

RFID lab management system using Arduino microcontroller approach associate with webpage

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Abstract: RFID stands for Radio-Frequency Identification. There has been emerging demand for secure system that must be reliable and fast responded for the industries and company. Radio Frequency Identification (RFID) is one of the reliable and fast means of identifying any material object. The RFID device must be scanned to retrieve the identifying information. On other hand, college student attendance management of class plays an important position in the work of management of college student, this can help to urge student to class on time, improve learning efficiency, increase learning grade, and thus entirely improve the education level of the school. In this system, RFID is used to change the way of the attendance to be recorded. The graphic user interface and database also included in this system. The objectives of the project are to increase management efficiency of student data and stored properly in database. Other than that, the objectives are to develop a system that is easy to applied and used at any places example like class and event. User only needs to scan their RFID tag near the RFID antenna and the attendance will automatically recorded in the database that has been created. This system will help to reduce the time of taking the attendance. The system provides the functionalities of the overall system such as displaying live ID tags transactions, registering ID, deleting ID, recording attendance and other minor functions. This interface was installed in the host computer. The web-based is to provide an online web that will provide all the information and utilities of the laboratory such as group timetable, calendar, lab sheet download and others needed. This paper presents a system that come with web portal for student and staff.

Key words: RFID; management; Arduino; Webpage

1. Introduction

This project is a study about the student lab attendance management system that uses an RFID approach. This system used to retrieved or stored data from database (Sandip, 2005). The implementation of the system is divided into two categories, which are hardware design and software design. In hardware design is to design the RFID devices that detect the unique ID in student card and then display the unique ID on Liquid Crystal Display (LCD) panel. The RFID reader, which is a low-frequency reader, is connected to the laptop or computer via a serial to USB converter cable. The attendance system GUI is developed using Visual Basic.Net. (Zatin Singhal, 2012). Hardware device is used Arduino Mega microcontroller as the platform. For the software design is to design the software system that provides a facility for contact number of person in charge of the lab, schedule for student involved and calendar. Furthermore, the systems also provide facilities to download lab sheet.

The software system design consists two sections which are system integration between system and devices and system and user. System integration

between system and devices is designed for the connection between the system and RFID devices. Each PC with RFID device must be installed with the driver connection. The function of the connection system is to record the attendance from device and save in database. System integration between system and user has designed the website that provides the facility for users. The website is consists with several menu pages. One of it is the announcement page that will inform news or any update from person in charge. At the side of menu page, there is a calendar and group timetable which is useful for student to prepare before entering the laboratory (Joaquin et al., 2007). This project is to observe and monitor student's attendance by using RFID approach and to provide a completed web-based full with information and utilities needed.

2. Methodology

This project will describe a completed lab management system for a better system equip with RFID tags. The overall methodology includes a combination of previous project studies, ideas and hardware. Fig. 1 show the approach used to implement the project.

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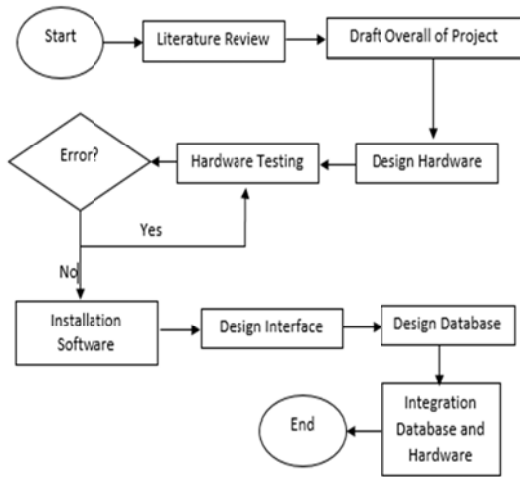


Fig. 1: Project flowchart

The implementation of the system is divided into two categories, which are hardware design and software design. In hardware design is to design the RFID devices that detect the unique ID in student card and then display the information student card on LCD panel. The hardware device is used Arduino MEGA microcontroller as the platform. For the software design is to design the software system that provides a facility for managing the attendance, contact number of person in charge of the lab, schedule for student involve and evaluation of student performance in the laboratory. The software system design consists two sections which are system integration between system and devices and other section is system and user. System integration between system and user has designed the website that provides the facility for users. The website is consists with several menu pages. One of it is the home pages that have such as home, admin login, staff login, student login, and contact. At the side of menu page, there is a chat box which is useful for student to communicate with lecturer or technician.

2.1. Software design

The software design will describe about the database and visual basic Interface. For the website development, Google Sites is chosen. Google Sites can be access directly through any browser portal for example google chrome and internet explorer (Joaquin et al., 2007). Fig. 2 shows website architecture for user.

There are several basic elements in home pages. The home pages consist of group timetable, assessment download, calendar, contact, lab sheet download. In group timetable page is page for student to view the assigned group that has been decided by lecturer. For the download pages, student can download the file such as lab manual, assessment and others.

