

Arduino Based Light Intensity Auto Curtain

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ABSTRACT

Today's technological developments provide very real changes in human life. There are many tools made to facilitate human work. With advances in science and technology, innovations are developed that are better. Automatic control systems in the field of science and technology lately also growing rapidly. This can be seen from the range of applications ranging from household to sophisticated equipment. Automatic curtains using Arduino-based light sensors are an idea that arose to meet the needs of home automation systems. Automatic curtains work based on the intensity of light that is captured by the light sensor and is real to be processed by Arduino and gives the task of the driving motor to carry out orders to go up or down the curtain according to the light intensity settings that have been set to the system. Simply put, when the light intensity is 271 - 1000 lux then the curtain goes up, then if the light intensity is 1001 lux the curtain will go down, and if the light intensity is 270 lux then the curtain stays down or closed.

INTRODUCTION

In this period of modernity, technological advances, especially in the realm of electronics, can aid human requirements in everyday life. Sensors can be used to automatically coordinate electronic equipment. Even simple items can benefit from the application of this technology. One of them is a window curtain that opens and closes automatically. The occupants of the property will frequently open the curtains to allow light into the room in cases that are discovered every day. When it becomes late at night, it will close again. The difference is that if it is noon, the sun will begin to enter the room, causing it to shine and feel hot, as well as disrupting the activities of those present. The door will then be manually closed so as not to disrupt the activity in the room. The presence of automatic curtains based on the strength of light based on Arduino eliminates the necessity for the tenants of the house to do so. Simply put, when the sun begins to enter or strikes the window, it will automatically close so that the light entering the room is not excessively brilliant or the space does not become too hot from too much sun exposure. In the era of modernization, this tool is supposed to boost the mobility of the house's occupants (Estiriana Limbong, 2018). Curtains are a means of regulating air circulation in the room, controlling sunlight entering the room, maintaining privacy in the room, and also as a complement to the interior of a building, and research on Arduino-based automatic curtains to increase student concentration and interest in learning. technology at SDN 03 fostered Tanjung pinang Barat" This tool is one of the proposed technological innovations is an Automatic Curtain based on an LDR (Light Dependent Resistor) sensor. Sensor-based Automatic Curtain is a system design where the LDR sensor when it gets to light will forward information to the Arduino microcontroller, the Arduino will give orders to the servo to work closing the curtain (Nusyirwan et al., 2020). Then research on "Design of automatic curtain controller via SMS "Curtains can be controlled automatically via cellphone or can also be controlled via buttons. You do this by typing SMS, to the mobile server that has been connected to the micro. And the micro is connected to the motor which will be driven later. This motor is the driving force of the curtain in question. After the SMS is sent by the user and received by the server, then the SMS data will be processed by the micro. The output data issued by the micro will be forwarded to the driver circuit to the motor to be driven (Yanprima Evan D, Akuwan Shaleh, 2008). Following that, there was more research into "controlling automatic curtains via a switching circuit." This automatic curtain is made up of a drive that is powered by a DC motor with a motor driver, a light sensor that uses a Light Dependent Resistor (LDR), a motion detection sensor that uses a Passive Infrared Red (PIR), and a relay and control system that uses a switching circuit. This method is used to control the curtains' opening and shutting. The switch in this system is in the form of a relay, which acts as a polarity reversal on the motor. The light intensity and the presence or absence of movement in the room are used to activate the relay. The spinning of the motor is controlled by the amount of light received (Perkasa, 2014).

Of the seven studies that form the background above, this research focuses on the implementation of Arduino-based automatic curtains based on light intensity with light sensor input and LCD output.

LITERATURE REVIEW

Many previous studies have discussed automatic curtains with various types of controllers and the methods used include the design of automatic curtain opening devices using a microcontroller and light sensors in control methods and processes (Sudimanto, 2014). Measuring Instrument Design and Realization Light Intensity with the use of an intensity sensor BH1750 digital light and use of LCD for output display (Pamungkas et al., 2015). Luxmeter Design Equipped with Arduino Based Proximity Sensor with the additional use of a light sensor in the luxmeter design (Astrawinata & Rahmawati, 2019). And several previous studies on the use of servo devices for pulleys to open and close curtains have also been carried out in other studies with different tools or methods including the design of an elevator prototype (Adriansyah & Hidayatama, 2013).

