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Automatic Visible Data Visible Licensing System Using Electronic Door Using RFID (Radio Frequency Identification), Arduino Mega 2560 and Visual Basic.Net

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Abstract:

Library serves as one of the factors that accelerate the acceleration of science transfer. Viewing the function of the library is so important that the library is worthy of attention by the manager to record the visitors more fully and accurately. Manual counting and recording usually ends with inaccurate information, this is because a lot of library visitors are sometimes reluctant or forget in charging the visitor data.

This system is an application that records the data of visitors who enter the library area. The workings of this system is to record the identity of visitors, date and time of entry. From the results obtained if the RFID tag is closer to the RFID reader the door opens and the id will show on the computer.

The study also reports the development of systems for library visitors using electronic doors. This device connects to the computer used to validate. Identification of student / computer visitors can open / close and the door automatically identifies the library visitor.

Keywords: Visitors library, electronic door, RFID

1. Introduction

Library has an important role as a container of information in various fields of science and technology. The stored information, whether in print media in the form of books, electronic media in the form of cassettes or video, or in database, or CD-ROM.

Viewing the function of the library that is so important then the library is worthy of attention by the manager to record the visitors in more complete and accurate.

To avoid forgetting to fill in attendance list visitors and can record all visitors who go to the library, and for access in and out of the door automatically and as a security library, it is necessary instrument that can be used to fill and record data visitors automatically combined with automatic door opener too. Open door closing system with radio frequency identification (RFID) technology will help solve this problem. Because it is not just a visitor data recorder / as an automatic door opener, but the system open the door is also able to function for security and identify the identity of who entered the library.

2. Literature Review

2.1. RFID

Maryono (2005) states that RFID is a technology to identify a person or object using a radio frequency transmission, specifically 125 kHz, 13.65 Mhz or 800-900 MHz. RFID uses radio wave communications to uniquely identify an object or a person. a. RFID Tags

Astono (2006) states that RFID tags are devices made from electronic circuits and antennas integrated in the circuit.



Figure 1: The RFID tag section Source: Rivas, (2004)

b. Antenna

Alaydrus (2011) states that an antenna is used to transmit radio frequency signals between RFID readers and RFID tags. c. RFID / Reader

Astono (2006) states that RFID readers are devices compatible with RFID tags that will communicate wirelessly with tags. d. Application Software

Application software is an application on a workstation or PC that can read data from tags through RFID readers.

2.2. RFID Working Frequency

Jeniffer (2005) states that RFID working on low operating systems (not requiring high read speeds) operates at low frequencies between 300 Hz to 3 kHz. As for those working on high operating systems operate at high frequencies between 3 MHz to 30 Mhz.

2.3. Introduction of Arduino Mega 2560

Sulaiman (2012) states that arduino is a platform consisting of software and hardware.



Figure 2: Board Arduino Mega 2560 Source: Warren, (2014)

Chip mikrokontroller	ATmega2560
Operating voltage	5V
Input voltage (recommended, via DC jack)	7V - 12V
Input voltage (limit, via DC jack)	6V - 20V
Digital I / O pins	54 pieces, 6 of which provide PWM output
Analog Input pin	16 pieces
DC current per pin I / O	20 mA
3.3V DC current pin	50 mA
Flash Memory	256 KB, 8 KB has been used for bootloader
SRAM	8 KB
EEPROM	4 KB
Clock speed	16 Mhz
Dimensions	101.5 mm x 53.4 mm

Table 1: Specification of Arduino Mega 2560 Source:Warren, (2014)

2.4. RTC

Real Time Clock (RTC) DS1307 is an IC made by Dallas Semiconductor company. RTC (Real Time Clock) The DS1307 works with low power, has a nonvolatile calendar / clock BCD and SRAM with a capacity of 56 bytes.



Figure 3.14 RTC Source: Singarimbun, (2015)

2.5. Motor Driver Shield L298P

This device is a type of motor driver with the principle of H-Bridge Mosfet which can be used to drive two 7-12V DC motors with maximum current up to 2A. The use of this device is based on the ease of use that is compatible with the arduino microcontroller.



Figure 4: Motor Shield L298P Source:Tutorial – L298P Motor Shield Instruction.pdf., (2017)

2.6. DC motor

According to Sumanto (1994) states that the DC Motor is electrical equipment that converts electrical energy into mechanical energy.



