EMPLOYEE ATTENDANCE RECORD SYSTEM USING MICROCONTROLLER

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Abstract

Private organizations tabulate the monthly working hours of employees and calculate wages based on the number of hours registered in the office. Employee login and logout times must be respect in various locations (including universities, businesses, and industries). The traditional attendance system manually signs and keeps the record is hand-recorded. Radio Frequency Identification (RFID) based attendance record systems can be used in any Business organization. The proposed is an attendance record system in which the system can make the presence and absence of the person and store the same files. The target system consists of detailed records that also update the time in the day, month, year, hour, minute, and second formats. The system can always save the record of attendance in a hard disk drive. The main objective of the RFID based Attendance System is to take the attendance of employees and storing the attendance of the respective person in the Excel File. The whole system designed on the Arduino platform together with the RFID module and PLX-DAQ software.

Keyword: Arduino Uno, RFID and PLX-DAQ

1.INTRODUCTION

An RFID based Attendance Record Systems based on some simple concepts. 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.[1] Barcode, Optical Character Recognition, Biometric, and smart cards are some methods for identification but the possible area of use is much larger for the RFID system. Radio Frequency Identification (RFID) is the wireless non-contact use of radio frequency waves to transfer data. Depending on the type of RFID, the range can read from a few centimeters to more than 20 meters.

The RFID's first application identifies aircraft as a friend or foe in World War II. As technology improves year on year, the cost of implementing and using the RFID system continues to decrease. Therefore, RFID is cost-effective and efficient. Most noticeable is that RFID tag data can read outside the line-of-sight. It also improves the visibility of employee track and management. RFID is similar to a bar code because the device stored in the database captures the tag or the data in the tag. However, RFID has several advantages over systems that use barcode asset tracking software.

2. ARDUINO UNO BOARD

The Arduino Uno board is a microcontroller based on the ATmega328. There are 14 digital input/output pins, 6 can be used as PWM output, 16MHz ceramic resonator, ICSP header, USB connection, 6 analog inputs, power jack and reset button. This includes all the support required for a microcontroller. To get started, simply connect it to your computer using a USB cable or AC-DC adapter or battery. The Arduino Uno Board is different from all other boards and does not use the FTDI USB-serial driver chip. Features Atmega16U2 (Atmega8U2 ~ version R2) programmed with USB-serial converter.

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3. PROGRAMMING

- The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring projects.
- The Arduino Uno board can be programmed with the Arduino software. Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board).[2]
- The ATmega328 in Arduino Uno comes with a bootloader that allows you to upload new code to it without the use of an external hardware programmer.
- Communicate using the original STK500 protocol.
- It is also possible to bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header.
- (In-Circuit Serial Programming) header.

The following in table 1 description is Technical Specification in Arduino Uno[2].

1.TABLES

Microcontroller	**Atmega 328**
Operational Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital Input/ Output Pin	14 (of which 6 provide PWM output)
Analog Input pin	6
DC current per Input/ Output Pin	40mA
CD current for 3.3V pin	50mA
Flash Memory	32KB of which 0.5KB used by boot loader
SRAM	2KB
EEPROM	1KB
Clock Speed	16 MHz

Table 1. Technical Specification in Arduino Uno

4. RFID

RFID belongs to a group of technologies referred to as Automatic Identification and Data Capture (AIDC). RFID systems consist of three components: an RFID tag, an RFID reader, and an antenna. RFID tags contain an integrated circuit and an antenna. The reader then converts the radio waves to digital information that can be passing on to computers, where the data can be stored in a database and analysed at later time.

A. RFID Tag

As stated above, an RFID tag consists of an integrated circuit and an antenna. The tag is also composed of a thin, flexible polymer or a plastic material capable of withstanding different environmental conditions. RFID tags come in a variety of shapes and sizes and are either passive or active.

1) *Passive tag:* are the most widely used, as they are smaller and less expensive to implement. Passive tags must be "powered up" by the RFID reader before they can transmit data.
2) *Active tags:* have an on-board power supply (e.g.,a battery), thereby enabling them to transmit data at all time.

B. RFID Reader:

The RFID reader consists of a radio frequency module, a control unit, and an antenna coil that generates frequency electromagnetic field. On the other hand, tags are usually passive components, consisting only of an antenna and an electronic microchip. Therefore, when the tag is close to the electromagnetic field of the transceiver, a voltage is generates in its antenna coil due to induction, and the voltage is uses as a power source for the microchip.