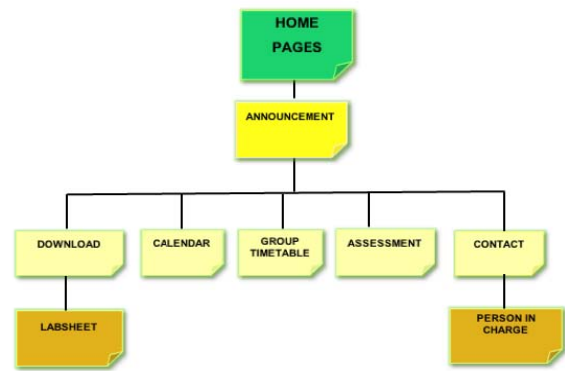


Fig 2: Website Architecture

For interface platform Visual Basic application is used. Visual Basic is the software to create graphical user interface describes the process of registration to the user. It is the primary way to interact with the user and allow user to interact with the system. Fig. 3 shows the interface created by using Visual Basic.

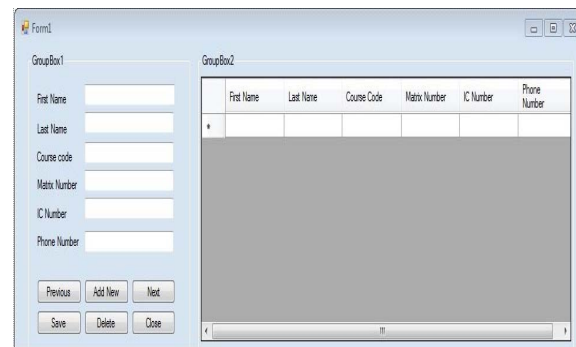


Fig. 3: Visual basic control panel

Microsoft Access is a database management system from Microsoft. One of an information management tool that can store information for reference, reporting and analysis. Table for student create to store all the data in database. In table of database, there is several basic steps in creating the database. As shows in Fig. 4, Microsoft Access is used. To create a new table, there is a 'create' tab at the upper window. Then the types of table can be choosing form 'tables' bar. This will determined the types of table needed by the user.

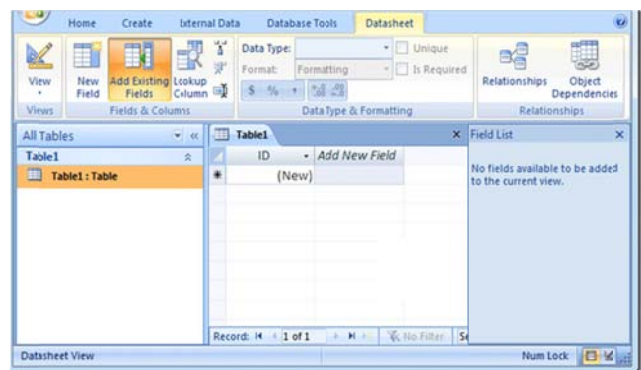


Fig 4: Microsoft access

To connect between the database and interface, there is an option in software that can establish a

connection. From there, when the setup for device and software is complete, surely there is no any problem to establish a connection through USB. Fig. 5 explains the process to create a connection between device and software.

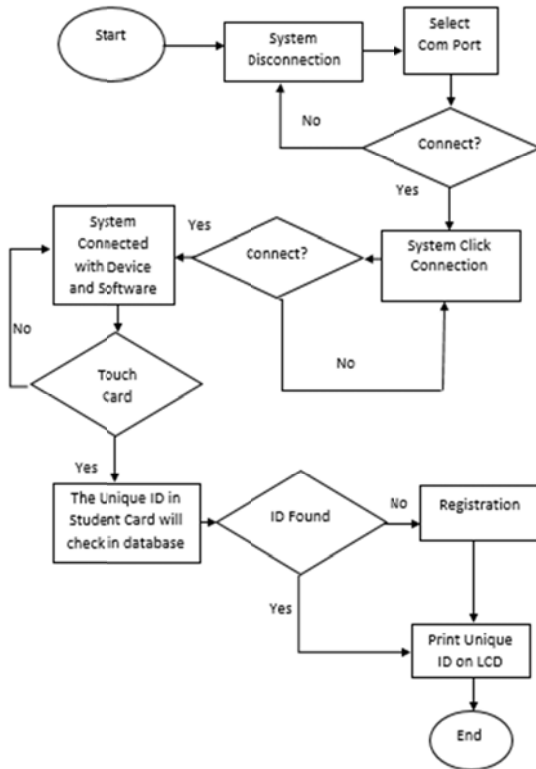


Fig. 5: Flow chart of Interface devices between software

2.2. Hardware design

The hardware design will describe about the hardware of the devices. For the RFID read-write, the RDM6300 RFID Reader was used. In contrast, RFID devices will work within a few feet (up to 20 feet for high-frequency devices) of the scanner (Pekka et al., 2011; Zatin Singhal and Ashish Gupta, 2012). Tags operate on Low frequency (LF) (30 KHz-300 KHz), High frequency (HF) (3MHz-30MHz), Ultra high frequency (Zhang Yuru, Chen Delong and Tan Liping, 2013). Fig. 7 shows the module of RFID read/write. Passive card was chosen in this hardware because it suitable for the project. Fig. 8 shows the example of RFID passive card. Most of student card in UiTM also used the passive card.

