DESIGN OF HOME LIGHT CONTROL TOOLS SCHEDULE OR DIRECTLY WITH ESP8266 BASED IoT

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RESEARCH AND BACKGROUND

Preventing electricity waste can be achieved by controlling the electrical load, one of which is the lighting load. By appropriately controlling it according to the need, electricity consumption will be reduced, leading to greater efficiency and decreased electricity expenses. Considering the background issues present in the author's home, with this device, the lighting load can be controlled according to needs. Therefore, with the advancement of internet technology, we must be able to utilize it properly. With the background of the issues faced by the author, the sophistication of the internet can be utilized for controlling electronic devices at home. The rapid development of internet technology can be utilized in various forms, one example being the Internet of Things.

FORMULATION of THE PROBLEM

1. How to schedule remote control of lights
2. How does LDR work to provide automatic control for the lamp
3. Is this one of the solutions to save electricity.
4. How to design the tool

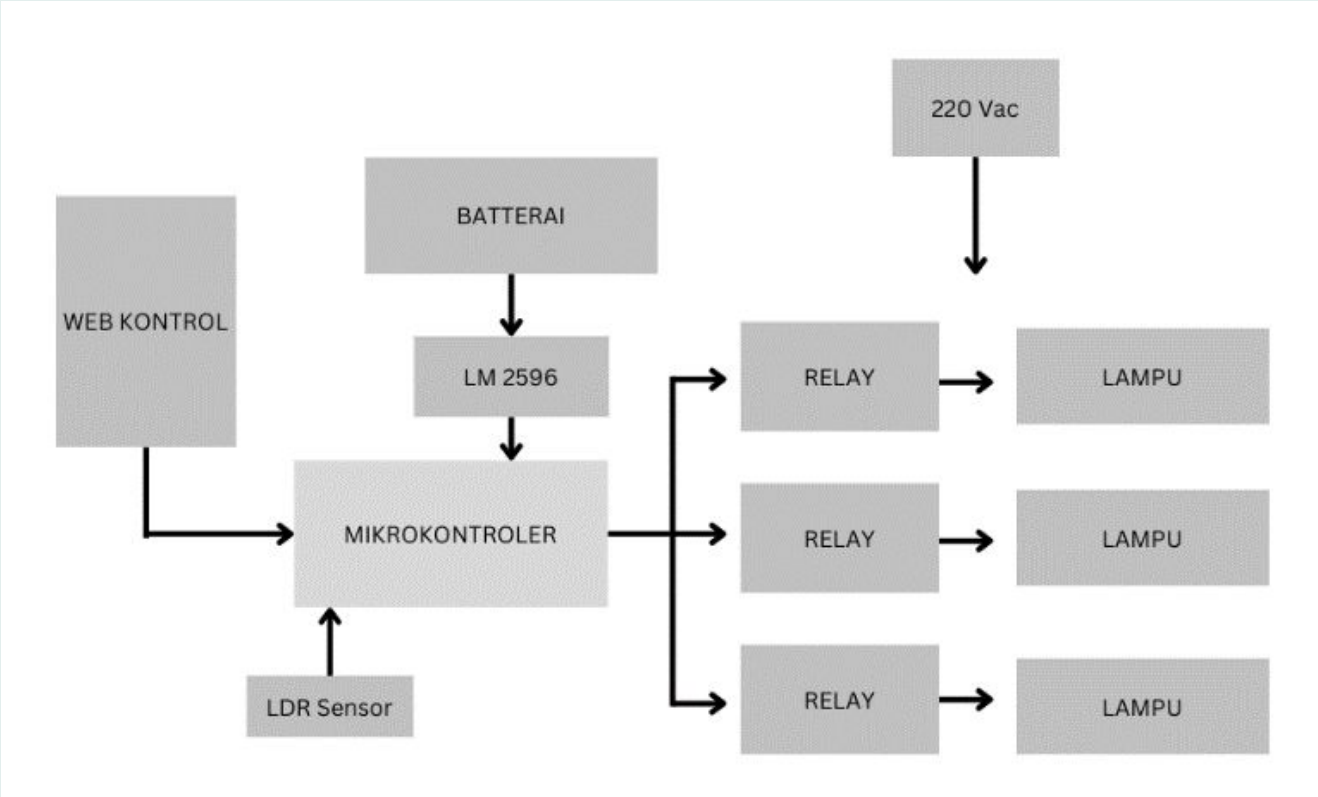
EXTERNAL TARGET

1. The device can operate optimally.

2. The device can be controlled remotely

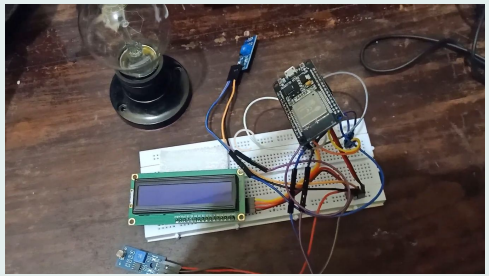
3. The tool has been made

BLOCK DIAGRAM OF THE SYSTEM

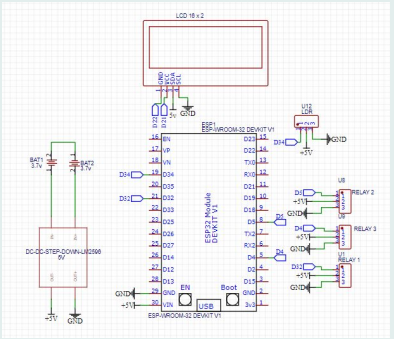


PROGRESS

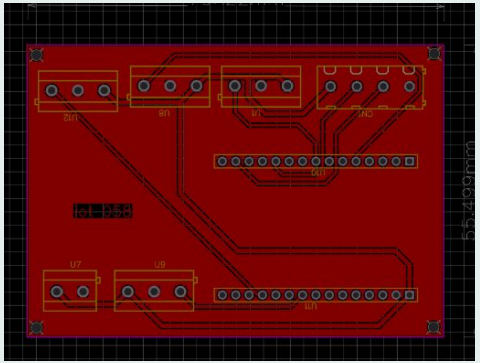
Testing the feasibility of the device to be used



