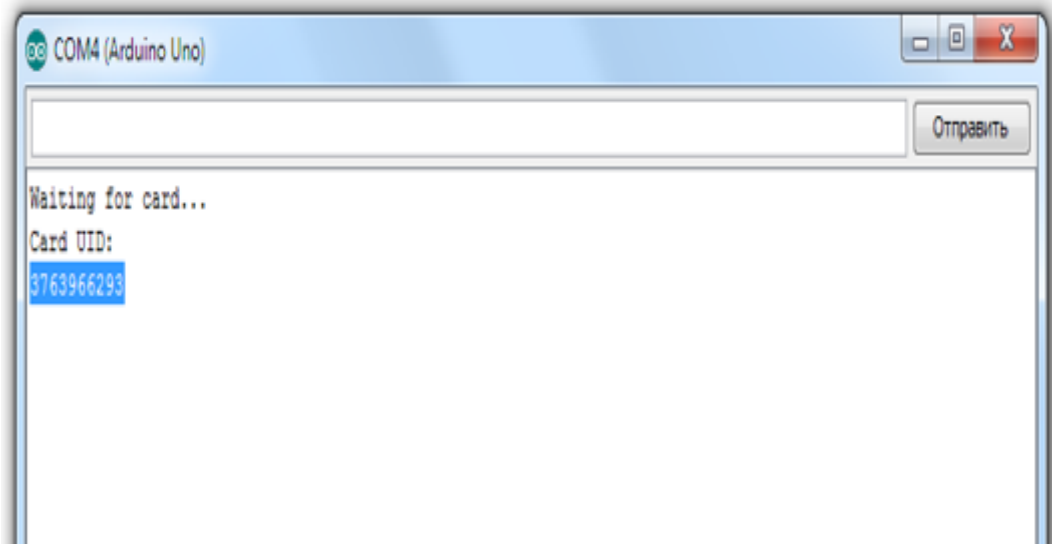


Figure 3.4. UID number

This identifier is unique for each card and cannot be duplicated. So, when you present the card whose identifier you set in the program, the system will open the entrance using the servo.

Assignment

Based on the given option, NFS card or NFS button numbers are provided , and RFID is configured and used accordingly.

NFS card or NFS button numbers options:

1. 4099160874;
2. 3840107306;
3. 1173143842;
4. 4180874426.

Control questions

1. What is the function of an RFID system?
2. Where is the RFID system used?

References

1. <https://habr.com/ru/post/592403/> (access time: 13.01.22).
2. <https://habr.com/ru/post/592403/> (access time: 13.01.22).