DESIGN AND IMPLEMENTATION OF A SMART HOME SYSTEM WITH THE INTERNET OF THINGS (IOT) USING ESP32

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Received: 11, April, 2023 ***Revised: 20, May, 2023*** ***Accepted: 30, May, 2023***

ABSTRACT

This Internet of Things technology is created and developed by humans to facilitate every work and affairs in various aspects of life. One of them can be applied in everyday life. The day is controlling household electrical appliances to turn off and on from loot. The use communication Internet through Android smartphones. The tool needed a device ESP32 as the intermediary to connect the instrument to network the Internet to Android smartphones. This study built the system using a microcontroller working with relays. In this system, the relay acts as a switch for turning off and on the device. Electricity Action: Turning off and turning on electrical equipment remotely. Generated tools in the form of controlling Android-based lights using ESP32 technology and can use Smartphones and Android to control the lights.

Keywords: Internet of Things, ESP32, Relay.

1. INTRODUCTION

Along with the development era, activity increases more, causing people to frequently leave their homes. With busyness in activity, somebody will experience difficulty communicating or interacting with electronic equipment in the house. For example, if someone goes on a long trip and comes home late at night, of course, he must prepare, especially formerly a number of matters during his departure. Wrong, only one that turns on light lighting before traveling. This, of course, will take time and will waste energy and electricity in vain. From the explanation, one can conclude that communication between homeowners and electronic equipment around the house turned out to be very important. Communication is one of the human needs, which is very important because by communicating, humans can exchange information with one another. One of the frequent long-distance communications used is through network internet communication (Syahputra Novelan and Permana 2022).

Development And progress technology, specifically in the field network very modern telecommunications at this time, it is undeniable that the Internet is needed in everyday life for all walks of life without see status social from the public That Alone. For Now, the use of the Internet by the community has greatly increased and is almost needed for up to 24 hours. With this modern advancement, there are now many devices of technology that can be connected to the Internet, both electronic and electronic devices, computer equipment as well Mobile. With this progress came A innovation where all of these technological tools can be controlled

remotely through the Internet so that they are more efficient and save time. Innovation is named the Internet of Things or IoT (Timofeev 1996).

The Internet of Things appears Because of exists development of technology, and social, economic, and cultural changes that demand time connection, Any Things connections, And place connections. Elements That there are in IoT are sensors, connectivity, people, and processes. Utilization of this IoT can apply To control a number of electronic tools Which There is in a house, like lights, fan wind, key doors, and automatically And Close Fence Automatic (Nizetic et al. 2020). Control can do from a distance Far with the use smartphone device. The smartphone device is connected to the Internet, where the Internet acts as a bridge between the device and the control system used. Remote control of the tools at home can be called a smart home. With Smart-home, you can make time and effort more efficient in carrying out the control equipment household electronics (Ahmad and Zulkifli 2022).

To make a Smart-home with the concept of the Internet of Things, needed A component of electronics That has arranged with various functions as a system. The electronic component that we often use now is esp32. In addition, a network is also needed which has a high level of security due to the use of the network intended to control and monitor devices in the house in real time.

2. THEORY

2.1 Internet of Things

The Internet of Things (IoT) is a concept that allows physical objects to be connected to the Internet for communication, data exchange, and remote access. This concept allows these objects to automatically and intelligently interact with their environment and users without human intervention(Radouan Ait Mouha 2021).

The concept of IoT involves using connected sensors, devices and network technology in a single system. These sensors can monitor, measure, and send data about the state of the environment and objects to the network. The system processes and analyzes this data to provide useful information to the user. The IoT concept allows internet-connected devices to interact with each other through a cloud-connected application or platform. Users can remotely access and control these objects through electronic devices such as smartphones and laptops (Radouan Ait Mouha 2021).

2.2 Module Relay

A relay module is a relay that is mounted on a board with other components to provide isolation and protection. This makes it easier to use in a variety of applications. The use of relay module devices offers a simple and convenient way to control electrical equipment systems remotely (Nizetic et al. 2020).

2.3 ESP32

ESP32 is an integrated microcontroller (System on Chip/SoC) designed for the Internet of Things (IoT) needs. This microcontroller is low-cost and comes with integrated Wi-Fi and Bluetooth. ESP32 is a development of ESP8266 with more exclusive features and higher performance. ESP32 has two computing processors: one is used to manage Wi-Fi and

Bluetooth networks, and another is used to run applications (Caraveo-Cacep, Vázquez-Medina, and Hernández Zavala 2023).

3. METHOD

3.1 Modelling System

Modelling This is done to make it easy in system development. Modelling system, which will make covers, architecture, diagram flow, use case, diagram, activity diagram, planning device hard and design application interface (Balsamo, Mamprin, and Marzolla 2004).