C. Antenna

The RFID antenna has been tuned to resonate only in a narrow range of carrier frequencies centered on the specified RFID system frequency. RFID antennas propagate waves both vertically and horizontally. This induced AC voltage is rectified to provide a voltage source for the device. When the DC voltage reaches a certain level, the device will start operating. By providing

an activating RF signal, the reader can communicate with remote devices that do not have an external power source such as a battery. Depending on the different capabilities of the RFID system, RFID antennas can be divided into two classes, tag antennas, and reader antennas.

Reader Antenna: The reader antenna converts the current into electromagnetic waves, and then radiates the electromagnetic waves into space, and the tag antenna can receive and convert it back into current.

Tag Antenna: The tag antenna collects energy and directs it to the chip to turn it on. The tag antenna not only emits waves carrying the information stored in the tag, but also needs to capture the waves from the reader to provide energy for tag operation. The tag antenna size should be small, low in cost, and easy to mass-produce. The tag antenna can be one signal turn or multiple turns, as shown here.

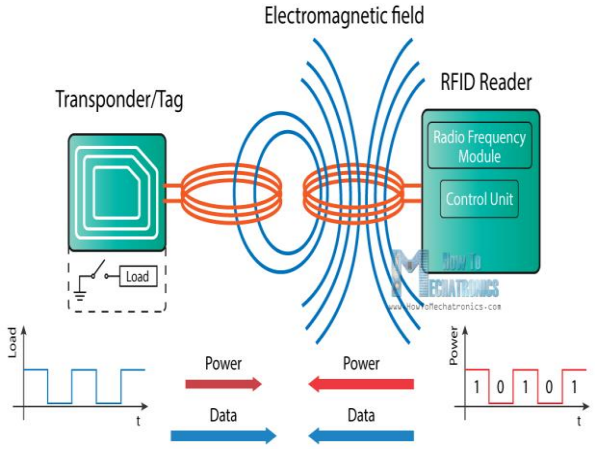

Figure 1 Communication of RFID Reader and Tag

4.1. MFRC522

The RC522 RFID module based on MFRC522 IC is one of the most inexpensive RFID options. It usually comes with a RFID card tag that has 1KB memory. MFRC522 reader with card kit includes a 13.56MHz RF reader module, which uses RC522 IC. It is a highly integrated transmission module for contactless communication at 13.56 MHz. The reading range of the RC522 is about 5 cm. The RFID reader module is used to read the data or ID number on the tag. The reader can communicate with the microcontroller through a 4-pin serial peripheral interface (SPI) with a maximum data rate of 10Mbps. It also supports communication via I2C and UART protocols.

The RC522 module interface has total 8 pins. The descriptions are as follows Table 2:

2.TABLES

Pin	Symbol	Description
8	SDA	I2C-bus serial data line input/output
7	SCK	SPI serial clock input
6	MOSI	SPI master out, slave in
5	MISO	SPI master in, slave out
4	IRQ	interrupt request output
3	GND	Ground
2	RST	Reset
1	3.3V	Power

Table 2. RC522 Pin Description

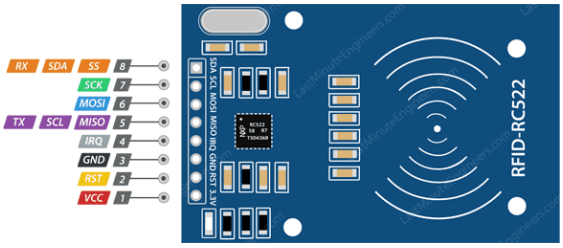

Figure 2. RC522 Pin Out

4.2. PLX-DAQ Software

The Parallax Data Acquisition Tool (PLX-DAQ) software add-in for Microsoft Excel takes up to 26 channels of data from a parallax microcontroller and drops numbers into columns on arrival. PLX-DAQ provides easy spreadsheet analysis of data collected in the field, laboratory analysis of sensors, and real-time instrument monitoring.

5. PLX-DAQ FEATURE

PLX-DAQ is a parallax microcontroller data acquisition add-on tool for Microsoft Excel. Any sensor and any microcontroller connected to your PC's serial port can send data directly to Excel. PLX-DAQ has the following features.

