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Automatic Curtain Design With LDR And IR Sensors at The BAPPENDA Kebumen

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Abstract

The Regional Revenue Management Agency of Kebumen Regency is a government agency that manages regional revenue in Kebumen Regency. The design of automatic curtains is expected to make it easier for office employees to use the facilities. This automatic curtain uses a flow chart and programming logic in designing programs for the light intensity of the IR sensor and the LDR sensor as an automatic curtain indicator using a remote. The design of the automatic curtain consists of an IR sensor and an LDR sensor as input, Arduino UNO as a processor, Relay as a component that transmits commands from the Arduino UNO to the motor, and motor as the output of this project. Automatic curtains at BAPEDA Kebumen can make it easier for employees to use office facilities to make them more durable, more comfortable, and more effective during working hours or on holidays because of the automatic curtain system that has been made.

Keywords: *Automatic curtains, IR sensor, LDR sensor*

Abstrak

Badan Pengelola Pendapatan Daerah Kabupaten Kebumen merupakan instansi pemerintah yang mengelola pendapatan daerah di Kabupaten Kebumen. Perancangan gorden otomatis ini diharapkan dapat memudahkan pegawai kantoran dalam menggunakan fasilitas tersebut. Tirai otomatis ini menggunakan flow chart dan logika pemrograman dalam merancang program untuk intensitas cahaya sensor IR dan sensor LDR sebagai indikator tirai otomatis menggunakan remote. Perancangan tirai otomatis terdiri dari sensor IR dan sensor LDR sebagai input, Arduino UNO sebagai prosesor, Relay sebagai komponen yang mengirimkan perintah dari Arduino UNO ke motor, dan motor sebagai output dari proyek ini. Tirai otomatis di BAPEDA Kebumen dapat memudahkan pegawai dalam menggunakan fasilitas kantor agar lebih awet, nyaman, dan lebih efektif pada saat jam kerja atau pada hari libur karena sistem tirai otomatis yang telah dibuat.

Kata-kata kunci: *Gorden otomatis, IR sensor, LDR sensor*

1. Introduction

An automatic system can be described as a technological tool related to the application, computer-based electronics (PLC) so that it has certain functions depending on the content of the given program. So, an automatic work system is a way of working tools that can do work on their own, by the given program **[1]**.

In early times, this automatic system was very rarely found because most people still used the manual one and it was limited in everyday life. However, in this day and age, offices, schools, universities, and many others have used automatic systems [2]. Two previous studies that discussed the curtains were done by Edy, Erfanti, and Erma (2017) who made automatic curtain designs based on micro-controllers [3], and by Eko Ihsanto and Faitul Rifky (2015) who made the curtains designs and smartphone-based automatic light switches [4].

So far, to open and close curtains, many are still done manually; by dragging or pulling using human power. It feels a little bit more time-consuming and troublesome when done in a house or hotel with lots of curtains to open and close in the morning and evening [5]. Therefore, with the times and technology advances, I took the initiative to make an automatic curtain tool to simplify human performance [6].

Along with the development of times and automatic and programmable technology using a microcontroller system and Arduino UNO, there are many types of equipment that use automatic systems [7]. In the automatic curtains using an IR sensor and an LDR sensor, if you get light from the sun, the curtains will open or close, and if you get input from an infrared or remote sensor, the system from the LDR will automatically turn off and the curtains are controlled by the remote.

The formulation of the problem of this research is how to make automatic curtains using an IR sensor and an LDR sensor? What problems will be discussed in these studies?

2. Method

2.1 Material

The design of automatic curtains using an IR sensor and an Arduino UNO-based LDR sensor requires several tools and materials in terms of hardware and software presented in the **Table 1.**

Tabel 1. Materials and Tools

No.	Materials and Tools	Uses
1.	*Transformator*	As a power supply
2.	IN4002 diode	As a power supply and relay driver
3.	*Elco 4700Mf*	*As a power supply*
4.	IC 7805	As a power supply
5.	Switch on / off	As a control power supply
6.	Arduino UNO R3	as a control system
7.	LDR sensor	as an input signal to the system
8.	DC motor	as an actuator
9.	cable	To connect the power supply circuit
10.	*Jumper*	*As a liaison circuit*
11.	Terminal block	As a cable terminal
12.	PCB	As a media circuit
13.	Solder and tin	As a tool to install components
14.	*Relay*	*As a motor driver circuit*
15.	*Cutter and cutting pliers*	*As a cutting tool*
16.	Screwdriver (+) and (-)	as supporting equipment
17.	Laptop (Windows 7)	As a programming medium
18.	Arduino IDE	As programming software
19.	Tentacle	As a binder
20.	Cloth	as curtains
21.	Markers as a series of rails	as a series of rails
22.	1K resistors, 220 Ohm, 100 Ohm	as resistance
23.	Transistor C828	As switching to the motor driver
24.	IN4001 Diode	As a voltage rectifier
25.	Limit switch	As a connector and voltage breaker

