Arduino-based Automatic Light Design Using a Light-dependent Resistor Sensor at dr. H.A Rotinsulu Hospital

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Abstract

Lights are one of the fundamental needs in the standard of living; if the light is cleared out, it'll squander power, and this often happens since you disregard to turn it off. in the list to fast improvement within the field of innovation the sum of power demand tends to extend quickly. This increment in demand can be caused by the expanding number of individuals utilizing electrical technology.In this case, a robotization light plan was made utilizing an Arduino-uno-based light sensor that can be set to turn on and off naturally, agreeing to the escalation of daylight so that it'll suit the desires of the lamp.The controller utilized is the Arduino microcontroller. The program connected to the microcontroller serves to initialize and design the equipment and examines the flag input from the light sensor, which at that point forms it is by being given a few conditions to create yield. In this case, a robotization light plan was made utilizing an Arduino-uno-based light-based Sensor that can be turned on and off, consequently concurring with the concentrated daylight received to suit the desires of the light.

 Keywords: Arduino UNO, Automatic Lighting System, Microcontroller, Sunlight Intensity

Abstrak

Jika lampu dibiarkan menyala, maka akan menyia-nyiakan daya, hal ini sering terjadi karena Anda lalai untuk mematikannya. dalam daftar peningkatan cepat dalam bidang inovasi, jumlah permintaan daya cenderung meningkat dengan cepat. Peningkatan permintaan ini dapat disebabkan oleh semakin banyaknya orang yang menggunakan teknologi listrik, dalam hal ini dibuatlah sebuah rancangan robotisasi lampu dengan menggunakan sensor cahaya berbasis arduino-uno yang dapat diatur untuk menyala dan mati secara alami sesuai dengan peningkatan cahaya matahari yang masuk sehingga sesuai dengan keinginan lampu. Program yang dihubungkan ke mikrokontroler berfungsi untuk menginisialisasi dan mendesain peralatan dan memeriksa input flag dari sensor cahaya yang pada saat itu membentuknya dengan diberikan beberapa kondisi untuk menciptakan hasil. Dalam hal ini dibuatlah sebuah rancangan bangun lampu dengan menggunakan sensor cahaya berbasis arduino uno yang dapat dinyalakan dan dimatikan sesuai dengan konsentrasi cahaya matahari yang diterima sehingga sesuai dengan keinginan.

Kata-kata kunci: Arduino UNO, Sistem Pencahayaan Otomatis, Intensitas Sinar Matahari

1. Introduction

Lighting systems are essential for everyday life because nowadays, the top priority is efficiency and saving electrical power. By illuminating a place that is unreachable by sunlight or at night, the intended peer helps with work and activities. Performance in terms of time will be improved with the use of computers. The internet is a medium that can be used to improve work efficiency as it provides various facilities and functions that make it an advanced medium for communication and information. Nowadays, with internet network technology that has grown rapidly, the problem of distance and time constraints can be solved by using technological solutions such as light sensors and Arduino. Technological developments can be utilized only by an internet connection [1].

Technological developments that require an internet connection allow access to electronic equipment, such as lights that can be operated automatically using a light sensor system. This makes it unnecessary for users to control the lights. Hospital employees often forget small things, such as turning off lights when there is a lot of activity and busyness. This is especially true if they have certain errands to run and leave the premises for a long time, sometimes in cloudy conditions. If the hospital employees do not have enough time to turn on the lights, they will face difficulties. The lights can automatically turn off with a microcontroller based on the sun's strength. Therefore, Rotinsulu Hospital employees no longer need to turn the lights on or off manually. This microcontroller is Arduino UNO and also uses an LDR (Light Dependent Resistor) sensor for the light sensor to set the lights on and off. This automatic lamp will be very useful because it reduces power usage and saves time because there is no need to turn off or turn on the lights manually [2].

Arduino Uno could be a microcontroller board prepared with ATmega328. It has fourteen advanced input and yield pins, with six input pins that can be used as PWM yields. In expansion, it encompasses a 16 MHz precious stone oscillator, control jack, ICSP header, reset button, and USB association. The Arduino Uno board can be connected to a computer with a USB cable to increase the microcontroller's ability to be used. To do this, the Arduino Uno can use the pinMode(), digitalWrite(), and digitalRead() functions. These functions work at 5 volts; each pin

can provide or receive up to 40 mA of current. In addition, the function has a pul-up resistor, which is by default disconnected [3] [4] [5].