METHOD

Tool Specifications

In designing this tool will discuss the needs that must be met, so that this tool can work according to what was planned, namely:

- a. The use of a light sensor lux meter GY-49 MAX44009 in reading light intensity..
- b. The use of the TB6600 stepper motor driver and nema 2 stepper motor for the device for the up and down of the curtain.
- c. Application of LCD as output to display the value of light intensity

The tools and materials we use in the manufacture of automatic curtains are based on light intensity as follows:

Hardware

The hardware used includes:

Table 1. Hardware and Function

Number	Hardware	Function
1	<i>Curtains</i>	Arduino based automatic blinds
2	<i>Arduino</i>	As automatic curtain controller based on light intensity
3	<i>GY-49 . Lux Meter light sensor</i>	Function to detect light intensity
4	<i>Stepper Motor Driver TB6600</i>	Works to lower the curtain
5	<i>Stepper Motor Nema 23</i>	Function to raise the curtain
	<i>Limit switch</i>	Serves to limit the motor steps so that the fabric rolls as desired.
	<i>LCD</i>	Function to see the light intensity (Lux)
	<i>Adapter</i>	Serves to change the voltage from ac to dc

Software

The software used in this research are:

Table 2. Software and Specifications

Number	Software	Specification
1	<i>IDE Arduino</i>	Berfungsi untuk mensimulasi rangkaian
2	<i>Fritzing</i>	Function to simulate circuit
3	<i>Microsoft visio</i>	Function to create flowcharts
4	<i>Sketchup</i>	Function for sketching

Schematic Design / Block diagram

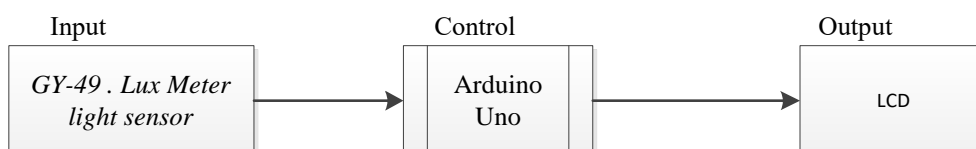


Figure 1. Block Diagram

Information:

1. Input Section

The input section consists of GY-49 . Lux Meter light sensor which functions as a sensor to detect the intensity of light which is used as data on the system.

2. Control Section

The control section consists of Arduino Uno which functions as a controller for the entire circuit so that the circuit can work optimally.

3. Output Section

The output section consists of an LCD which functions to display data captured by the light intensity detected by the sensor.

System flowchart

The following is a flowchart of an Arduino-based automatic curtain with light intensity.

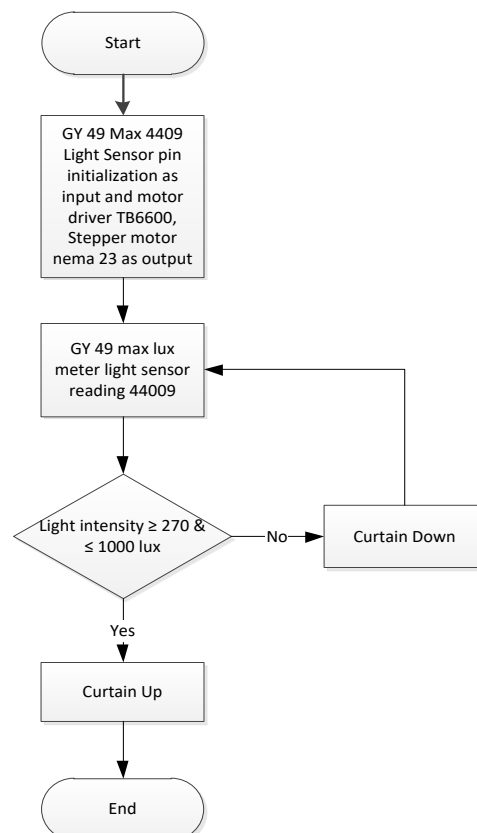


Figure 2. Flowchart of Program Flow

The flowchart above explains the flow of how the program:

The first step is to set all components by connecting the pins on the component. Then start initializing the GY-49 MAX44009 lux meter light sensor component, TB6600 motor driver and also the nema 23 stepper motor. After the sensor reads the light intensity, the GY-49 MAX44009 lux meter light sensor and limit switch function to limit the motor steps so that the fabric rolls match what is desired as an input detects the intensity of light, the stepper motor driver TB6600 and stepper motor nema 23 as output will rotate down the curtain and then the LCD functions to display the value.