Figure 5: Simple DC Motor Source: Sumanto, (1994)

2.7. Power Supply

The power supply circuit is a circuit used to provide a power source in the form of a voltage output. The resulting voltage is supplied to various other circuits to activate the circuits. On 12 VDC power supply paired IC LM7809, so that the output voltage is stable and ranges on the voltage needed later to provide input on the Arduino and other supporting components.

2.8. FT232RL

FT232RL is a chip used as a USART interface between a micro controller and a computer (PC). The chip uses a working voltage of 3.3 Volts and becomes a voltage level converter (converter) between a USB port on a PC with RS232 on a micro controller.



Figure 6: Pin and schematic FT232RL Source: Future Technology Devices Ltd., (2015)

2.9. Knowing Visual Basic

Basuki (2006) states that the basic language is basically a language that is easy to understand so that programming in the Basic language can be easily done even by people who are just learning to make the program. This is even easier after the presence of Microsoft Visual Basic, which builds on the idea of making simple and easy scripting languages for graphic user interfaces developed in Microsoft Windows operating systems.

3. Research Methods

3.1. Problem Solving Flowchart

This Flow Chart is a description of the steps and steps of the manufacturing process from start to finish.



Source: Researcher (2017)

3.2. Data Analysis

In the preparation and preparation of this final project, the author uses the following methods

3.2.1. Determining Theme Design

The very first thing to be determined is the theme of the design to be created.

3.2.2. Creating a Design Concept

All thoughts or ideas that are poured in an initial design that is also called the image sketch

3.2.3. Preliminary Design Analysis



Figure 8: System block diagram Source: Researcher (2017)

In this design use AC voltage reducer, that is power supply 220 volt AC to 12 volt DC as motor drive DC and IC LM7809 DC as arduino mega 2560 power supply. Arduino Mega 2560 as controller, computer as identifier. RFID is used for Identity to the computer as well as to open the door, to move the door using a DC motor that is limited by switch limit cap and open limit switch. RTC is used as timing and FTDI232RL as serial communication to computer.

3.2.4. Component Inventory

Inventory component is done to record what parts are already available.

3.2.5. Making Work Order

Sequence of workmanship needs to be made to facilitate the making of the tool, so that the process sequence can be done systematically.

3.2.6. Component Procurement

Tools / Material	Specification
RFID	MFRC522
Microcontroller	Arduino Mega 2560
Motor Driver	Driver motorL298P
Motor DC	Motor DC 12 volt
IC RTC	IC DS1307
IC serial to computer	FTDI232RL
Power Supply	Power Supply 12 volt and IC LM7809
PC (Personal Computer)	PC 14 "
Switch limit	Switch limit
Prototype open door cover	Acrylic 5mm and 3mm

Table 2: Components

Source: Researcher (2017)

3.2.7. System Design

The application of RFID and database design for the open-door model in the library on access to and out of the door with RFID (Radio Frequency Identification) is still in prototype form but the test is done by actual step.

3.2.8. Hardware Design



Figure 9: Schematic of all hardware (Hardware) Source: Researcher (2017)



Figure 10: Miniature Door Design Source: Researcher (2017)

3.2.9. Software Design

After the manufacture of hardware, the next step is the creation of software. Software created in this final project is Arduino Programming Language that is with C language and Visual Basic Programming.

3.2.10. Integration and Testing System

At this stage testing the system made so that problems can be found and performed improvements. Testing is done on hardware, software (software), and system integration. The goal is to know the performance of the system has been made and provide analysis of the test results. This effort is also conducted to determine the ability of test equipment that has been made, whether it has fulfilled the desire or not. This test is done several times to get good results.



Figure 11: Flowchart for door safety system Source: Researcher (2017)

In the picture above flowchart explains if there is RFID tags attached to the RFID reader then the RFID tag ID will be used to display the identity of a person along with the time on the computer and also used to open a library door.

3.2.11. Failure Analysis and Corrective Action

Not always testing tool system can directly get satisfactory results. Therefore, if encountered unsuitable results need to be analyzed failure and corrective action.