- Plot or graph incoming data in real time using Microsoft Excel
- Record up to 26 columns of data
- Mark data in real time (hh:mm:ss) or in seconds after reset
- Read/write any cell in worksheet
- Read/set any of the four checkboxes that control the interface
- Baud rate up to 128K
- Supports Com1-15

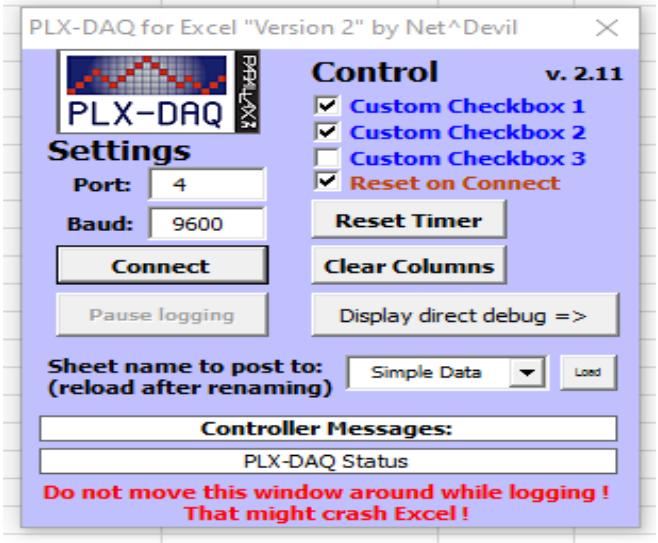

Figure 3. PLX-DAQ Software Version 2

4.3. Components Used For the Design

Table 1 below shows the components used for the construction of an RFID Based Employee Attendance Record System. The specific properties of each of the components used in the design are also detail in table3.

3.TABLES

No	Components	Description
1	Microcontroller	Arduino Uno
2	RFID Module	RFID RC522
3	PC computer	Laptop/Desktop
4	LED	Green LED
5	Buzzer	Active Buzzer (5V)

Table 2. Specific components of the system

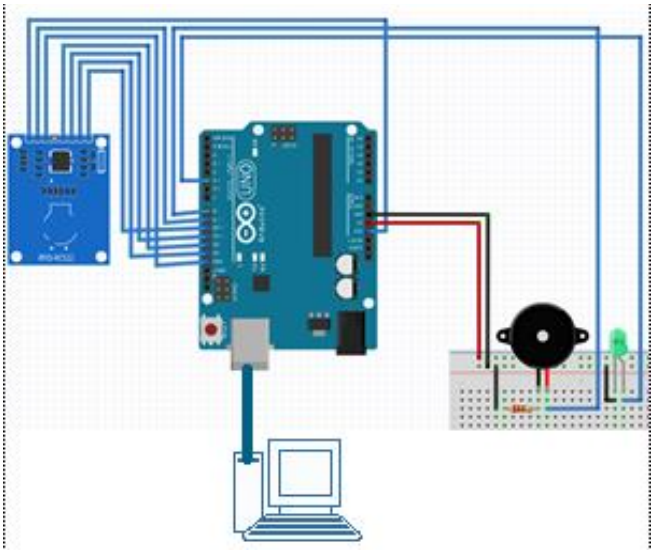

Figure 4. Circuit connection diagram of the system

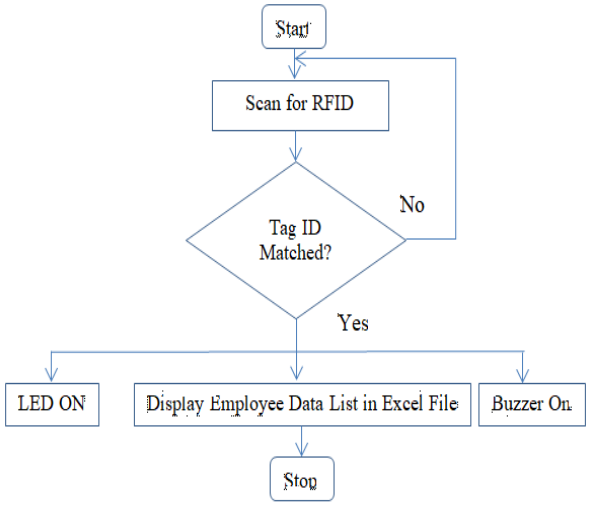

Figure 5. Flow Chart of the system

5. IMPLEMENTATION AND RESULTS

The Arduino IDE was used to develop sketches that were uploaded to the microcontroller as firmware. The system may then record without user intervention. The library is required for robust firmware development using Arduino. In this case, the "MFRC522" library is used. In the first step, download the library file, select the Sketch menu in the Arduino IDE, and add the .ZIP library. Next, connect the Arduino pin and RC522. Arduino digital pins 9, 10, 11, 12, 13 are attached with each RC522 pin RST, SDA, MOSI, MISO, SCK.

