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Electronic Equipment Control System for Households by using Android Based on IoT (Internet of Things)

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Abstract. Utilization of internet based on technology is currently widely used as a means to facilitate control. This research utilizes internet technology and a microcontroller as an automatic control. The purpose of making this tool is to create a control system for household electronic appliances using an IoT based on android. This household electronic equipment control system can assist users in controlling household electronic devices such as: Lights, AC (Air Conditioner), Water Machines, Dispensers, Fans and others. Household electronic equipment control is made using a Wemos D1 microcontroller that is communicated with the internet network. The use of software is also done by installing the application on an android smartphone as a media control tool. The output from wemos d1 is then connected to the relay module which is then connected to the electronic device. The results of this study are in the form of a prototype of a household electronic equipment control device. Based on the test results it can be concluded that the household electronic equipment control system works in accordance with its function. Besides this tool is also very efficient because it can save time for controlling the device from a long distance though.

1. Introduction

Electricity is one of the most basic needs for everyday life, electricity can also be categorized as a primary need for people today in modern times. Everything everyday needs electricity, especially in life that always relies on devices that require electrical energy, especially household appliances, currently Indonesia is one of the countries in the world that has the largest population in the world, with a number of So many people need a large supply of electricity to carry out their daily life.

With the habit of humans who leave their homes with their electrical appliances still alive, this triggers additional energy that continues to run and causes splintering of electricity payments to be issued[2].

The use of electric appliances in households is something that is common nowadays. Almost all households that have electricity supply have electrical equipment. However, in the daily use of electricity, people are sometimes wasteful. For example, forgetting to turn off the electric device or leaving the device on, so that electricity usage in the house exceeds the reasonable limit and the payment increases.

Electrical equipment needs such as turn on household electrical appliances more practical if it can be controlled with well. So far, the community uses cable and remote control based infrared to control

something from long distance, but for such controllability limited by distance. In order to control it is broad and easy, then one of the solutions is using a cell phone Android smartphone as a remote control[6].

A remote control system will be required when it is not possible to control the equipment from a short distance under certain conditions. For example, when someone is outside the house to do certain activities and no one is in the house to control electrical equipment from a short distance, remote control is needed.

Along with the times, human activity is increasing and sometimes it requires people to leave their homes. Someone's activities outside the home, such as a vacation out of town or work that requires someone to leave the house empty for 24 hours, will cause someone to have difficulty interacting with electrical equipment at home.

Electronic technology that can control household electronic equipment from a distance is the internet of things technology. Another technology being developed is technology that aims to save electrical energy used in households[8].

IoT is defined as an interconnection of sensing and drive devices that provide the ability to share information across platforms through a unified framework, developing a common operating image to enable innovative applications. This can be achieved using seamless ubiquitous sensing, data analysis and information representation with cloud computing as the unifying framework[3].

2. Methodology

A frame of mind will be needed in conducting a study, this frame of mind will be used as a reference for the author in completing the research, the framework in research refers to the methodology used [4].

Design (Prototype) is the stage after analysis of the system development cycle which is a definition of functional requirements, and describes how a system is formed which can be in the form of depiction, planning and sketching or arrangement of several separate elements. into a complete and functional unit, including the configuration of the hardware and software components of a system. The essence of this method is the work of a model development into a final system [1].

In addition, to model a software, several stages are needed in the development process, these stages will determine the success of a control system.
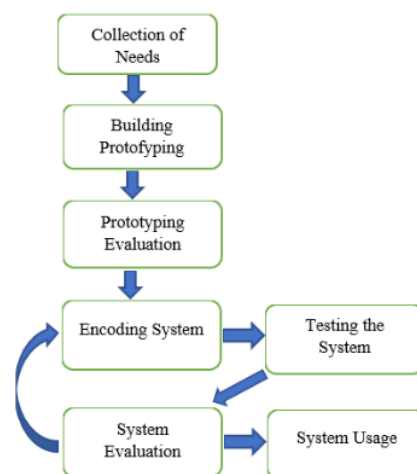

Figure 1. Prototype Stages

a. Collection of Needs

Requirements analysis stage is the most important stage for analyzing a system in solving a problem [9]. Here the researcher analyzes the needs in the design of the control system to be built. Among them is the selection of the required hardware and software. In this case, the researcher uses the Wemos D1 microcontroller as the main hardware and blynk as an intermediary for communication between the smartphone and the hardware.

Wemos is a board module that can function with Arduino, especially for projects that carry the IOT concept [5].

Relay is a device that works on an electromagnetic basis to move a number of arranged contactors or an electronic switch that can be controlled from other electronic circuits by utilizing electric power as its energy source [1].

b. Building Prototyping
In this case the researcher describes the input and output formats that will be produced by the control system created. Here the researcher describes the input and output schemes that will be received by Wemos D1 [7].

c. Prototyping Evaluation
Furthermore, after the prototyping development stage, the researcher defines the format and requirements of the overall control system, identifies all requirements, and an outline of the system to be built, for example the communication path between the Wemos D1 microcontroller and the Blynk platform.

d. Encoding System
In this stage the prototyping that has been agreed upon is translated into an appropriate programming language as a process for inputting commands that will be received on the microcontroller. In this system, the programming language used is C ++ using the Arduino IDE software.
An information system is a system that collects, processes, stores and analyzes data, and separates information for specific purposes [10].

e. System Testing
In this stage, the modules that have been made are combined and tested to find out whether the system that has been built is in accordance with the design and whether there are still errors or not. Testing using android is testing carried out directly by the user.

f. System Evaluation
System evaluation is not prototyping evaluation, system evaluation is evaluating the finished system or software and hardware whether it is in accordance with the wishes or not.