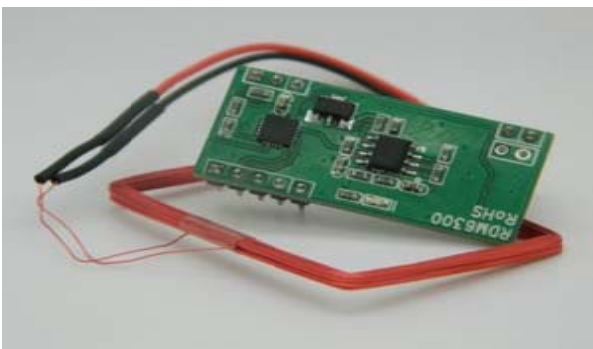


Fig.6: RDM6300 RFID reader



Fig.7: RFID card and tag

The basic illustration between RFID card and RFID reader/writer module using the radio frequency (Yashi Mishra, 2015). Fig. 8 shows the illustration of RFID work.

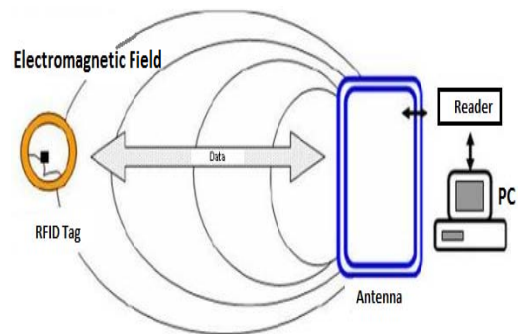


Fig. 8: Illustration of RFID works

RFID lab management system needs microcontroller to control the LCD and data transfer from RFID card to web server. Arduino is selected as hardware platform for RFID lab management system. The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, 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 an AC-to-DC adapter or battery to get started. The assemble language is C/C++ and it's also have many libraries that help to create or write the program more easily (Arizaga, 2012); for the hardware connection shows in block diagram at Fig. 9.

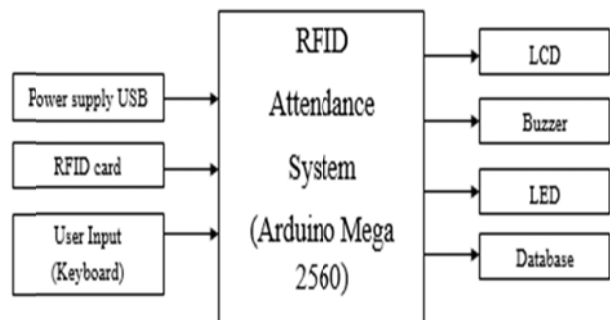


Fig.9: Block Diagram of RFID hardware system

3. Result and discussion

This part will describe the system testing from RFID devices to the database system. The testing have been done is detect the unique ID in student card, interfacing between hardware and software.

3.1. Hardware testing result

For hardware testing session, the first step of procedures is to detect the RFID system devices for the unique ID. To detect the unique id in student card software Microsoft Access has been used (Sumita Nainan, 2013). From the Fig. 10 shows the hardware prototype device and the connection of the circuit.

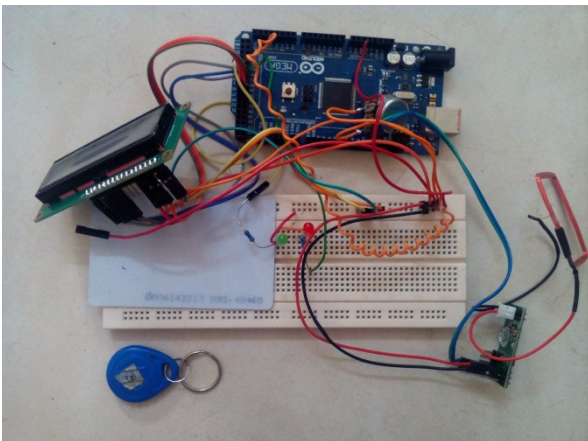


Fig. 10: Hardware prototype of RFID system devices

RFID will detect the unique ID after each card scanned. If success, that mean the hardware does not have any problem in circuit connection and serial communication. The next step is to test the Microsoft Access trace the unique ID card in system database. The process start with LCD print card serial number, after Microsoft Access trace the unique ID in student card it stored in database which is shows that the student is attended. Each card scanned show on Fig. 11.