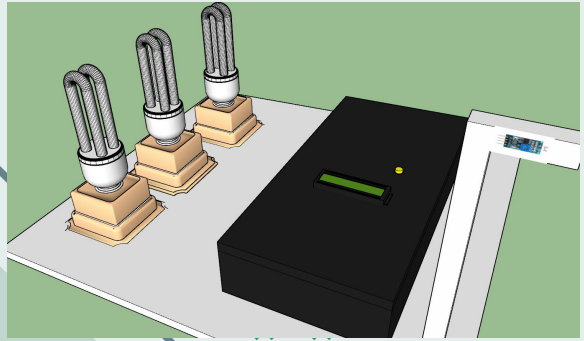
Schematic Tools



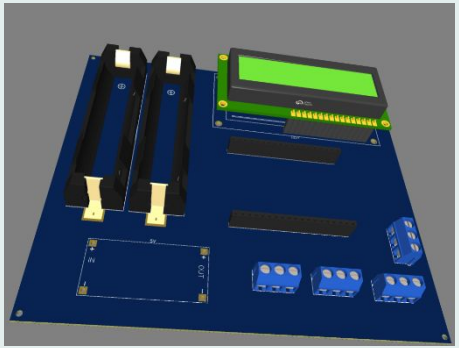
PCB DESIGN



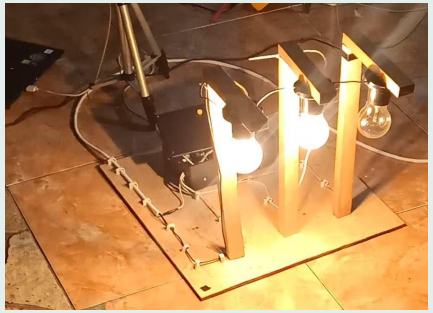
3D Construction Tools



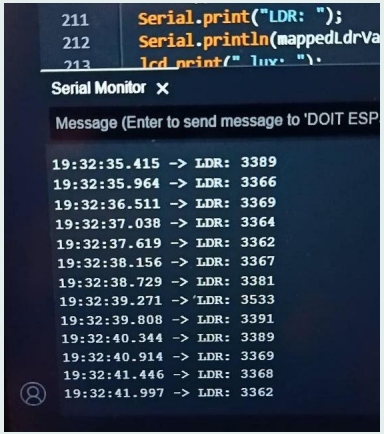
3D DESIGN HARDWARE



Design the Construction

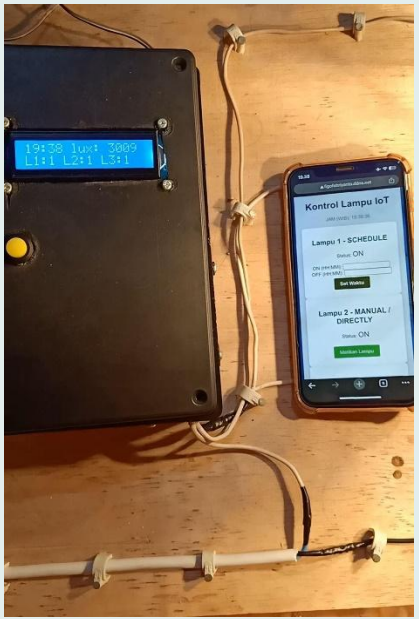


Get value from LDR sensor in the night



Hardware

Hardware Software



Code program for web IoT

```
void handleRoot() {
  String html = "<!DOCTYPE html><html>";
  html += "<head>";
  html += "<meta name=\"viewport\" content=\"width=device-width, initial-scale=1\">";
  html += "<style>";
  html += "body { font-family: Arial, sans-serif; text-align: center; background-image: url('https://png.pngtree.com/backg
  html += ".container { max-width: 500px; margin: auto; padding-top: 50px; }";
  html += ".card { background-color: rgba(255, 255, 255, 0.8); padding: 20px; border-radius: 10px; box-shadow: 0 4px 8px r
  html += ".card h1 { font-size: 2em; }";
  html += ".status { font-size: 1.5em; }";
  html += ".button { background-color: #4CAF50; color: white; padding: 10px 20px; text-align: center; text-decoration: no
  html += ".button:hover { background-color: #45a049; }"; /
  html += ".army-button { background-color: #4B5320; color: white; padding: 10px 20px; text-align: center; text-decoration
  html += ".army-button:hover { background-color: #6A7228; }";
  html += "</style>";
  html += "</head>";
  html += "<body onload=\"updateTime(); updateRelay3Status();\">";
  html += "<div class=\"container\">";
  html += "<div class=\"card\">";
  html += "<h1 style=\"color: #333;\">Kontrol Lampu IoT</h1>";
  html += "<p style=\"color: #555;\">JAM (WIB): <span id=\"currentTime\"></span></p>";
  html += "<div class=\"card\">";
