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Utilization of Arduino UNO Technology and Arduino IDE to Create Electrical Disconnect Products for Electronic Equipment

Dwi Iskandar¹⁾ and Ahmad Sunandar²⁾

^{1),2)} Politeknik Indonusa Surakarta

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Corresponding author:

Dwi Iskandar

E-mail:

dwik@poltekindonusa.ac.id

ABSTRACT

Today many people often forget to turn off household appliances such as fans or lights, which results in the flow of electricity from the socket even when not in use, resulting in excessive power consumption. Electricity tariff for the first quarter of 2019: IDR 1,115 / kWh for medium voltage customers. If the lecture room has 4 lamps where each lamp has 23 watts of power, 2 Daikin AC units with 1 PK each, each air conditioner has 840 watts of power. Acer S1213Hn LCD projector has the power: 250 Watt, the total cost of electricity consumption per hour and usage for a month of 26 days for the lecture hall consisting of lamps, air conditioner and LCD projectors is IDR 58,617.78. The research method used is literature study and data collection, technology concept design, development preparation, hardware assembly, Arduino UNO coding, upload coding to hardware, technology testing. To find out the test results whether the technology can work properly, it must be applied directly by connecting the technology that has been created with electricity directly. The way that can be done is to connect the Arduino with mains power using a DC 5 V adapter then connect the relay to a 220 V AC power source and a 220 V halogen lamp. After everything is connected, the lights can be turned on by bringing the registered RFID closer to the RFID Reader, if you want. set how long it takes for the light to turn on can press a button on the IR remote

INTRODUCTION

The Ministry of Energy and Mineral Resources (ESDM) noted that the realization of national electricity consumption increased throughout 2018 to 1,064 kWh per capita. This condition is considered to show a positive trend towards equality in consumption in developed countries. "National electricity consumption has increased now to 1,064 kwh per capita. Yes, that's not bad," said ESDM Minister Ignasius Jonan, at the Ministry of Energy and Mineral Resources, Jakarta, Thursday (24/1/2019).

Because of their busy life, nowadays many people often forget to turn off household appliances such as fans or lights, which results in the flow of electricity from the socket even when not in use, resulting in excessive power consumption. (Hang Poh, Ye Tan, Syafiqah Mat-Ruslan, & Othman, 2019)

1 HP Laserjet printer with 550 watts of power, 1 hour operation, $\cos \Phi = 0,85$

$$\text{kWh} = \frac{P \times n \times t \times \cos F (0,85)}{1000}$$

$$(550 \times 1 \times 1 \times 0,85) / 1000 = 0,47 \text{ kWh/day. (Ida, Rukmi, Kartiwi, \& I Nyoman, 2012)}$$

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Electricity tariff for the first quarter of 2019: IDR 1,115 / kWh for medium voltage customers, namely B-3 Large Businesses with power above 200 kVA and P2 Government Offices with power above 200 kVA.

For example, a PLN customer with a tariff / power of R1T / 1300 VA (Prepaid). Using an electric iron with 350 watts of power, used a day for 3 hours, then the count of usage in 1 month: Daily electricity consumption: 350 watts x 3 hours = 1050 watt hours = 1,050 kWh. Monthly usage = 1,050 kwh x 30 days = 31.5 kWh. Tariff: Electricity consumption = total kwh usage multiplied by price per kWh = 31.5 kWh x IDR 1,355.29 = IDR 42,691.64 (rounded off: forty-two thousand six hundred and ninety-two rupiahs).

If the lecture hall has 4 lamps where each lamp has 23 watts of power, the electricity cost per hour and usage for 26 days is Rp. 2,667.08. air conditioner Daikin 2 units with 1 PK each, each air conditioner has a power of 840 watts then multiplied by 2 to 1,680 watts, then the cost of electricity per hour and usage for 26 days is Rp. 48,702.2. Acer S1213Hn LCD projector has a power of: 250 Watts, then the electricity cost per hour and 26 days of usage for a month is Rp. 7,247.5. So the total cost of electricity consumption per hour and usage for a month of 26 days for the lecture hall consisting of lamps, air conditioner and LCD projectors is IDR 58,617.78.

From the above calculations it can be concluded that for the cost of hourly electricity consumption and usage for a month a total of 26 working days for one room, if after finishing lectures then the room is no longer used and forgets to turn off the electronic equipment in it, the more it will increase the burden of the monthly bill. electricity. If something similar happens in several rooms, it will further increase the burden on the electricity bill.

With Arduino UNO and Arduino IDE technology, it is hoped that it can be used as a controller for the use of electricity in the lecture room in the form of a time timer, if the time timer has run out, the electronic device that is used will turn itself off. The formulation of the problem includes how to design the concept of making electric circuit breakers in electronic equipment? How to make electric circuit breakers in electronic equipment? How to apply power cutoff products to electronic equipment?