The system that works with input on the IR sensor or LDR sensor is then processed by Arduino UNO and the command is forwarded to the relay, when is the time to turn on or off which is limited by Limit Switch, the motor will automatically rotate to the right or left according to the contents of the program on the Arduino Uno.

2.2 Methods

After calculating the tools and materials, the researchers then designed a system using the LIVEWARE application. This design can be seen in the **Figure 1**.

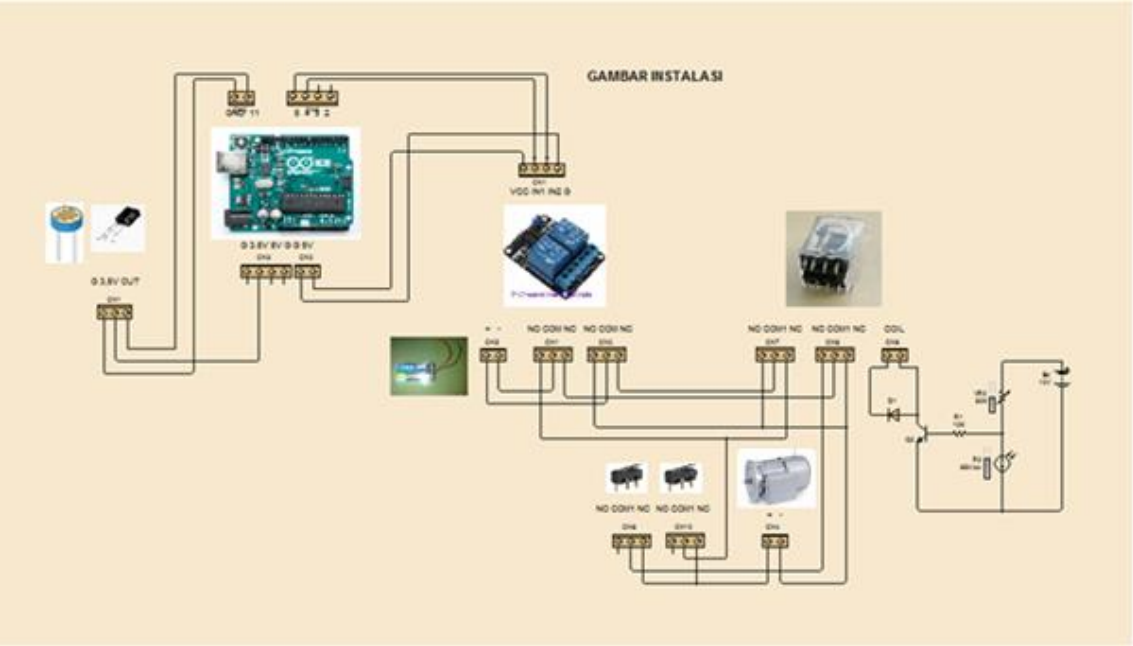

Figure 1. Automatic Curtain Installation

Before starting this research, the researchers conducted secondary data discussions, namely from scientific journals originating from various journals, both national and international journals, books, as well as literature from the Internet of which publication date was not more than 5 years. The secondary data sources obtained were literature that were relevant to this research. Previous research was reviewed in the form of a journal review to make it easier to find similarities in topics, theories, differences, to review the results of previous studies as learning materials in carrying out this research.

In software planning, the first step was identifying the problem, which in this process, the researchers identified any problems that occurred in the automatic curtain system that was being implemented.

After identifying the problem, the next step was to collect data. This data collection was done using literature from previous researchers.

Finally, as a preparatory step for designing, it is necessary to analyze the hardware and software. Automatic curtain system design using Arduino. The software used was the Arduino IDE [8]. The methods used in preparing journals were (a) literature review: studying books, articles, and sites on the internet about this material, (b) interview: conducting interviews with lecturers and staff of the district revenue management office in Kebumen, (c) data collection: collecting data files related to making automatic curtain tools.

3. Results and Discussion

The issues covered consist of several troubleshooting explanations for automatic curtains. Office employees of the Regional Revenue Management Agency of Kebumen Regency often experience forgetting to open the curtains during holidays. This, according to the researchers, needs to be given a solution.