3.1.1 Architecture System

Architecture system describes process for describe physique from system to be built. Home-based light control system architecture loT can be seen in Figure 1.

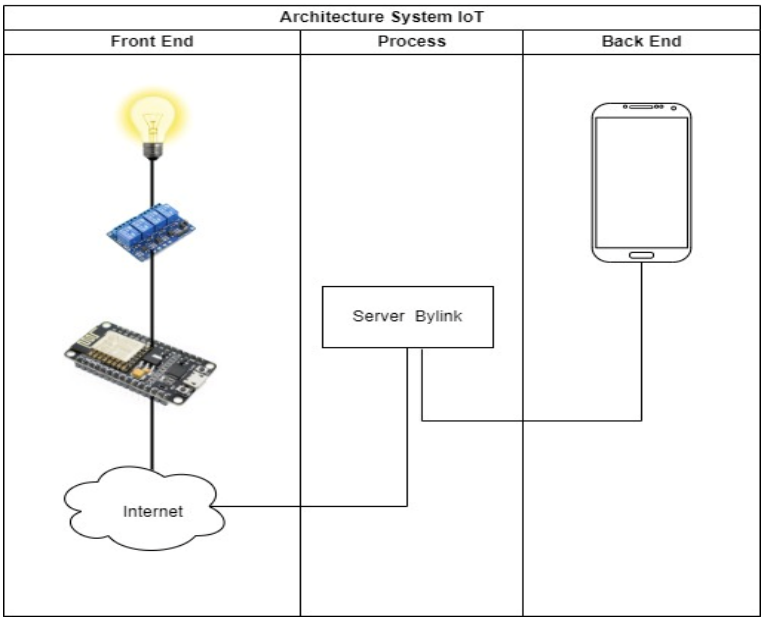


Figure 1. Architecture System

Figure 1 explains that the second device, device smart home and mobile devices are connected using the server. Web applications send the order to servers, and from servers, send an order to the smart home.

3.1.2 Use Case Diagram

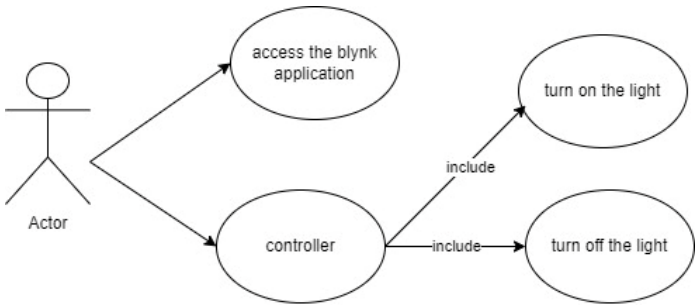


Figure 2. Use Case Diagram

Figure 2 is the activity, whole Which happens the moment user controls the lights through the Blynk application. Activity in use the case diagram starts when the user first accesses the Blynk

application formerly. Then the user enters the main menu and runs the application with a choice control light. For the status light, the user can see the condition/state of the lamp on the button. Light control options, user can choose the control light, turn on the light and turn off the light based on the location of the house lights that have been adjusted to the buttons in the main menu application Blynk. The system ends after the user exits the application on the smartphone.

3.1.3 Activity Diagram

Activity diagrams are used to describe the flow of how the system starts, does, and ends processing the something Work. This activity will be divided into several categories of activities according to the activity the user can do with the application. Following This will explain the activity diagram that will be applied to IoT Implementation (Internet of Things) On Smart-home Design Using ESP32. Activity diagrams can be seen in Figure 3.

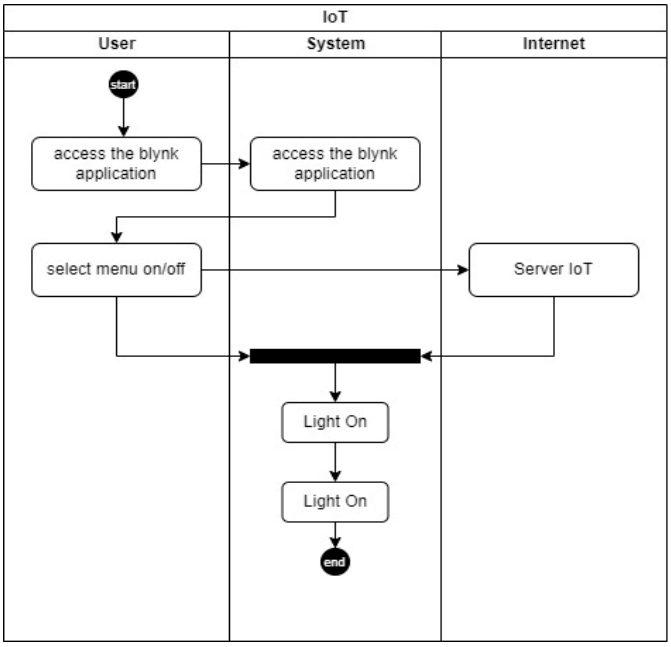


Figure 3. Activities Diagram

3.1.4 Planning Module Relay

Module Relays is a Suite with a number of Relays connected into one and accompanied by components for protection from electricity. The objective of the merger from a number of Relays so that drafting tools more easily be done using relays which separate Structure modules, Relay showed in Figure 4.

