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Article

Designing Smart Home Prototype Using IoT Based ESP32 Microcontroller and Telegram

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A B S T R A C T

Smart home is a combination of internet of things (IoT). The controlled use of a smart home using telegram functions to provide better comfort, provide efficiency in activities and save on electrical energy use. That way, there will be no more forgetting to turn on the AC or turning on or off the lights, watering house plants and forgetting to lock the door because by using a Smart home device at home or in an office building, electrical equipment is able to work automatically according to the user's needs. The aim of creating this smart home is to provide better comfort, make it easier to control home electronic devices because with the smart home system home electronic equipment can be controlled remotely or remotely so that activities become more efficient. The development model used in this research is design to look for research that is similar to the tools that will be used then analysis to study things related to the research after that design to make a miniature room as clear as possible and implementation aims to examine and find out each whether each system is functioning as desired or whether an error has occurred. Based on the results of system testing, it can be concluded that the tool can work as expected.

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I. INTRODUCTION

Technological developments are currently very rapid, as evidenced by the discovery of increasingly sophisticated tools that make it easier for humans to carry out daily activities, technological developments can be felt in the environment around us. However, the crime rate in Indonesia is still quite high [1]. One way is to create a smart home.

Smart from the meaning of the word Smart while Home from the word Home if combined into a smart home, Smart home or smart home is defined as a place to live that does not only get comfort in it, one of the smart home facilities is information technology that can respond to the needs of residents of the house, work with relying on efficiency, device automation, convenience, security, savings, and entertainment that can be obtained through technology management from inside the house and connections to the outside world that can be controlled by homeowners remotely. At this time Smart Home allows us to be able to control devices in the house anywhere and anytime by using the Android application [2].

Smart home is a combination of internet of things (IoT), software and cloud technology that provides services to users to make their homes comfortable and safe. By using a smart home system, there is no longer any need to forget to turn off the air conditioner, turn on or off the lights, forget to lock the door or lose the key and no longer need to water the plants, because with the smart home system the equipment can operate automatically according to the user's needs or controlled from inside the house or outside the house. From the various problems that have been explained, then the system created can propose solutions by designing and build tools that can monitor in real time and can be accessed remotely [3]. In the modern industrial world, equipment can be designed to provide information about conditions from one device to another via the internet. With this system, we can easily monitor and control the equipment used [4].

Smart home based on ESP32 microcontroller via Telegram messenger is a prototype for opening and closing doors, turning the lights on and off, as well as control the situation at home. This smart home controlled via telegram messages either on smartphone, laptop, tablet or computer The Telegram application has been installed to make it easier home users control the state of the home from remotely, anytime, and anywhere. Smart House It was developed with the Java programming language C/C++ via Arduino Integrated Development Environment (IDE) and telegram data processing using telegram BOT [5] .

So that smart home devices can connect to smartphones, an application is needed that can connect to the device, namely using an application called Telegram. Telegram provides two forms of API (Application Programming Interface). The first API is an IM (Instant Messaging) client that anyone can use to become an instant messenger. This means that anyone who wants to develop their own version of Telegram doesn't have to start from scratch. The second type of API allows anyone to create a bot that will respond to all its users if they send command messages that the bot receives. This means that we can set the Telegram bot according to what we want, provided that this bot service can only be used by users who use the Telegram application [6].

Microcontroller is a controller whose components are very common in modern electronic systems at this time of course [7], its use is very wide in our lives today such as in offices, homes, schools and others, microcontrollers are widely used in a large number of electronic systems such as the following car system management systems, computer keyboards, electronic measuring instruments, televisions, radios, refrigerators, microwave ovens, printers, scanners and many more of course we can use microcontrollers for various applications, for example for controllers, industrial automation, data acquisition, telecommunications and many more [8]. others, the benefits of using this microcontroller at an affordable price can be programmed repeatedly and can be programmed according to what we want [9].

How is the performance of esp32 in processing the manufacture of smart homes for someone to

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use to make things easier, as well as the implementation of the classification results into android [10]. Generally, the scope of information about smart home is very broad [11], therefore it is necessary to make boundaries so that the author can carry out clearly in accordance with the author's goals: This design uses various sensors, LDR sensors for yard lights, DHT11 sensors for air conditioners, Capacitive Soil Moisture sensors for water pumps, RFID (radio frequency identification) for smart locks and for lights in the house using a smartphone. The smartphone application used to remote is Telegram. Smart door locks use RFID, this is a technology used to collect data or identification using a barcode or magnetic card [12].