Design Tools

Automatic curtain design with light intensity:

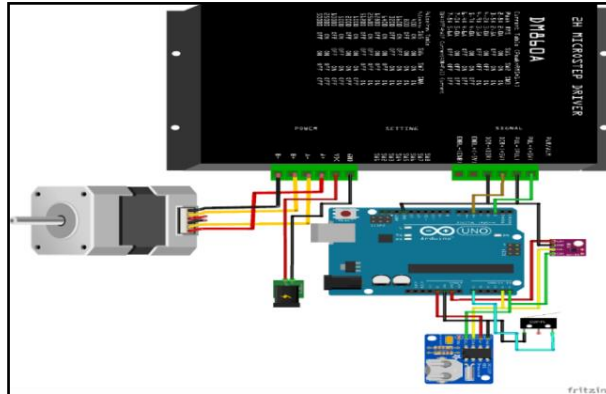


Figure 3. Tool Design

GY-49 MAX44009 lux meter light sensor is connected to arduino and nema 23 stepper motor is connected to TB6600 stepper motor driver, then TB6600's stepper motor driver is connected to Arduino, limit switch is connected to Arduino and LCD is connected to Arduino then motor driver requires DC power 9-42 VDC.

RESULT

Overall Toolkit

Overall Toolkit of automatic blinds with arduino based light intensity detection.



Figure 4. Overall Toolkit Results

The appliance is started by connecting to a 220 volt AC power supply. The roller starts to roll the cloth up (opens the curtain) until it presses the limit switch and the roller stops rolling. If the light intensity is smaller equal to 271 - 1000 lux then the curtain is open, then if the light intensity is greater equal to 1001 lux the curtain will be closed. And if the light intensity is less than 270 lux then the curtains are closed. This process will be repeated as long as the power supply is still connected to 220 Volt AC. As for this tool, it can be run manually by pressing the switch where the manual mode of the curtain will follow the direction of the controller (switch), if the up switch is pressed then the curtain will go up and if the button is pressed down then the curtain will go down and then the automatic mode which is the automatic mode. which depends on the light intensity where the curtains follow the light intensity.

Tool test results

After the design of the tool is complete, testing is carried out 11 times with different time samples as shown in table 3 Testing Automatic Curtains Based on Arduino-Based Light Intensity:

Table 3. Arduino Based Light Intensity Automated Curtain Testing

Number	Test	Time	Light Intensity	Curtain
1	Test 1	17.30	291	Open
2	Test 2	07.03	375	Open
3	Test 3	13.15	2342	Closed
4	Test 4	15.29	1510	Closed
5	Test 5	19.41	270	Closed
6	Test 6	21.16	193	Closed
7	Test 7	16.53	1072	Closed
8	Test 8	12.47	3475	Closed
9	Test 9	08.00	406	Open
10	Test 10	10.32	3801	Closed
11	Test 11	07.58	500	Open

From table 3. it can be seen that the test was carried out 11 times. From the results of the light intensity test, the lowest lux value was 109 lux and the highest lux value was 3801 lux. The results of the test in the morning were carried out at 07.03 the light intensity of the lux was 375lux the curtain was open, then the results of the test in the afternoon carried out at 12.47 the lux light intensity was 3801 lux the curtain was closed, then the results of the tool test in the afternoon was 17.30 the lux light intensity 291 lux curtains open, and the results of testing tools at night at 21.16 lux light intensity is 193 lux the curtains are open. Light intensity also depends on weather conditions such as cloudy, cloudy, and sunny.

DISCUSSION

The light intensity measurement test on the automatic curtain circuit was carried out with 11 trials with different times. From the test results, it was known that the light intensity with a range of 271 to 1000 then the curtain would rise automatically and if the light intensity was < 270 and > 1000 then the account curtain fell.

CONCLUSION

After carrying out the design and manufacture of the tool, which was then continued with the results and discussion stage, it can be concluded that the design of an automatic curtain device based on Arduino-based light intensity has been completed with input and output to run the curtain automatically. The appliance is started by connecting to a 220 volt AC power supply. The roller starts to roll the cloth up (opens the curtain) until it presses the limit switch and the roller stops rolling. If the light intensity (lux) is less than 271 to 1000 the curtain will open automatically, then if the light intensity (lux) is greater than 1001 the curtain will be closed automatically, and if the light intensity (lux) is less than 270 then the curtain will close. As for this tool, it can be run manually by pressing the switch where the manual mode of the curtain will follow the direction of the controller (switch), if the up switch is pressed then the curtain will go up and if the button is pressed down then the curtain will go down and then the automatic mode which is the automatic mode. which depends on the light intensity where the curtains follow the light intensity.

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