CONTROL SYSTEM SIMULATION DESIGN
NODEMCU ESP 8266 MICROCONTROLLER BASED HOME LIGHTING

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Abstract

This learning tool is made with the aim that readers can learn or get to know about microcontrollers and one of their uses and applications. In addition, the author tried something new, namely simulating a home lighting control system based on the NodeMCU ESP 8266 microcontroller which works automatically by utilizing RTC (Real Time Clock) so that it can work according to the time and conditions that have been determined so that when left at home as in an inhabited state. The working principle of this design is programming on a microcontroller that has been set with certain time settings, which will be processed and the result is in the form of real time and the state of the lights will be displayed in the LCD and mock up. By simulating a home lighting control system based on the nodemcu esp 8266 microcontroller, the author has several conclusions, namely this tool can be operated to turn on porch lights and living room lights remotely without having to be in place using the android application, namely Blynk, The ability of this tool can detect objects using PIR sensors so as to make the living room lights turn on automatically to minimize the occurrence theft, The porch light can turn on automatically every 5:00 p.m. and turn itself off at 6:00 a.m.

Keywords: NodeMCU ESP 8266 Microcontroller, Light Lighting System

INTRODUCTION
Background

The number of activities that must be done outside the home is sometimes even to the point of having to leave the house for days. The state of the abandoned house is usually static, there is no visible activity in the house. Conditions like this can cause the vulnerability of theft in the form of empty houses such as, often occurs in urban housing. To prevent this from happening, one solution is to create a household electrical installation control system using *the NodeMCU ESP 8266 Microcontroller*.

At this time the use of microcontrollers can be found in various equipment found at home, such as digital telephones, televisions, washing machines, home security systems, etc. Microcontrollers can be used for control, industrial automation, telecommunications and others. The advantage of using a microcontroller is that it is cheap, can be programmed repeatedly, and we can program according to our wishes. Here the author will utilize this microcontroller for the control system of household electrical installations. Where this is a relatively new thing in Indonesia. With the working principle of the microcontroller itself to change the situation so that if the occupants of the house leave the house for more than 24 hours, the home installation will work like a house when occupied. Thus conditions as above can be overcome. The purpose of the research behind the author raising the title above is that the author wants to make a device that can turn off and turn on the lights and can find out the condition of the lights (on / off) remotely without having to be

where the lights are using the blynk android application, the author wants to make the lights turn on automatically when there are objects approaching the house to minimize theft, The author wants to turn on the porch light automatically every 5:00 p.m. and turn itself off at 6:00 a.m.

METHOD

Planning and Tool Building

The design process of simulating a home lighting control system based on the ESP 8266 node microcontroller and making this household electrical installation using two conditions, namely manual and automatic in a series of NodeMCU ESP 8266 microcontroller modules equipped with RTC (*Real Time Clock*) or real time components and LCD *(Liquid Crystal Display)* and can be controlled automatically using the blynk android application.

Current State

The number of urban housing that is left behind by residents out of the city sometimes for days makes the house almost seem like no activity and without residents. This triggers criminal acts such as theft and robbery. Not infrequently we encounter similar cases both in the news on television and in newspapers.

Desired conditions

To minimize the occurrence of crime or criminality, especially in urban housing and generally in residential neighborhoods in the community, the author wants to make a tool that can make the house left by its residents look like an inhabited or not empty house. In this case, the author uses the NodeMCU ESP 8266 microcontroller and RTC (*Real Time Clock)* components to be able to adjust the time of turning on and off the house lights according to conditions like a house when there are residents automatically and using a PIR *(Passive Infrared) sensor.*
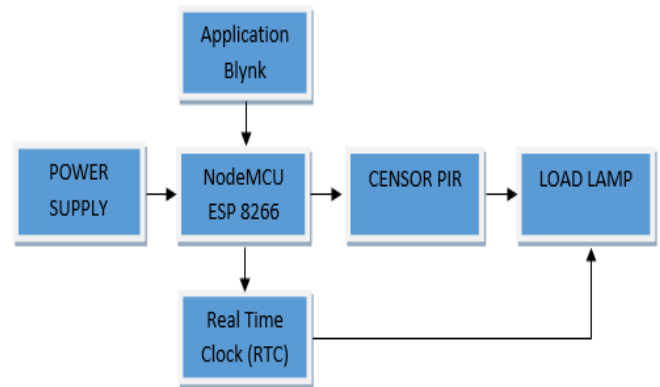
Block Diagram

Figure 1 Design Block Diagram
Source : Author's Work

In designing this household electrical installation, the author uses two inputs to turn on the lights, namely manually and automatically. Manual by using a switch and automatic by using a preset time program. Then the programming is processed in Arduino NodeMCU 8266. The time used in real time is to add RTC *(Real Time Clock)* to run according to the real clock, so that when PLN turns off, the clock does not reset again. After being processed in Arduino NodeMCU 8266, the desired results or outputs are in the form of displays on the LCD (displaying the light turn time as desired) and household electrical installations (turning on house lights according to desired conditions) which can be operated online using the Blynk android application.

RESULT AND DISCUSSION
Research Results

From the planning carried out on the tool starting from the work design, the series of each component to the final result. Planning and making this tool basically requires good design and systematics so that it will provide conveniences in the process of making tools. Tests in this study include electronic circuits, control unit circuits and blynk applications. Testing on hardware is carried out to determine the feasibility or capability of the hardware used. Testing on software is

carried out to determine the capabilities of the software used. To find out this, the author tested each component used.