2. Method

The qualitative method used is observation. Research using this qualitative approach allows for a more in-depth exploration of social aspects of electricity use, considering the context and complexity of human behavior. Descriptive data is needed to reveal the opinions and attitudes of hospital employees toward implementing an automatic lighting system in Dr. H.A Rotinsulu Hospital and its impact on daily living patterns. By combining interpretative data analysis and guiding theory development, qualitative research can understand all aspects of non-invasive energy conservation. The activities carried out in this research.

a. Design Diagram Blok

To explain the system's design by knowing how to make an automatic lighting system using Arduino Uno based on LDR sensors, first with a block diagram of the working system represented by the Arduino Uno microcontroller for input/output processing and data storage. A command or program is created, and then the LDR sensor enters the light, and Arduino Uno responds properly [8] [9] .
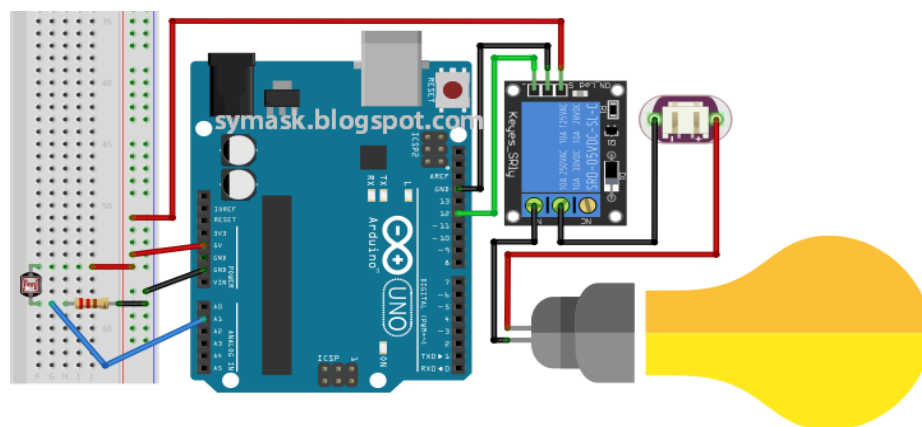

Figure 1. Physical Form of Tool Series.

b. Analysis and Field

The analysis focuses on improving the quality of the ongoing automatic lighting system at Dr. H.A Rotinsulu Hospital. This study involves a series of stages, including

observation, interviews, and documentation studies as methods of collecting data related to this study.

c. Control analysis

By using automatic lighting with Arduino UNO and Light Dependent Resistor (LDR) sensors on Arduino UNO, it is hoped that this system can help develop the use of practical, safe and effective automatic lighting for users of this technology. The completion step is testing; application testing is very important to ensure the design application can run as desired and smoothly. When testing the program, the first thing to know is the errors that occur at the coding stage on the Arduino Uno, and secondly, errors in the component circuit [5].

d. Data Collection:

According to the workers, the light bulbs had many problems. One problem was that the lights stayed on when unnecessary and vice versa. The workers agreed to use electronic circuits and found a solution by implementing an automated system for the lights. Automation technology is expected to increase energy efficiency, provide optimal lighting, and reduce manual labor throughout the hospital environment [6].
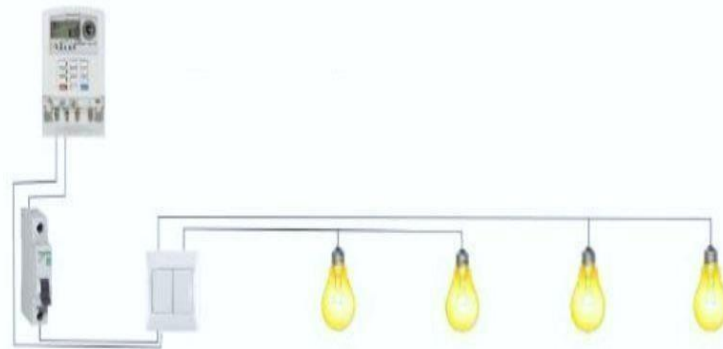
Figure 2. Electrical Circuit at Rumah Sakit dr. H.A Rotinsulu At This Time.

e. System Design

The electrical circuit design is an automatic system to turn on and off the lights in the yard of Dr. H.A. Rotinsulu hospital. The electrical circuit in Figure 8 is an old diagram made at Dr. H.A. Rotinsulu hospital. The circuit that will be made next uses the

Arduino Uno sensor, LDR (light sensor) integrated in this circuit to turn on and off the lights automatically based on solar energy from the sensor [2].

Table 1. Device For Circuit System Automatic Lamp

No.	Name Device	Total	Description
1	Source electricity	1	Source electricity from PLN
2	Stop contact	2	As place connecting power electricity to lights and arduino
3	Jumper cable	10-15	As connector current electricity
4	Arduino UNO	1	As controller light
5	LDR sensor	1	As tool receiver light
6	Riley 5V	1	As disconnect and connect current electricity
7	Incandescent Lamp	1	provide general lighting in various rooms
8	BreadBoard	1	As an electrical conductor as well as a place to attach jumper cables or male pin headers so that the electric current from one component to another can be well distributed.
9	Light Fittings	1	As connecting lights and electrical circuits so that they can be lit
10	Resistors	1	As it controls the current magnitude and lowers level voltage in various electronic applications.