3.TABLES

RFID RC522 Module	Arduino Uno
SDA	Digital Pin 10
SCK	Digital Pin 13
MOSI	Digital Pin 11
MISO	Digital Pin 12
IRQ	No Connect
GND	GND
RST	Digital Pin 9
3.3V	3.3V

Table 3. Pin Connection for RFID and Arduino

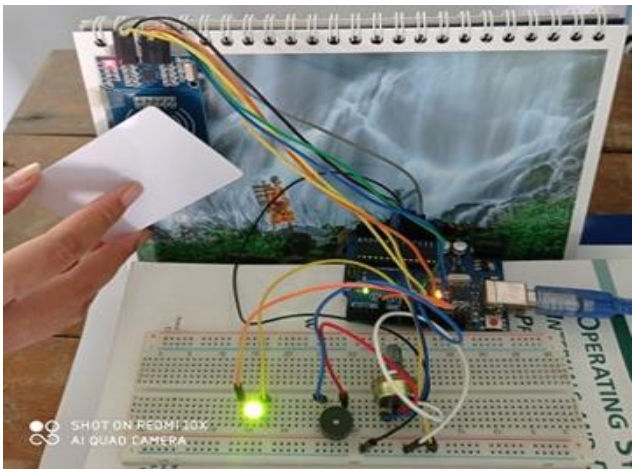

Figure 6. Hardware Implementing Employee Attendance Record System

In this paper, Arduino connects Excel (PLX-DAQ), details about downloading PLX-DAQ, and how to communicate its microcontroller Atmega328p to Excel. In this system, Arduino board is connected to the Laptop via USB cable, when it is connecting there will be beep sound occurs. Check the COM port and baud rate. Then open PLX DAQ and Microsoft Forms Dialogue box will be open and click on 'Connect' button. When the RFID tags is detected, the CARD ID holder Name will be passed to the PLX DAQ software and the current time and RFID cardholder name, Employee Number will be displayed on Excel.

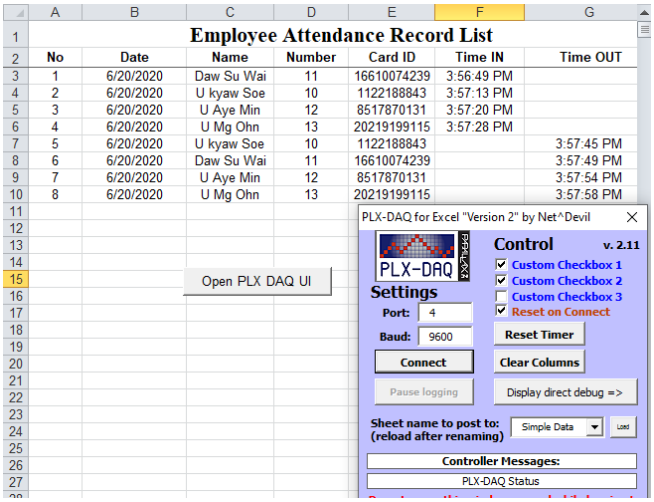

Figure 6. Display Employee Data Detail in Excel File

5. CONCLUSION

It is easy to keep a record of employees without having to worry about office hours. It can save a lot of time for office work, as well as a daily record. RFID technology can automatically perform data collection and greatly reduce staff and errors. RFID supports tag reading without line-of-sight scanning or item-by-item scanning RFID reader can read multiple RFID tags simultaneously, thus improving efficiency. It can immediately detect all RFID tags in range and match with the information in the database. The developed system is cost-effective but not recommended for high-security systems. The target system can be modified to use the fingerprint module but this biometric device does not always read an individual fingerprint accurately, and could therefore refuse access to an employee. The system can be extended on the IoT platform as an attendance record can be extracted directly on the webpage.

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