3.2.12. Working Analysis Tool

In the data retrieval we can know whether the test tool can work properly by looking at the results or data taken. Is there a significant deviation between the same data, or the results taken are relatively the same data.

4. Analysis and Discussion

a. Power Supply Chain Testing

Testing power supply circuit is very important because to turn on all electronic components that require a suitable and stable voltage.

1. The No Chain circuit



Figure 12: Testing power input supply no load, b) Testing power output supply 12 volts without load, c) Testing of LM7809 IC output without load Source: Researcher (2017)

The result of loadless power supply testing is shown in table 3:

Power Supply	Measure Output	Output Theory	Current
12 Volt	12.00 Volt	12 Volt	0
IC LM7809	9,00 Volt	9 Volt	0

Table 3: Measurements of the no-load power supplySource: Researcher (2017)

The voltage error presentation can be calculated as follows % error = $\frac{V \ teori-v \ praktek}{V \ teori} \times 100\%$

- V teori
 - a. % error on the power supply 12 Volt

% error =
$$\frac{12-12}{12} \times 100\% = 0$$
 %

b. % error on the power supply IC LM7809

$$\% \text{ error} = \frac{9-9,00}{2} \times 100\% = 0\%$$

2. The Chain of Weight



Figure 13: a) Testing input power supply burdened, b) Testing power output supply12-volt load, c) Testing output power supply IC LM7809 load. Source: Researcher (2017)

Power Supply	Output Measure	Output Theory	Current	Power
Power Supply 12 Volt	12 V	12V	0,250 A	3 watt
IC LM7809	8,86 V	9V	0,71 A	6,39 watt
			-	

 Table 4: Measurements of loaded power supply
 Source: Researcher, (2017)

The output error presentation can be calculated as follows:

% error = $\frac{V \ teori-v \ praktek}{V \ teori} \times 100\%$ V teori

- % error on power supply12 Volt a. a. 70 error on power supplying that % error = $\frac{12-12,00}{12} \times 100\% = 0$ % b. % error on power supplyIC LM7809
- % error = $\frac{9-8,86}{9} \times 100\% = 1,55$ %

5. Results and Analysis

From the results after testing the power supply is still functioning properly and suitable for use in this tool.

5.1. RFID Testing

1. Unhampered Testing

This test is done by calculating the distance that can be read by RFID reader without any obstacle.



a) Figure 14: a) RFID A range testing (card).b) RFID distance test B(key chain). Source: Researcher (2017)

From the test obtained the furthest distance from the reading is 3.5 cm with card tag and 2 cm with keychain tag, because the keychain tag of antenna size used is smaller than card tag.

RFID tag A	RFID tag B	Data sheet
Distance reading	Distance reading	Distance reading
3,5	2	5 cm

Table 5: Comparison of read distance between RFID tag implementation on RFID A and B with data sheet Source: Researcher (2017)

Tests with these obstacles are done by various experiments. Barriers used, among others, with acrylic, paper, and iron plate. This test is performed to determine the ability of the RFID reader in reading tags with certain obstacles. This barrier can be likened to a container or casing that is best suited for door locks.

The success rate of RFID tags detected by the acrylic barrier RFID reader after 5 tests:

% error = (Total Success Detected) / (Maximum reading) = %

error = (100% + 100% + 100% + 100% + 100% + 80% + 60% + 40% + 100% + 100% + 100% + 80% + 60%)/13 = 100% + 10% + 10% + 10% + 100% + 100% + 10% + 10% + 10% + 100%86,15 %

The success rate of RFID tags detected by RFID reader barrier paper after 5 tested: % error = ((Total Success Detected) / (Maximum reading) = %

(100 % + 100 % + 100 % + 100 % + 100 % + 100 % + 60 % + 40 % + 100 % + 100 % + 100 % + 100 % + error 60 %)/13 = 89,23 %

The success rate is detected by RFID tag RFID reader with iron plate iron plate after 5 test:% error = $\frac{\text{Total Success Detected}}{\text{Maximum reading}}$ =

%

 $error = \frac{0}{13} = 0 \%$

The furthest readable RFID reader of the RFID tag is 3.5 cm for RFID tag A. while the furthest readable RFID reader of the RFID tag is 2 for RFID tag B. From testing the suitable barrier material used the casing is a type of acrylic. RTC Testing DS 1307

This test aims to determine whether the RTC timing can continue to run and is sustainable even if the system is off or inactive.