MATERIALS AND METHODS

1. Literature study and data collection

Looking for reference material regarding:

- Use of everyday electronic equipment
- Utilization of Arduino UNO technology and Arduino IDE
- The C programming language is concerned with using the Arduino IDE

2. Designing technology concepts

- Based on the purpose of making electrical breaker products in electronic equipment
- Determine the capabilities of the product to be made

3. Preparation for development

- Software preparation, including the Arduino IDE application along with the Arduino library
- Hardware preparation, including computers / laptops used for development, hardware used for implementing power breaker products on electronic equipment

The hardware used, among others

- Arduino uno R3 board original made in Italy
- Relay 4 Phase/Channel
- Adaptor DC 9 Volt
- Cable USB type B
- Cable Jumper Arduino
- LCD 16x2 included IIC (inter integrated circuit)
- IR (Infra Red) Remote
- RFID Card
- Lamp
- Power Cable
- Lamp Fittings
- Lamp Led 3 Watt
- IR Received
- RFID Reader

4. Hardware assembly

Assembly in this stage is the assembly of equipment used in producing electric breaker products for electronic equipment

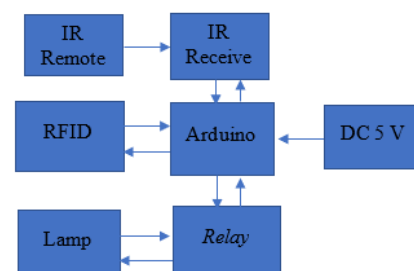


Figure 1.
Hardware Design

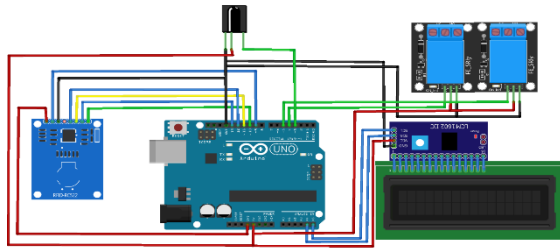


Figure 2.
Product Wiring Sketch

5. Arduino UNO coding

The stages of writing program code where the program code will be uploaded to the Arduino device

Example of the Arduino IDE program to add to the program library

```
#include <SPI.h>
#include <MFRC522.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <IRremote.h>
// inialisasi pin RFID, buzzer, dan relay
#define SS_PIN 10
#define RST_PIN 9
#define LED_DENIED_PIN 7
#define LED_ACCESS_PIN 6
LiquidCrystal_I2C lcd(0x27,16,2);
MFRC522 mfrc522(SS_PIN, RST_PIN);
int code[] = {32,154,149,117}; //This is the stored UID (Unlock Card)
int codeRead = 0;
int pinRelay1 = 4;
int pinRelay2 = 5;
int pinRelay3 = 2;
int pinRelay4 = 8;
int tndRelay1 = 1;
int pinRemote = 3;
String uidString;
```

```
IRrecv irrecv(pinRemote);
decode_results results;
// inialisasi variabel kondisi
int kondisi;
static char textbegin[] = {"          SILAHKAN
TEMPELKAN KARTU ANDA.  "};
static char card_ok[] = {"          KARTU TIDAK
TERDAFTAR  "};
int position = 0;
// ===== PROGRAM
PENGATURAN                AWAL
===== //
void setup()
{
```

6. Upload Coding to Hardware

The process of uploading the program code created from the Arduino IDE application to the Arduino UNO device to find out whether

the coding made is in accordance with the purpose of creating a power breaker product on electronic equipment

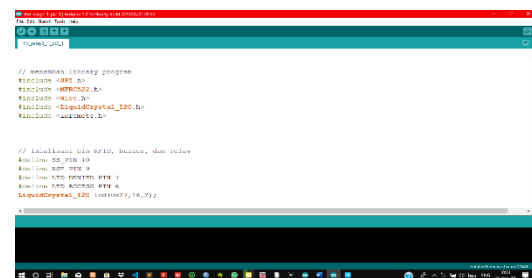


Figure 3.
Arduino IDE display

Steps to upload coding to hardware

- Open the Arduino IDE application on your computer.
- Type the script that will be used
- Arduino Uno connection to a computer using USB type B (USB Printer)
- In the Arduino IDE application, select the tab "Tools" point to "Board" and make sure "Board" is selected "Arduino Genuino / Uno".
- Navigate to the "Tools" menu point to "Port", select "Port" which is already registered
- Upload the code from the Arduino IDE to the Arduino Uno by selecting the "Sketch" menu then "Upload".
- Wait until the indicator light on the Arduino Uno flashes.

7. Technology Trial

RESULTS AND DISCUSSION

1. Result

The test is carried out by connecting directly between the device that has been uploaded the program code to the Arduino UNO and the supporting device with electronic equipment Technology trial flow

- Test the product with a 220 V lamp medium.
- Connect the Arduino to a power source using a DC 5 V adapter.
- Connect the relay to a 220 V AC power supply and a 220 V halogen lamp.
- Conduct a test by pasting registered and unregistered RFID cards.
- Perform a timer test, whether the lights will turn off according to the predetermined timer



Figure 4.
Power Circuit Breaker Technology

The results of the trials that have been carried out are as follows

Table 1.
Testing with an RFID card

Initial conditions	RFID Card	The Result
Lights off	Registered	The light is on
Lights off	not listed	Lights off

Table 2.
Testing the timer with the remote

Timer	The Result
10 second	Success
20 second	Success
30 second	Success

2. Discussion

To find out the test results whether the technology can work properly, it must be applied directly by connecting the technology that has been created with electricity directly. The way that can be done is to connect the Arduino with mains power using a DC 5 V adapter then connect the relay to a 220 V AC power source and a 220 V halogen lamp. After everything is connected, the lights can be turned on by bringing the registered RFID closer to the RFID Reader, if you want set how long it takes for the light to turn on can press a button on the IR remote.

CONCLUSIONS AND SUGGESTION

This technology is an electric control device where when using existing electronic equipment, the person must have a previously registered RFID card. If you want to set the time for using electrical equipment, you can press the button on the IR Remote. For further development it can be developed using the IoT concept, where electronic equipment can be controlled using a smartphone.

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