  html += "<h2 style=\"color: #333;\">Lampu 1 - SCHEDULE</h2>";
  html += "<p>Status: <span id=\"relay1Status\" class=\"status\">" + String(isLampOn ? "ON" : "OFF") + "</span></p>";
  html += "<form onsubmit=\"setTime(event)\">";
  html += "<label>ON (HH:MM): </label><input type=\"text\" id=\"ontime\"><br>";
  html += "<label>OFF (HH:MM): </label><input type=\"text\" id=\"offtime\"><br>";
  html += "<input type=\"submit\" class=\"army-button\" value=\"Set Waktu\">";
  html += "</form>";
  html += "</div>";
  html += "<div class=\"card\">";
  html += "<h2 style=\"color: #333;\">Lampu 2 - MANUAL / DIRECTLY</h2>";
  html += "<p>Status: <span id=\"relay2Status\" class=\"status\">" + String(isRelay2On ? "ON" : "OFF") + "</span></p>";
html += "</body></html>";
 server.send(200, "text/html", html);
}

void handleSetTime() {
  if (server.hasArg("onTime") && server.hasArg("offTime")) {
    String onTime = server.arg("onTime");
    String offTime = server.arg("offTime");
    sscanf(onTime.c_str(), "%d:%d", &turnOnHour, &turnOnMinute);
    sscanf(offTime.c_str(), "%d:%d", &turnOffHour, &turnOffMinute);
  }
  server.send(200, "text/plain", "Waktu set untuk nyala: " + String(turnOnHour) + ":" + String(turnOnMinute) +
                                 " dan mati: " + String(turnOffHour) + ":" + String(turnOffMinute));
}

void handleToggleRelay1() {
  isLampOn = !isLampOn;
  digitalWrite(relay1Pin, isLampOn ? HIGH : LOW);
  server.send(200, "text/plain", isLampOn ? "ON" : "OFF");
}

void handleToggleRelay2() {
  isRelay2On = !isRelay2On;
  digitalWrite(relay2Pin, isRelay2On ? HIGH : LOW);
  server.send(200, "text/plain", isRelay2On ? "ON" : "OFF");
}

void handleGetRelay3Status() {
  server.send(200, "text/plain", isRelay3On ? "ON" : "OFF");
}
```