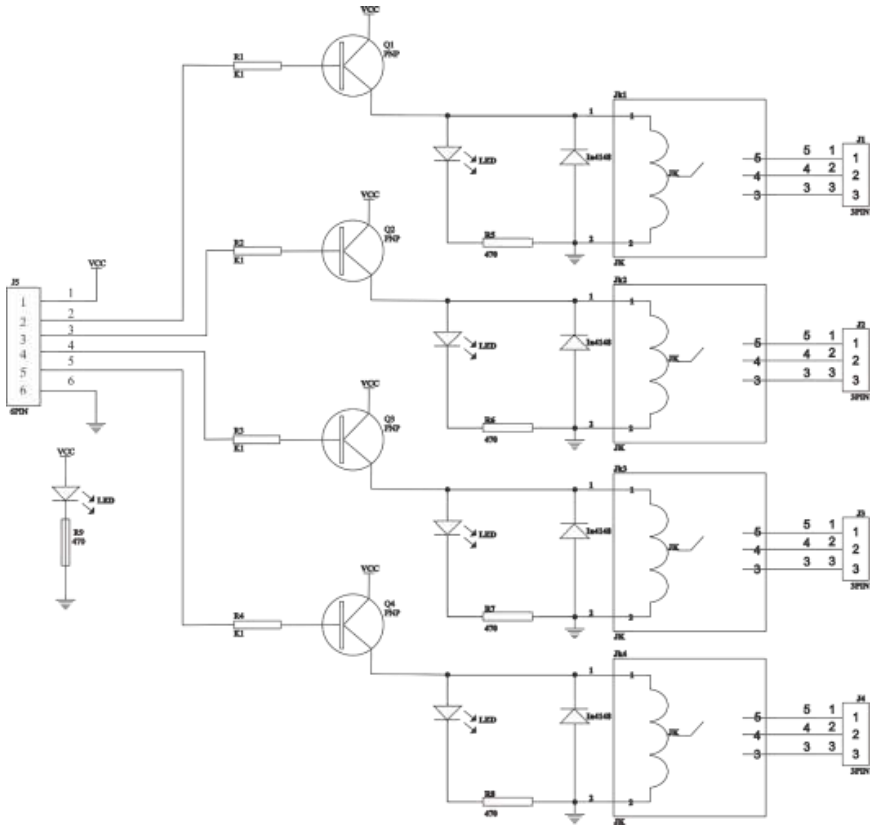


Figure 4. Network Module Relay 4 Channel

3.1.4 Planning ESP32 by Module Relay

Control of on/off light can be done from a distance Far with access to the internet. So, the relay circuit will be connected to ESP32 on predefined pins. The relay will work when it gets input logic high from ESP32. For Suite relays, the controller light can be seen in Figure 5.