Figure 15: RTC Testing. RTC view on computer Source: Researcher, (2017)

Here	is	the	table	of	test	results
TICLE	15	uic	laure	UI.	ισδι	resuits

RTC System	Computer Digital Clock
21:51:00	21:51:00
21:51:01	21:51:01
21:51:02	21:51:02
21:51:03	21:51:03

Table 6: RTC test with digital clock on computerSource: Researcher (2017)

From the test results that RTC DS1307 has been working properly and can be said to be in good condition.

a. In testing arduino mega 2560 series is to know whether the circuit that has been made to run properly or not. In this test that includes testing I / O.



Figure 16: Arduino mega 2560 test. Source: Researcher, (2017)

From the tests that have been done on the arduino mega 2560 program that has been created and in the program successfully uploaded, it is proven by rx or receive sign on arduino flashing.

b. Testing L298P Motor Driver Series and DC Motor

To find out whether the L298P motor driver circuit and motor can work according to plan. Connect the L298P motor driver to the arduino PWM pin and grab the source from the 12 VDC power supply as the power supply of the driver motor. The output of the L298P motor driver is connected to the DC motor. Here is the testing of L298P motor drivers and DC motors.



Figure 17: The comparison graph between the output voltage count with the measuring output voltage. Source: Researcher (2017)

5.2. Results and Analysis

Measurement of output voltage of driver as motor power supply with input of 8 bit PWM bit which controlled by arduino mega 2560 result of measurement resulted nonlinear data, this is because the characteristic of L293P shield motor driver material happened drop voltage where reference voltage given equal to 12 Volt, but the maximum PWM value of 255 only produces 10 Volt voltage is different from the calculation results, because the characteristics of motor driver shield L293P as mentioned in the datasheet that there will be a voltage drop of 1.8 to 3.2 Volts.

5.3. Testing Display on Computer

Tests on the display program on the computer the function tested is Administration Login and the readout of the ID displayed through the computer and the results can be saved.



Figure 18: Testing the login menu display Source: Researcher (2017)

Daftar Siswa	D Katu	NIM	Nama	Entrittan	State
Export Absen	218154101202239	20131330041	Ade Ainur Bofik	Tenik Komputer	Keluar
Logout	218154101202239	20131330041	Ade Ainur Bofik	Tenik Komputer	Masuk
25-07-2017 12:09:11	218154101202239	20131330041	Ade Ainur Rofik	Tenik Komputer	Keluar
25-07-2017 12:08:59	852242109218	20131330038	Randy Pangalila	Management	Keluar
25-07-2017 12:08:38	15410484202108	20131330040	Novan Dwi Cipta	Teknik Bektro	Keluar
25-07-2017 12:08:27	852242109218	20131330038	Randy Pangalila	Management	Masuk
25-07-2017 12:08:12	852242109218	20131330038	Randy Pangalila	Management	Keluar
25-07-2017 12:07:57	218154101202239	20131330041	Ade Ainur Rofik	Tenik Komputer	Masuk
25-07-2017 11:20:32	58242251160147	20131330039	Bryan Marojahan Hutauruk	Teknik Mesin	Masuk
25-07-2017 11:07:42	580101202239				Masuk
25-07-2017 11:07:36	218154101202239	20131330041	Ade Ainur Rofik	Tenik Komputer	Keluar
25-07-2017 11:07:25	58242251160147	20131330039	Bryan Marojahan Hutauruk	Teknik Mesin	Keluar
25-07-2017 11:07:07	218154101202239	20131330041	Ade Ainur Rofik	Tenik Komputer	Masuk
24-07-2017 14:49:24	852242109218	20131330038	Randy Pangalila	Management	Masuk
24-07-2017 14:49:18	15410484202108	20131330040	Novan Dwi Cipta	Teknik Elektro	Masuk
24-07-2017 14:49:14	90233148160135	20131330045	Imam Munthoib	Keperawatan	Masuk
24-07-2017 14:49:06	218154101202239	20131330041	Ade Ainur Rofik	Tenik Komputer	Keluar
24-07-2017 14:49:02	218154101202239	20131330041	Ade Ainur Rofik	Tenik Komputer	Masuk
24-07-2017 14:48:54	58242251160147	20131330039	Bryan Marojahan Hutauruk	Teknik Mesin	Masuk
24-07-2017 14:48:49	58242251160147	20131330039	Bryan Marojahan Hutauruk	Teknik Mesin	Keluar
24-07-2017 14:48:45	58242251160147	20131330039	Bryan Marojahan Hutauruk	Teknik Mesin	Masuk
24-07-2017 14:48:34	58242251160147	20131330039	Bryan Marojahan Hutauruk	Teknik Mesin	Keluar
24-07-2017 14:48:24	582422510147				Masuk
24-07-2017 14:47:07	58242251160147	20131330039	Bryan Marojahan Hutauruk	Teknik Mesin	Masuk
24-07-2017 14:45:24	218154101202239	20131330041	Ade Ainur Rofik	Tenik Komputer	Keluar
24-07-2017 14:45:05	90233148160135	20131330045	Imam Munthoib	Keperawatan	Keluar
24-07-2017 14:44:43	852242109218	20131330038	Randy Pangalila	Management	Keluar