Real-time coding for scheduled control

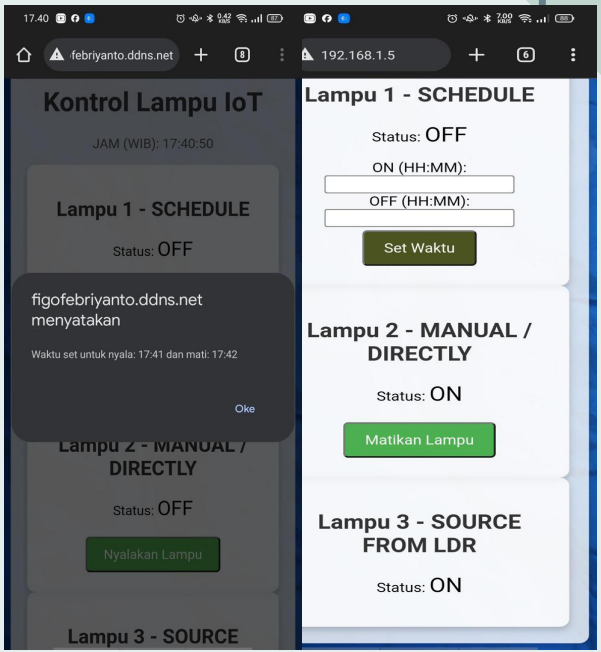
```
WiFiUDP ntpUDP;
NTPClient timeClient(ntpUDP, "pool.ntp.org", 7 * 3600, 60000);

WebServer server(80);

int turnOnHour = 18;
int turnOnMinute = 0;
int turnOffHour = 18;
int turnOffMinute = 2;
```

Measuring the voltage of the LDR sensor and collecting the data values read by the sensor every predetermined hour.

Interface IoT



TESTING AND ANALYSYS

Control for lamp 1

Pengujian ke	Set time ON	Respon waktu lampu ON	Delay time ON	Set time OFF	Respon waktu lampu OFF	Delay time OFF	Jarak
1	10:02:00	10:02:00	0s	10:03:00	10:03:01	1s	5 M
2	10:42:00	10:42:12	12s	10:43:00	10:43:02	2s	60 M
3	11:06:00	11:06:01	1s	11:07:00	11:09:02	2s	2 Km
4	11:17:00	11:17:06	6s	11:18:00	11:18:11	11s	8 Km
5	11:55:00	11:55:09	9s	11:56:00	11:56:04	4s	17 Km
6	12:25:00	12:25:05	5s	12:26:00	11:27:08	8s	31 Km
7	19:40:00	19:40:23	23s	19:41:00	19:41:19	19s	87 Km
8	22:15:00	22:15:05	5s	22:16:00	22:20:13	13s	126 Km

The device can be controlled remotely, with delays occurring due to the distance or the user's signal speed when controlling it. The delay occurs for 0 seconds due to the user's mobile phone signal speed, as well as the close distance. The longest delay is 23 seconds, occurring when the user controls the device in areas with poor signal and far away.