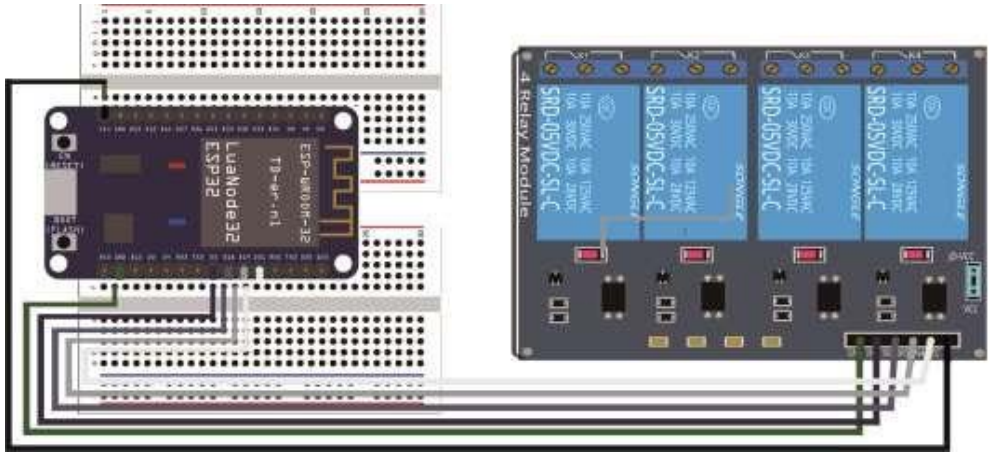


Figure 5 Design ESP32 with Module Relays

4. RESULTS AND DISCUSSION

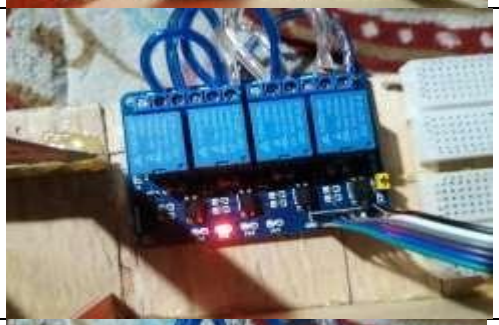
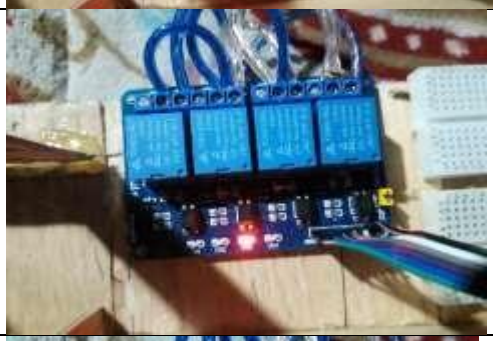
4.1 Testing

In this study, several tests were carried out to find out how far the capabilities of the system were made. Testing is carried out for each component of the system so that the output of each series of features can be known as a whole so that you can understand that the system is

functioning correctly. Testing is carried out by testing each function of the part or subsystem as a whole.

4.1.1 Testing Module Relay

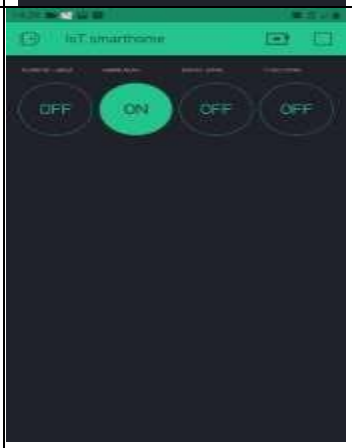
Module relays function as switch electronic, which is controlled by device ESP32. Module relays are an intermediary between electronic equipment connected with home electricity and use high voltage with the ESP32 microcontroller device that uses Power 5VDC. Testing This is done on the module relays with do order from ESP32, look at the light's indicator on module relays.

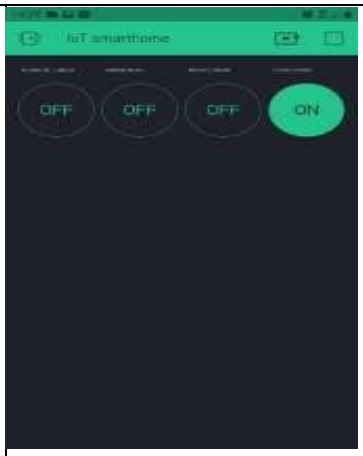
No	Relay	Response	Description
1	Relay 1		Works good
2	Relay 2		Works good
3	Relay 3		Works good
4	Relay 4		Works good

The test results above show that the relay module circuit is functioning correctly; after the program is tested and run, the relay responds to the commands given by ESP32.

4.1.2 Test Tool Whole

After testing the parts, the next test is done regularly whole. Trying this is a merger of fundamental components to be one. After that, testing is done on miniatures home, which has been made before and uses Wi-Fi with the internet stable. A representation of the house is shown in the table below.

No	Button Application	Response Tool	Descriptionn
1			It works Good
2			
3			it works Good

4			It works Good

4.1.3 Discussion

After testing the entire system on the implementation concept Internet of Things, time This applied to A miniature House And can in control through the Internet. In matter, This Which become point focuses lies in the IoT technology itself, namely internet usage technology applied to a miniature house to control the lights House. Based on the tests that have been done, it can be concluded that the test is by what is expected with the achievement – achievement as follows:

1. Smart-home can be controlled via the internet network, and control can be done with distance Which is very Far from tools connected with the network Internet.
2. Microcontroller ESP32 can use as Iot.
3. Smart-home can use a manual switch when the homeowner is present indoors.
4. Help homeowners turn the lights on and off when No is in House.

From the test results above, it can be seen that this tool requires a stable internet network, and if the internet network is unstable, you can cause the connection from application to device to be disturbed.

5. CONCLUSIONS AND SUGGESTIONS

Human beings create and develop Internet of Things technology to facilitate every work and business in various aspects of life. To make this tool, an ESP32 device is needed as an intermediary tool to connect the device to the internet network so that the tool can be connected to an Android smartphone. This study built the system using a microcontroller that works with relays. In this system, the relay acts as a switch to turn off and turn on electrical devices. Actions to turn off and turn on electrical equipment can be done remotely. The resulting tool is an Android-based lamp controller using ESP32 technology and can utilize Android smartphones to control lights.

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