Fig. 11: LCD panel display

The RFID reader has no unlimited total of card and tag scanned because each has it is own unique ID and data storage is based on database created.

3.2. Software testing result

The RFID device need interface driver to read the data from the device and pass to the software system. The drivers communicate using communication port by using USB. The software which is Visual Basic is used to create interface between user and device.

For each new registration for student, the student need to key in the student data manually. The student needs to fill in data which is name, matrix number, identification card, phone number and course code. The Fig. 12 shows the screens are designed in Visual Basic.

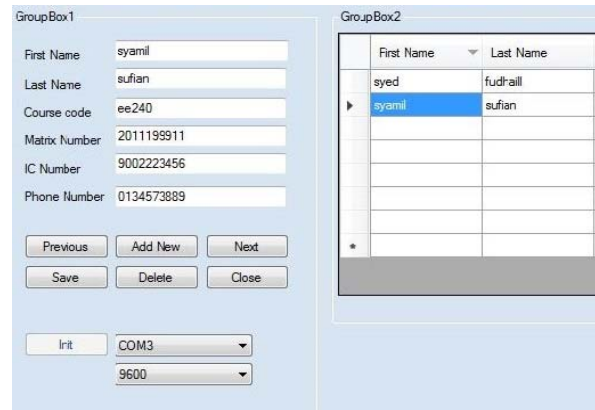


Fig.12: GUI interface

System interface for user is created by using software Visual Basic. The interface called GUI is the effective interface and easy to handle. There are several steps that need to be done to complete the interface. The most importance part is programming of this software. The result of interface is depending of programming.

The student database has been prepared by entering the name, course code, matrix number, identification number and phone number. When the registration was successful, the data automatic stored at database. Fig. 13 show the outcome of data stored.

ID	First Name	Last Name	Course Code	Matrix Num	IC Number	Phone Num
1	syed	fudhail	ee240	2011180459	891029126005	0174004857
2	syamil	sufian	ee240	2011199911	9002223456	0134573889
3						
4						
5						
6						
7						
*	(New)					

Fig. 13: Student database

For Web portal for student can be access through Google Sites. The student can view any announcement made by the lecturer at the home pages. Home page consists of several menu which is one of it is announcement if any news or work of lab that need to be take noted by student. Other than that, student can view their assigned group on group

schedule. So from this, each student will know their own group before the laboratory take place at first day of new semester. Furthermore, the student can download the lab sheet directly from the web. The student also can refer directly the day of laboratory held in the website calendar. Student will have access to communicate with the person in charge at contact page which is consisting of person in charge contact number. Fig. 14 show contact web pages for student.

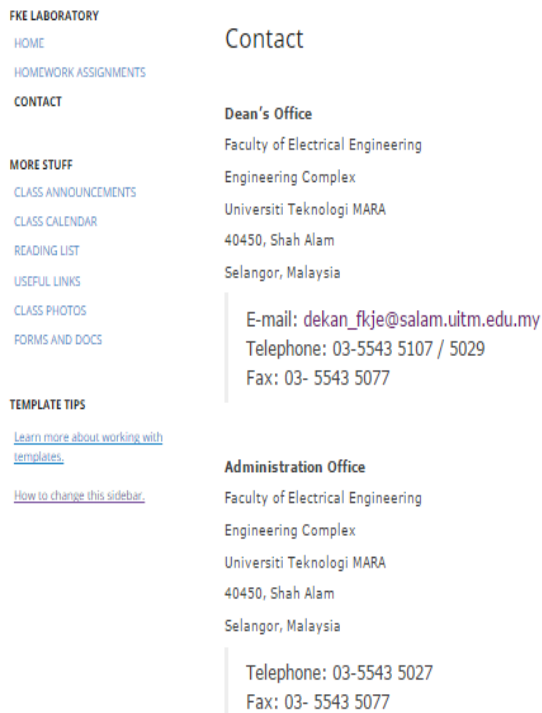


Fig. 14: Contact web pages



Fig. 15: Announcement web pages

3. Conclusion

After completing the project, it can be concluded the RFID Lab Management System is a project that will improve the system attendance in every place especially university and academy because it will get the precise information about date and time of

student attendance. Moreover, the RFID Lab Management System also can give the staff easier to manage the attendance in laboratory. Otherwise it's also help student review the group timetable, assessment, download lab sheet, download notes and anymore by using web browser. In addition, it can encourage the community to use information technology to improve the level of academic achievement into becoming a developed nation (Arulogun et al., 2013). From here, we can create a new level of mentality for nation which is from positive side of thinking minded. This will give benefit to much side whether to human or society. This will courage the people to decrease the usage of paper and used modern method which is paperless.

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