From several problems, the authors proposed an alternative by making a tool that can help employees to make it easier to maintain electronic equipment in the office so that it is not damp and when an internal meeting will be held, it can be conditioned using its IR sensor [9]. Flowchart flow of automatic curtain system presented in the Figure 2.

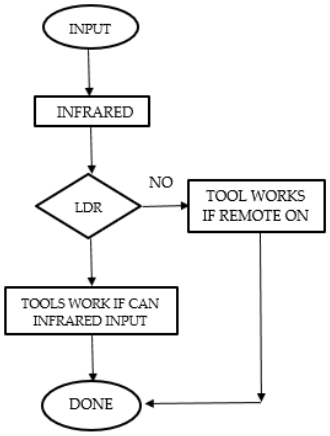

Figure 2. Flowchart Flow of Automatic Curtain System

a. Presenting research results

1) LDR Sensor Testing

This test was used to ensure that the LDR sensor functioned properly. The way to do this test was by connecting the LDR sensor directly to the relay circuit and motor driver. The following image shows that the LDR sensor detects light entering the LDR sensor. The wave is responded to as input data which will be processed by Arduino UNO R3 as a data processor. The result of the data processing is a motor movement that closes the curtain. LDR testing presented in the Figure 3.

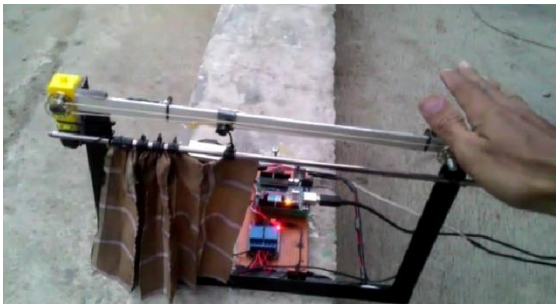

Figure 3. LDR Sensor Testing

2) Testing Arduino UNO R3

This test was carried out to check the pins of the Arduino UNO R3 system to function properly in the incoming program. The test method was to give commands using the source code program on the Arduino UNO R3 system [10]. Programming Language presented in the **Table 2.**

Table 2. Programming

No.	Information Program	Program

1.	Entering the Program Into an Arduino UNO	// Program LDR
		// Muhammad dzikri
		#include <IRremote.h>
		int IRpin = 11;
		int R1 = 4;
		int R2 = 5;
		IRrecv irrecv(IRpin);
		decode_results results;

2.	Coding of motor rotation speed settings	void setup()
		{
		Serial.begin(9600);
		irrecv.enableIRIn();
		pinMode(R1, OUTPUT);
		pinMode(R2, OUTPUT);
		digitalWrite(R1,HIGH);
		digitalWrite(R2,HIGH);
		}

3.	Entering Monthly on Arduino	void setup()
		{
		Serial.begin(9600);
		irrecv.enableIRIn();
		pinMode(R1, OUTPUT);
		pinMode(R2, OUTPUT);
		digitalWrite(R1,HIGH);
		digitalWrite(R2,HIGH);
		}

4.	LDR Sensor system running program	// Program LDR
		// Muhammad dzikri
		#include <IRremote.h>
		int IRpin = 11;
		int R1 = 4;
		int R2 = 5;
		IRrecv irrecv(IRpin);
		decode_results results;

5.	Entering Monthly on Arduino	void loop()
		{
		if (irrecv.decode(&results))
		{
		Eksekusi();
		Serial.println(results.value);
		irrecv.resume();
		}
		}

6.	LDR Sensor system running program	void Eksekusi(){
		switch(results.value){
		case 16753245: //Kode remot ON
		Serial.println("RELAI HIDUP");
		digitalWrite(R1,!digitalRead(R1));
		digitalWrite(R2,!digitalRead(R2));
		break;

7.	IR Sensor system running program	case 16736925: //Kode remot STOP
		Serial.println("RELAI HIDUP");
		digitalWrite(R1,!digitalRead(R1));
		digitalWrite(R2,!digitalRead(R2));
		break;

8.	Inserting Rotation From IR Sensor To LDR Sensor	case 16724175: //Kode remot 1
		Serial.println("RELAI OK");
		digitalWrite(R1,!digitalRead(R1));
		digitalWrite(R2,!digitalRead(R2));
		break;

When the above program runs, the relay located on Arduino UNO R3 will move the motor. When the logic is "1", the motor rotates to the left and opens, and vice versa, value "0" results in the motor rotates to the right and closes.