II. LITERATURES REVIEW

Based on research previously conducted by Peby Wahyu Purnawan dan Yuni Rosita (2019) "Design and Build a Smart Home System Using NodeMCU Esp8266 Based on Telegram Communication messenger". Result of This research aims to maximize surveillance, monitoring and security remotely using smartphones [13].

In a journal entitled "Control Light And Air Conditioner With Telegram" Which investigated by Zulhipni Reno Saputra Elsi, et al (2021). Research result it can be concluded to control the lights and air conditioning at a distance to carry out activities more efficiently and if you forget to turn them off, you can turn them off outside the house [14].

III. FRAMEWORK

This design uses an ESP32 microcontroller device which already has a WiFi module in it. A framework is a flow that is used as a thinking scheme to strengthen the indicators behind the creation of this matter application. In this framework the explanation will be formed in a diagram.

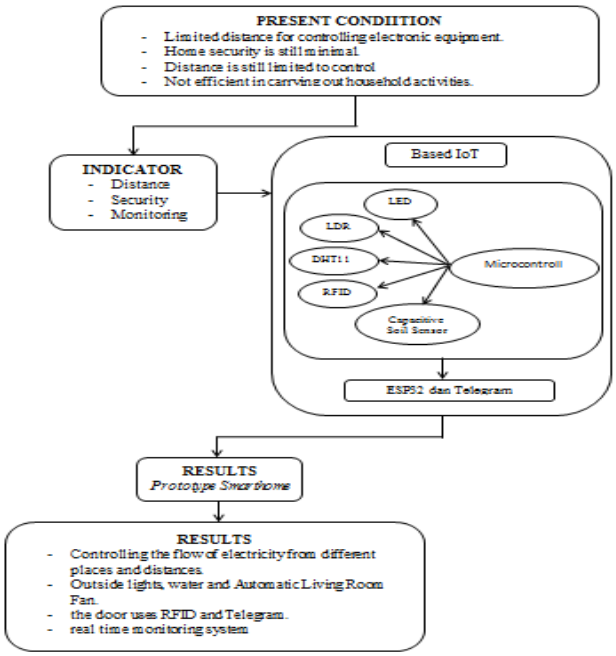

Figure 1. Thought Diagrams

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The following is an explanation of the framework of thought, the indicators contain distance, security and monitoring systems, which include this system where this tool can function outside the home, this tool has a security system and this tool has a monitoring system which can notify the tool if it operates automatically.

The IoT based section here explains the microcontroller connected to LED, LDR sensors, DHT11 sensors, RFID and ground sensors with the aim of these devices being able to be controlled using telegram.

This will produce a smart home prototype where home appliances can work automatically and can be controlled remotely.

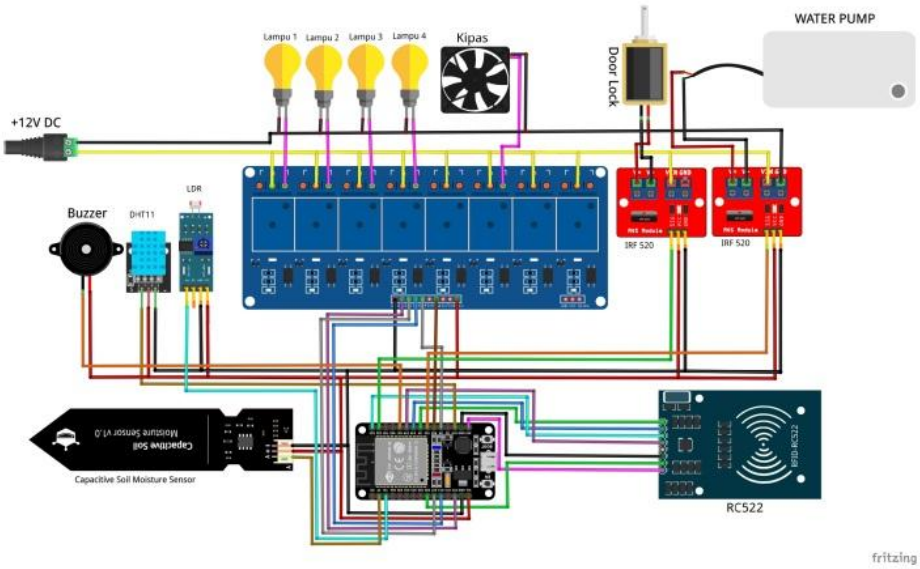

Figure 2. Schematic Smart home

The following is a smart home system wiring diagram.