f.   Automatic System Testing

After the design stage is complete, the light switch is tested to fulfill the basic principles of building an automatic lighting system [2].

g. Data Analysis

Data analysis focused on continuously improving the quality of automated lighting in hospitals. The research package includes monitoring the implemented automated lighting system [1].
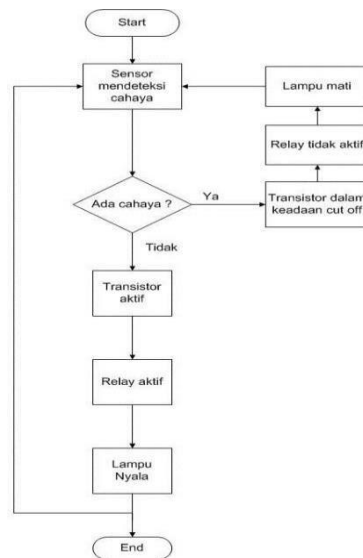
Figure 3. Flow Diagram Data.

Graphical illustration The steps and sequence of equipment design procedures, equipment operating systems are depicted using flow charts [10].

3. Result And Discussion

All of these functions will run if they are assembled in accordance with what has been prepared and the tools that have been programmed through Arduino UNO. Arduino UNO software is connected to electricity so that all components of the tool or device perform their functions according to the program-created Overall Tool Circuit. [5] [10] [11] [12].

The assembly begins with making a circuit diagram or circuit diagram of the device to be used. After the construction of everything, the actual assembly of the device is carried out according to the designed design, which saves time during assembly and avoids the risk of electric shock and reduces the error of pin adjustment that may be wrong on the part. Advertising is the next step in the manufacture and application of the device. The main electronic components in this research are Arduino UNO, LDR sensor, LED, breadboard and jumper cables. This assembly begins with installing all major components such as breadboards, jumper cables, sensors and microcontrollers. If all components are installed according to the design, the next step is configuring each component by writing the application code as needed [7].

Figure 4. Sensor When not getting light LED on

To test the LDR sensor, the device is tested to see if it can read and respond to light. If the sensor does not detect light, then the output value obtained in the system management indicates that the lights are on and bad. If the sensor detects ambient light, the lights will turn off.

After the pins of each module are connected with jumper cables, the Arduino UNO circuit board assembly process uses an Arduino UNO computer. Entering the programming code into the Arduino microcontroller requires a cable connection, namely USB cable A to B [8]. The code above shows the Arduino Uno project code where A0 is used as a sensor input and relay as an output to control the lights. After viewing the serial monitoring data, it is found that the light intensity is above 1000 lux, while the dark light intensity is below 1000 lux. With this data, a scenario can be made if the light intensity reaches 1000 lux or more, the lights will turn on, otherwise it will turn on, but if the light intensity is less than 1000 lux, the lights will turn on and off [4].
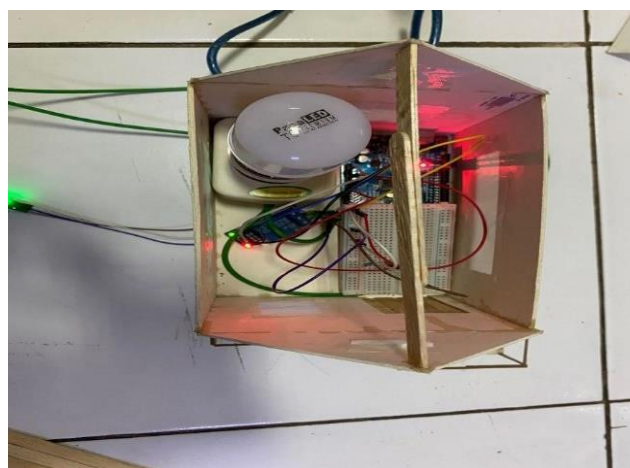

Figure 5. The Result of The Circuit

4. Conclusion

The results can be taken from them research of automatic lights using light sensors based on Arduino. Automatic lighting function that uses LED lights to read the lights and turn them off automatically. From the information above, we know that if the light intensity reaches 1000 lux or more, the lights will turn on, but if it is less than 700 lux, the lights will turn off. The system has good test results, but more than one LDR sensor is needed to turn on the lights automatically. Simulation results and field implementation show how the system reacts to lighting conditions, turning on when needed and off when there is enough light. Therefore, this research will be useful in improving energy efficiency and comfort in Dr.H.A Rotinsulu Hospital uses smart lighting and automatic lighting. Ideas for development include music sensitivity enhancement, light threshold adjustment, testing under weather conditions, integration with renewable energy sources, exploration of the Internet of Things (IoT) technology, environmental impact studies, economic research, citizen participation, and model development. Simple and easy-to-use monitoring programs to improve understanding of energy consumption and system efficiency.

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