System Usage
This stage is the final stage of creating a control system using the Prototyping Model method. At this stage the ready-made tools that have passed the test are ready for use.

3. Result and Discussion
Implementation is one of the stages in system development, where this stage is the stage of placing a control system for household electronic equipment so that it is ready for operation and can be seen as an effort to realize a system that has been designed
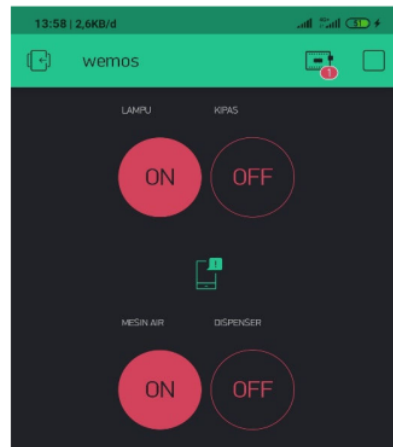
Figure 2. Display control in blynk

In Figure 5.1 it can be seen that there are 4 buttons that can be used with each function. The full red button with the writing on indicates that the condition of the electronic device is on, while the red circle button with the writing off indicates that the condition of the electronic device is in a dead condition. When the off button is pressed, the button turns on and the electronic device turns on, vice versa. In addition, there is also a notification button that functions to send notifications to Android as a notification that the Wemos D1 microcontroller is not connected to the internet network.

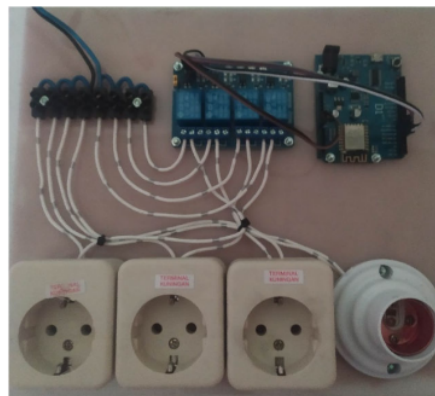**Implementation of Household Electronic Appliance Controls.**

Figure 3. Implementation of Household Electronic Appliance Control Devices.

In the picture above, you can see the results of a prototype or prototype of a household electronic device control device. There is a series of Wemos D1 microcontrollers connected to a 4 channel relay, then from a 4 channel relay connected to 3 plug terminals with their respective functions and 1 lamp holder as a bulb holder with 220v AC source.

System Testing

The testing stage is the final stage when all processes are passed in order to find out whether the model designed is in accordance with the expected results. Testing the control system for household electronic equipment can be carried out in the following steps:

1. Connect 220v AC mains power to the household electronic appliance control system hardware circuit.
2. After the control system turns on, the Wemos D1 microcontroller will connect to the internet network that has been previously set on the Arduino IDE. The connection of the Wemos D1 microcontroller can be seen in the Blynk application as shown below.

3. After the Wemos D1 microcontroller is connected to the internet, the Blynk application on Android is ready to be used to turn on and off household electronic devices.
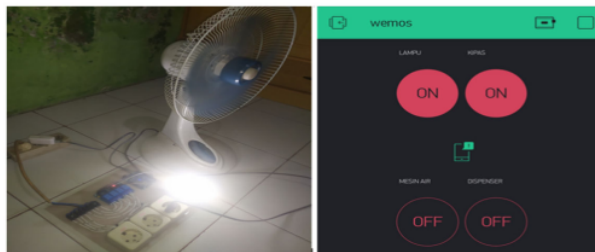

Figure 4. Household Electronic Equipment Control System

Testing Systems on the Prototype

Testing is done to test the system on a prototype that has been designed. Testing is done by accessing the button from the blynk application and synchronizing the hardware device and the connection connection from Wemos d1 pins to 4 channel relay pins, then from 4 channel relays to household electronic equipment.

Table 1. Testing With the On Command

No	Expected Scenarios	Expected results	Result
1	The Blynk application performs the on command to Wemos D1 pin D4 which is connected to pin in1 on the relay that is connected to the lamp.	The condition of the light is on according to the order carried out from the android	Valid
2	The Blynk application performs the on command to Wemos D1 pin D5 which is connected to pin in2 on the relay connected to terminal 1.	The terminal condition is on according to the command carried out from android.	Valid

3	The Blynk application performs the on command to Wemos D1 pin D6 which is connected to pin in3 on the relay connected to terminal 2.	The terminal condition is on according to the command carried out from android.	Valid
4	The Blynk application performs the on command to Wemos D1 pin D7 which is connected to pin in4 on the relay connected to terminal 3.	The terminal condition is on according to the command carried out from android.	Valid

4. Conclusion

Based on the results of the analysis, design and implementation that has been done. Then several conclusions can be drawn including the following The results of the research on the IoT-based household electronic equipment control system using android in the form of a prototype are quite effective in helping users control electronic devices without having to be near a home electronic device switch.

The prototype for controlling household electronic equipment using Wemos D1 and Android which functions as an on / off control for electronic devices is integrated and functioning properly. The control system for household electronic equipment can make it easier for users to chat even though they are at a long distance or outside the city and even abroad.

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