Table 1. Wiring Smart Home

Pin on components	Connect to
DHT 11	ESP 32 pin D15
Relay pin 4	ESP 32 pin D4
Relay pin 6	ESP 32 pin RX2
IFR 520 Water Pump	ESP 32 pin TX2
SDA	ESP 32 pin D5
SCK	ESP 32 pin D18
MISO	ESP 32 pin D19
Buzzer	ESP 32 pin D21
IFR 520 Door Lock	ESP 32 pin D22
MOSI	ESP 32 pin D23
Relay pin 1	ESP 32 pin D13
Relay pin 3	ESP 32 pin D14
Relay pin 2	ESP 32 pin D27
RST	ESP 32 pin D28
LDR	ESP 32 pin VN
Capacitive Soil Moisture	ESP 32 pin VP

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IV. METHODS

Some of the methods used in this research are:

a. Planning

At this stage, we try to find research that is similar to the tools that will be used to make this tool. The author tries to find out how this system works, what components are needed, how much it will cost.

b. Analysis

At the analysis stage, start studying things related to research, such as what tools will be used and how the tools work via the internet, books, people who are experts in the field. In this way, get input, descriptions and ways to carry out this research

c. Design

At the design stage, start making a miniature room as clear as possible so that users can understand the function of this tool.

d. Implementation

At the implementation stage, starting to implement this tool, the aim is to check and find out whether each system is working as desired or whether an error has occurred. If an error occurs, it is analyzed and corrected.

V. RESULT

Figure 4. Appearance of the tools used

In figure 4 is the display of the tool interface in designing an internet of things-based home automation system with telegram such as a display of the series of tools used in the design.

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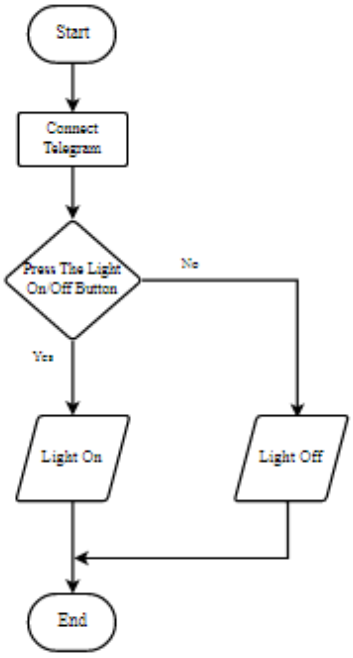

Figure 5. Flowchart of Light Control Using Telegram

In Figure 5 above, the design of the light control system flow using the Telegram application is explained. The system will run using Telegram which is connected to the smartphone using the internet network.

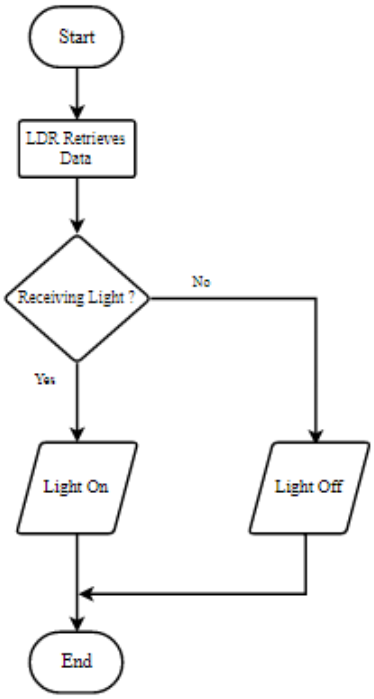

Figure 6. Light Control Flowchart Light Sensors

In Figure 6 above, the design of the flow of the light control system using an LDR sensor is explained, where the system will run automatically, if the room is dark then the lights will turn on and if the room is bright then the lights will turn off.

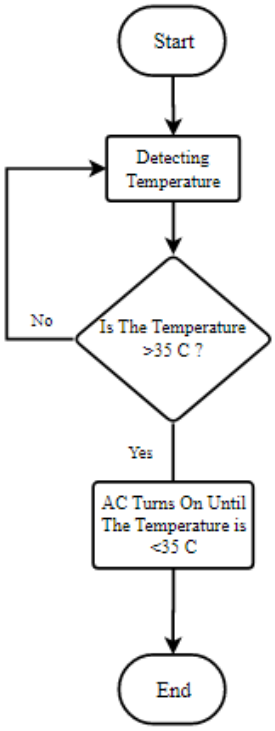

Figure 7. Flowchart Automatic Air Conditioning

In Figure 7 above, the flow design of the air conditioning system is explained, where the air conditioner will automatically turn on if the room temperature is more than 35°C and will turn off automatically if the temperature is less than 35°C.