Figure 19: Testing view of visitor list Source: Researcher (2017)

	Card ID	NIM	Nama	Fakultas
	26322109218	20131330037	Ferry Firmanto	Teknik Sipil
	852242109218	20131330038	Randy Pangalila	Management
	58242251160147	20131330039	Bryan Marojahan	Teknik Mesin
	218154101202239	20131330041	Ade Ainur Rofik	Tenik Komputer
	90233148160135	20131330045	Imam Munthoib	Keperawatan
	15410484202108	20131330040	Novan Dwi Cipta	Teknik Elektro
	58284202108			
*				

Figure 20: Testing display Registration of new ID name Source: Researcher (2017)





6. Conclusions and Suggestions

6.1. Conclusion

After analyzing and experimenting the system built, then the conclusion obtained from the design of prototype library visitor recorder system automatically memafaatkan electronic door with RFID is as follows:

- a. This RFID method can be designed or created as a door opener at the library by identifying the ID number on the RFID tag, then the ID number will be sent by the arduino microcontroller to move the motor on the door.
- b. This device is connected to the computer used to communicate with RFID, the RFID will give the ID to the computer used to identify the identity data of the library visitor by registering ID first.

6.2. Suggestion

Some things that need to be considered to develop the system to a better direction, namely:

- a. System design tool is not equipped with a safety system means that all types of cards with a frequency of 13.56 Mhz can open the door.
- b. The RFID tag used should have a faster response time and a longer range.
- c. If applied then the RFID reader shields used should not contain much metal, because the metal reduces the emission of radio waves emitted by the RFID reader.

7. References

- i. Rivas, M. (2004). RFID its Aplications and Benefit Philips
- ii. Warren, D. (2014). Arduino Robotics. U.S.A.
- iii. Alaydrus, M. (2011). Antena Prinsip dan Aplikasi. yogyakarta: Graha Ilmu
- iv. Astono, R. (2006). Implementasi Dan Perancangan Kunci Pintu Hotel. Semarang : Universitas NegeriSemarang.
- v. Basuki, A. (2006). Algoritma Pemograman. Surabaya: PENS.
- vi. Future Technology Devices Ltd. (2015). FT232R USB UART IC. Future Technology Devices
- vii. Tutorial L298N Dual Motor Controller Module 2A and Arduino.pdf. . (2017)
- viii. Maryono. (2005). Dasar Dasar Radio Frequency Identification (RfID) Teknologi yang Berpengaruhdi perpustakaan. Media Informasi vol XIV no.20.
- ix. Prayogo, R. (2012). Pulse Width Modulation(PWM) dengan PLC.
- x. Rizkiawan, I. (2015). Rancang Bangun Robot Beroda Dengan Pengendali Jarak Jauh Berbasis Raspberry PI. Sumatra Utara: Universitas Sumatra Utara.
- xi. Singsarimbun, A. P. (2015). RTC (Real Time Clock) DS1307 Sebagai Pengatur Waktu Pada Sistem Traffic Light Adaktif. Sumatra Utara: Universitas Sumatra Utara.
- xii. Sumanto. (1994). Mesin Arus Searah. Yogjakarta: Andi Offset.