TESTING AND ANALYSYS

Control for lamp 2

Pengujian ke	Jarak	Waktu Tekan	Respon waktu lampu	Delay	Respon Lampu
1	5 M	10:00:04	10:00:04	0 Detik	ON
2	5 M	10:01:02	10:01:02	0 Detik	OFF
3	60 M	10:40:12	10:40:12	0 Detik	ON
4	60 M	10:40:15	10:40:15	0 Detik	OFF
5	2 Km	11:03:02	11:03:02	0 Detik	ON
6	2 Km	11:03:55	11:03:57	2 Detik	OFF
7	8 Km	11:15:30	11:15:31	1 Detik	ON
8	8 Km	11:15:41	11:15:42	1 Detik	OFF
9	17 Km	11:50:14	11:50:14	1 Detik	ON
10	17 Km	11:50:20	11:50:21	1 Detik	OFF
11	31 Km	12:22:58	12:23:00	2 Detik	ON
12	31 Km	12:23:07	12:23:06	-1 Detik	OFF
13	87 Km	19:38:43	19:38:49	6 Detik	ON
14	87 Km	19:38:43	19:39:05	13 Detik	OFF
15	126 Km	22:13:39	22:13:44	5 Detik	ON
16	126 Km	22:13:51	22:14:03	12 Detik	OFF

The delay when pressing the switch on the IoT web is at most 13 seconds. Longer delays are typically influenced by areas with poor signal strength. During testing, there was a faster delay of minus 1 second. This was caused by the relay coil detaching from the normally close contact, resulting in the relay responding faster than the time it takes to press the switch on the IoT web.

TESTING AND ANALYSYS

Control for lamp 3

Pengujian Ke	Jam	Nilai Intensitas LDR	Tegangan LDR	Respon lampu
1	07.00	69	0.16 V	OFF
2	07.10	72	0.17 V	OFF
3	07.30	71	0.17 V	OFF
4	08.00	66	0.16 V	OFF
5	09.00	65	0.16 V	OFF
6	10.00	68	0.17 V	OFF
7	12.00	72	0.18 V	OFF
8	13.00	74	0.18 V	OFF
9	15.00	154	0.20 V	OFF
10	16.00	1183	1.18 V	OFF
11	17.00	2543	2.54 V	OFF
12	18.00	3372	3.37 V	ON
13	19.00	3304	3.29 V	ON
14	02.00	3582	3.53 V	ON
15	04.00	3691	3.61 V	ON

Controlled by an LDR sensor, if the LDR sensor reads an intensity value >3000, the relay will respond with an active high signal, and the lamp will turn on. Conversely, if the intensity value read by the LDR sensor is <3000, the relay will respond with an active low signal, and the lamp will turn off. The voltage is measured using a 20V scale on a multimeter tester. The voltage value is not far from the intensity value read.

TESTING AND ANALYSYS

Test the overall control function.

No	Jenis Pengujian	Kondisi	Respon lampu	Status Lampu pada web IoT
1	Fungsi NTP sebagai set time kontrol	Set waktu menyala	ON	ON
		Set waktu lampu nonaktif	OFF	OFF
2	Fungsi switch pada kontrol IoT	Saklar terbuka	OFF	OFF
		Saklar tertutup	ON	ON
3	Fungsi sensor LDR	Nilai intensitas >3000	OFF	OFF
		Nilai intensitas <3000	ON	ON

All control functions can work optimally and assist users in controlling the device remotely.

CONCLUSION

All control functions can work well success for control long range. If users control remotely, there will be a slight waiting time for the signal to be sent to the device from a distance. To ensure whether the light is on or off, it can be monitored through the status display on the IoT interface. Essentially, the farther the distance, the more delay occurs, but it all depends on the signal speed.

FUTURE WORKS

- Overall completion
- Gathering data for the report book
- The device can be directly applied to the maker's house
- The device can have commercial value

THANK YOU