Figure 2 Home Installation Prototype
Source : Author's work

Power Supply Testing

A power supply or power supply is an electrical appliance that supplies electric power to an electrical load. The main function of a power supply is to convert the electric current from the source into the correct voltage, current, and frequency to power the *load.*

Table 1 *Power Supply Testing*
Source : Author's Work

No	Input	Output
1.	220 VAC	12.8VDC
2.	230 VAC	12.6 VDC

Figure 3 Power Supply Testing
Source: Author's work

IR *(Passive Infrared) Sensor Testing*

The PIR sensor is a sensor that can detect movement, in this case the PIR sensor is widely used to find out whether there is human movement in the area that can be reached by the PIR sensor (*Passive Infrared)* so as to make the living room lights and left and right rooms turn on.

Table 2 Pir Sensor Testing
Source : Author's Work

Object	Pin	Response	Result
Exist	Digital Pin 2	I	Turn on
Exist	Digital Pin 3	I	Turn on
Undetectable	Digital Pin 2	O	Does not turn on

Figure 4 Conditions of the PIR Sensor Detecting Objects
Source : Author's Work

NodeMCU ESP 8266 Microcontroller Testing

This module requires about 3.3v power by having three wifi modes namely Station, Access Point and Both (Both). This module is also equipped with a processor, memory and GPIO where the number of pins depends on the type of ESP8266 we use. So that this module can stand alone without using any microcontroller because it already has equipment like a microcontroller.

Figure 5 Testing Arduino NodeMCU 8266
Source : Author's Work

Then testing the Arduino program is done by compiling all the coding that has been made. Is there an error or error in the bottom column of the arduino program. If an error occurs, it can be ascertained that there is an error in coding. But if there is no error and compile successfully but the tool does not operate according to the programmer's command, it can be ascertained that the program is wrong.

Figure 6 *Compile* NodeMCU ESP 8266 Program
Source : Author's Work

Real Time Clock (RTC) Testing

Serial RTC (*Real Time Clock*) is a timer module and data storage.The RTC used is RTC with I2C interface, namely DS1307 in the study of terrace lights will turn on automatically every 17.00 and turn itself off at 06.00 every day.

Figure 7 *Real Time Clock* (RTC)
Source : Author's Work

Blynk App Testing

Blynk is an application for Android OS to control Arduino NodeMCU over the Internet. This application can be used to control hardware devices, display sensor data, store data, visualization with this blynk android application as an online interface using the internet network to turn on and off the lights of the terrace, living room and bedroom left and right.
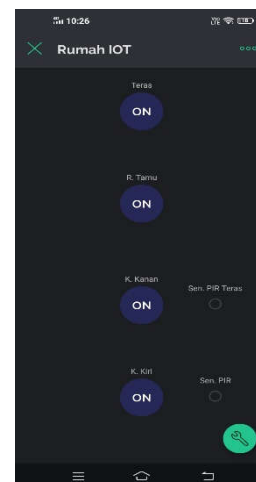

Figure 8 Blynk App Testing
Source: Author's Work

Overall Tool Test Results

Testing the tool as a whole aims to find out if the entire system has been operating according to the author's plan after being combined into one. Testing is carried out by :

1. First turn it on. Prototype design simulation of home lighting control system based on NodeMCU ESP 8266 microcontroller

2. Create a network (Access Point) with username admin23, without using password

3. Make sure nodeMCU 8266 is connected to the network. Then enter the username and password in the Blynk application that has been obtained in the playstore or Appstore.

4. Username : rumahiot23@gmail.com,
   Password : Rumahiot2023

5. Ensure connection between NodeMCU ESP 8266 microcontroller and blynk android application interface

6. In addition to object detection using pir sensors to turn on experimental lights, the control of the terrace and living room lighting system can also be controlled using the blynk android application in figure 4.9 turning on the terrace lights through the blynk android application as follows :
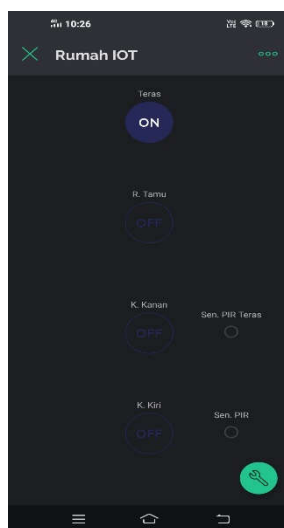

Figure 9 Testing the tool with the Blynk app
Source : Author's Work

Figure 10 Results of Testing Tools with the Blynk App
Source : Author's Work

From testing, it was found that the overall system worked well and was ready to be tested. As for the anomalies obtained such as sometimes the old interface in loading data, but this is still in a reasonable category in the system because this is influenced by the quality of the internet network.

COVER
Conclusion

By conducting a simulation design of a home lighting control system based on the nodemcu esp 8266 microcontroller, the author has several conclusions, namely:

1. This tool can be operated to turn on the terrace lights and living room lights remotely without having to be in place using the android application, namely Blynk.

2. The ability of this tool can detect objects using a PIR sensor so that the living room lights turn on automatically to minimize theft.

3. Terrace lights can turn on automatically every 17.00 and turn off by themselves at 06.00.

Suggestion

Some things that need to be considered in design and operation and there are a few additions to improve the monitoring tool, namely :

1. To make this research more perfect, the power supply should be supplemented by batteries so that it can back up if PLN *is off*.

2. To complete the maximum performance of the tool, it is expected to add additional sensors so that it can only detect humans not all objects when approaching the front of the house.

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