3) IR Sensor Testing

This test was used to make sure the IR sensor functioned properly. The way to do this test was to connect the Arduino UNO R3 circuit to the Relay. The following figure shows that IR displays the results of the processing of data waves sent by the remote and begins to open and close the curtains. IR sensor testing presented in the **Figure 4.**

Figure 4. IR Sensor Testing

4) Motor Driver Circuit Testing

This test was used to ensure the motor driver circuit functioned properly. The way to do this test was by connecting the motor driver circuit directly to the relay circuit. The picture below shows that the motor driver circuit operates the automatic curtain as a result of light processing processed by the LDR sensor and then processed by Arduino UNO R3. Motor driver network testing can be seen in the **Figure 5.**

Figure 5. Motor Driver Network Testing

5) Overall Testing

Overall circuit testing was done by combining previously tested circuits. The series were combined, then the download and upload processes were carried out. The program was downloaded used the Arduino 1.5.8 IDE software.

Testing of the whole circuit was carried out by observing the work of the automatic curtains that have been made. The following are the results of the automatic curtain testing carried out at the Kebumen Regional Revenue Management Agency. LDR Sensor Test Results on Automatic Curtains presented in the **Table 3**.

Table 3. LDR Sensor Test Results on Automatic Curtains

LDR SENSOR TEST					CONDITION	DESCRIPTION OF THE TOOL
1	2	3	4	5		
05.00	05.00	05.00	05.00	05.00	Closed	The LDR sensor does not receive light
06.30	06.30	06.30	06.30	06.30	Open	The condition of the LDR sensor is receiving moderate light
08.00	08.00	08.00	08.00	08.00	Open	The condition of the LDR sensor is receiving moderate light
10.00	10.00	10.00	10.00	10.00	Open	The LDR sensor does not receive full
12.00	12.00	12.00	12.00	12.00	Open	The LDR sensor does not receive light
14.00	14.00	14.00	14.00	14.00	Open	The condition of the LDR sensor is receiving moderate light
16.00	16.00	16.00	16.00	16.00	Open	The condition of the LDR sensor is receiving moderate light
18.00	18.00	18.00	18.00	18.00	Closed	The LDR sensor does not receive light

LDR sensor testing presented in the **Figure 6**.

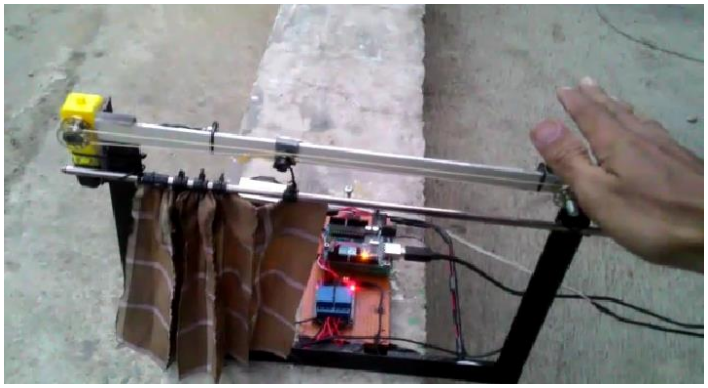

Figure 6. LDR Sensor Testing

Test results of the IR presented in the **Table 4.**

Table 4. Test Results of the IR

Testing Space (m)			Curtain	Note
I	II	II		
0,5	0,5	0,5	Open/ Closed	IR sensor conditions receive commands from the remote
1	1	1	Open/ Closed	IR sensor conditions receive commands from the remote
1,5	1,5	1,5	Open/ Closed	IR sensor conditions receive commands from the remote
2	2	2	Open/ Closed	IR sensor conditions receive commands from the remote
2,5	2,5	2,5	Open/ Closed	IR sensor conditions receive commands from the remote
3	3	3	Open/ Closed	IR sensor conditions receive commands from the remote
>3	>3	>3	No Response	No Response IR sensor conditions receive commands from the remote

4. Conclusion

Based on the observation and testing of the tools as a whole or in part, the following conclusions were obtained

a. The design of automatic curtains using LDR and IR sensors based on Arduino UNO R3 was done by making hardware and software realization. The results of the overall test show that the curtains work automatically in the presence of light on the LDR sensor, besides that, through the IR sensor, the curtains will work semi-automatically using a remote if desired.

b. This automatic curtain provides a good level of comfort, because when the employee's office is busy or on holiday, this system continues, that is, the curtain will always run unless the remote is activated to switch to semi-automatic mode

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