Development on Mechatronics Based RFID Attendance System with Artificial Intelligence

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ABSTRACT

An RFID attendance system is a system that uses radio frequency identification (RFID) technology to track and record attendance. RFID tags are small electronic devices that store a unique identifier. When an RFID tag is brought near an RFID reader, the reader can read the identifier and send it to a computer. The computer can then use the identifier to look up the corresponding person's attendance record. An RFID attendance system is an automated system that uses RFID (Radio Frequency Identification) technology to track and record employee attendance. It consists of two main components: RFID tags and RFID readers. RFID tags are small electronic devices that store a unique identifier. They are typically attached to employee badges or cards. RFID readers are devices that can read the unique identifiers stored on RFID tags. They are typically installed at entry points to buildings or rooms. When an employee enters a building or room, they must present their RFID badge or card to an RFID reader. The reader will read the unique identifier stored on the tag and send it to a computer. The computer will then use the identifier to look up the employee's attendance record. If the employee is not already clocked in, they will be clocked in. If the employee is already clocked in, they will be clocked out.

INTRODUCTION:

Supply chain management: RFID tags can be attached to pallets, cartons, and individual items to track their movement through the supply chain. This can help to improve inventory management, reduce theft, and ensure that products are delivered on time[1].
Access control: RFID tags can be used to control access to buildings, rooms, and other secure areas. This can help to improve security and prevent unauthorized access.
Asset tracking: RFID tags can be used to track the location of valuable assets, such as computers, medical equipment, and tools. This can help to prevent theft and loss.
Animal tracking: RFID tags can be used to track the location and movement of animals, such as livestock and pets. This can help to improve animal welfare and management.
Payment systems: RFID tags can be used to make payments for goods and services. This is a convenient and contactless way to pay.
Retail: RFID tags can be used to track the movement of goods in a retail store. This can help to prevent theft and improve inventory management.
Manufacturing: RFID tags can be used to track the movement of parts and products through a manufacturing process. This can help to improve efficiency and reduce errors.

Logistics: RFID tags can be used to track the movement of shipments through the logistics network. This can help to improve efficiency and visibility[2].
Healthcare: RFID tags can be used to track the location of patients, medications, and equipment in a hospital or other healthcare setting. This can help to improve patient care and safety.
Transportation: RFID tags can be used to track the movement of vehicles, cargo, and passengers in the transportation industry. This can help to improve efficiency and safety.
These are just a few of the many use cases for RFID technology. As RFID technology continues to develop, it is likely to find even more applications in the future[3].

MATERIALS AND METHODS:

Code: Files for Student-Data Code generation shown in Fig.1**.**

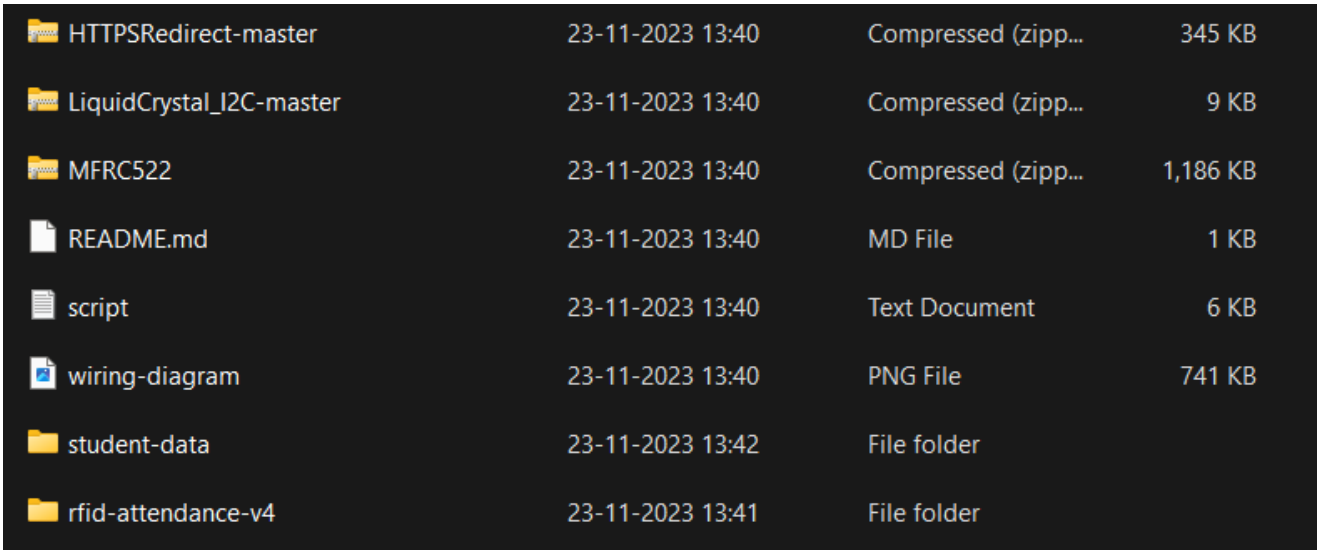

Fig 1: Files for Student-Data Code

Student-Data Code.ion

```
#include <SPI.h>
#include <MFRC522.h>
//-------------------------------------------------
//GPIO 0 --> D3
//GPIO 2 --> D4
const uint8_t RST_PIN = D3;
const uint8_t SS_PIN = D4;
//-------------------------------------------------
MFRC522 mfrc522(SS_PIN, RST_PIN);
MFRC522::MIFARE_Key key;
//-------------------------------------------------
/* Be aware of Sector Trailer Blocks */
int blockNum = 4;
/* Create array to read data from Block */
/* Length of buffer should be 4 Bytes
more than the size of Block (16 Bytes) */
byte bufferLen = 18;
byte readBlockData[18];
//-------------------------------------------------
MFRC522::StatusCode status;
```

```
//-------------------------------------------------

void setup()
{
  //--------------------------------------------------
  //Initialize serial communications with PC
  Serial.begin(9600);
  //--------------------------------------------------
  //Initialize SPI bus
  SPI.begin();
  //--------------------------------------------------
  //Initialize MFRC522 Module
  mfrc522.PCD_Init();
  Serial.println("Scan a MIFARE 1K Tag to write data...");
  //--------------------------------------------------
}

/*****************************************************************************************************
******
 * loop() function

*****************************************************************************************************
*****/
void loop()
{
  //-------------------------------------------------------------------------
  /* Prepare the ksy for authentication */
  /* All keys are set to FFFFFFFFFFFFh at chip delivery from the factory */
  for (byte i = 0; i < 6; i++){
    key.keyByte[i] = 0xFF;
  }
  //-------------------------------------------------------------------------
  /* Look for new cards */
  /* Reset the loop if no new card is present on RC522 Reader */
  if ( ! mfrc522.PICC_IsNewCardPresent()){return;}
  //-------------------------------------------------------------------------
  /* Select one of the cards */
  if ( ! mfrc522.PICC_ReadCardSerial()) {return;}
  //-------------------------------------------------------------------------
  Serial.print("\n");
  Serial.println("**Card Detected**");
  /* Print UID of the Card */
  Serial.print(F("Card UID:"));
  for (byte i = 0; i < mfrc522.uid.size; i++){
    Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
    Serial.print(mfrc522.uid.uidByte[i], HEX);
  }
  Serial.print("\n");
  /* Print type of card (for example, MIFARE 1K) */
```

```
  Serial.print(F("PICC type: "));
  MFRC522::PICC_Type piccType = mfrc522.PICC_GetType(mfrc522.uid.sak);
  Serial.println(mfrc522.PICC_GetTypeName(piccType));

  //------------------------------------------------------------------------------
  byte buffer[18];
  byte len;
  //wait until 20 seconds for input from serial
  Serial.setTimeout(20000L);

//MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMM
  Serial.println(F("---------------------------------------"));
  Serial.println(F("Enter Student ID, ending with #"));
  len = Serial.readBytesUntil('#', (char *) buffer, 16);
  //add empty spaces to the remaining bytes of buffer
  for (byte i = len; i < 16; i++) buffer[i] = ' ';
  blockNum = 4;
  WriteDataToBlock(blockNum, buffer);
  ReadDataFromBlock(blockNum, readBlockData);
  dumpSerial(blockNum, readBlockData);

//MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMM
  Serial.println(F("---------------------------------------"));
  Serial.println(F("Enter First Name, ending with #"));
  len = Serial.readBytesUntil('#', (char *) buffer, 16);
  for (byte i = len; i < 16; i++) buffer[i] = ' ';
  blockNum = 5;
  WriteDataToBlock(blockNum, buffer);
  ReadDataFromBlock(blockNum, readBlockData);
  dumpSerial(blockNum, readBlockData);

//MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMM
  Serial.println(F("---------------------------------------"));
  Serial.println(F("Enter Last Name, ending with #"));
  len = Serial.readBytesUntil('#', (char *) buffer, 16);
  for (byte i = len; i < 16; i++) buffer[i] = ' ';
  blockNum = 6;
  WriteDataToBlock(blockNum, buffer);
  ReadDataFromBlock(blockNum, readBlockData);
  dumpSerial(blockNum, readBlockData);

//MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMM
  Serial.println(F("---------------------------------------"));
  Serial.println(F("Enter Phone Number, ending with #"));
  len = Serial.readBytesUntil('#', (char *) buffer, 16);
```

```
  for (byte i = len; i < 16; i++) buffer[i] = ' ';
  blockNum = 8;
  WriteDataToBlock(blockNum, buffer);
  ReadDataFromBlock(blockNum, readBlockData);
  dumpSerial(blockNum, readBlockData);
  Serial.println(F("---------------------------------------"));
  Serial.println(F("Enter Address, ending with #"));
  len = Serial.readBytesUntil('#', (char *) buffer, 16);
  for (byte i = len; i < 16; i++) buffer[i] = ' ';
  blockNum = 9;
  WriteDataToBlock(blockNum, buffer);
  ReadDataFromBlock(blockNum, readBlockData);
  dumpSerial(blockNum, readBlockData);
}
```

RESULTS:

RFID attendance systems use RFID technology to mark student attendance at educational institutions. Students use an RFID tag to mark their presence on an RFID reader, and the data is stored in the attendance system. This system can help teachers and parents track and monitor students' activities. It can also be used to track the attendance of faculty or staff to simplify payroll management.

References:

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3. RFID Forecasts, Players and Opportunities 2019-2029b. IDTechEx. 2020-02-27