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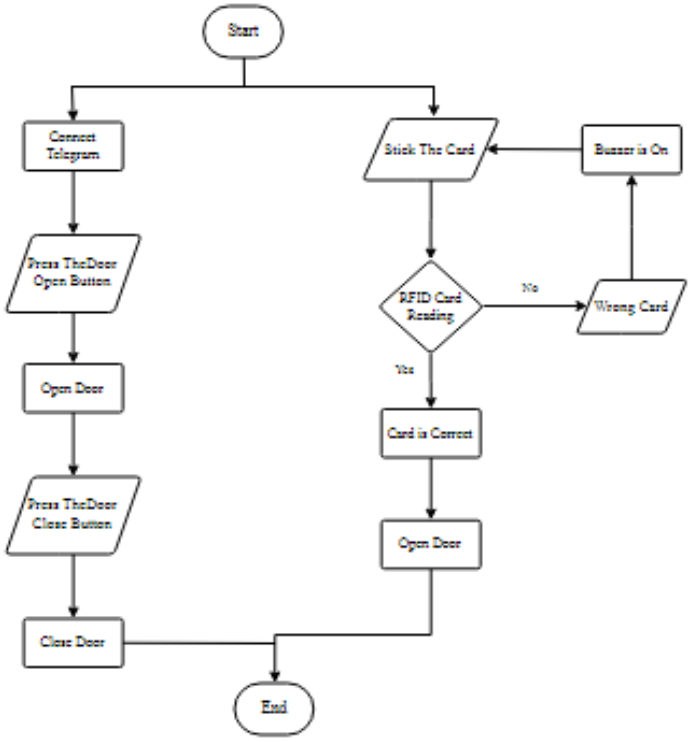

Figure 8. Flowchart Home Security

In Figure 8 above, the home security system flow design is explained using two working systems, the first uses telegram which is connected to a smartphone using a network. and secondly using RFID.

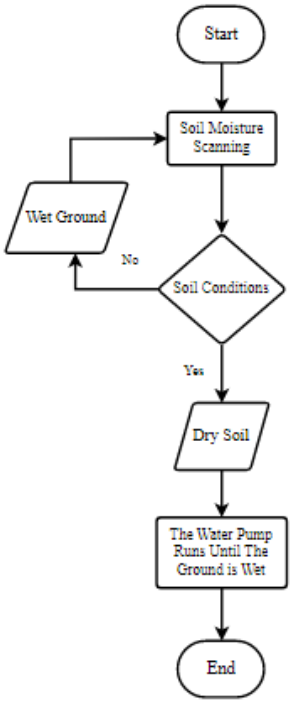

Figure 9. Flowchart Water Pump

In Figure 9 above, the flow design of the automatic water pump system is explained, where the pump will turn on when the ground is dry and will turn off if the ground is wet.

Based on the results from Figures 5 to 9, it explains house lights that are controlled remotely using telegrams, house lights that operate automatically using LDR sensors, water pumps that can flow automatically using soil sensors, where if the soil is dry it will flow automatically. and if the ground is wet it will stop automatically. automatic, AC, where if the room temperature is more than 35°C then the AC will automatically turn on and if the temperature is less than 35°C then the AC will turn off automatically, door security uses two systems, the first uses RFID, which is used to operate it. using a card and the second using a telegram which can be controlled remotely.

The way to run this tool is to provide a voltage of 5 Volts to the ESP32, then the ESP32 will automatically look for the SSID that has been registered. If you are connected to the internet you will get messages from Telegram and if you

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are not connected to the internet you will not get messages from Telegram and the system will not function. Can be run using Telegram.

A system connected to the internet means the tool can be run remotely or remotely, the tool can respond to commands depending on the internet network used, if the internet is unstable then the tool's response is a bit slow and if the internet network is stable then the tool will respond quickly when commanded.

This system also has a real time monitoring system, if the AC, water pump and yard lights are on then the bot will give a message and if it is off the bot will give a message again, and also for smart doors if the door is tried to be opened using an RFID card that has not been registered or is If you have registered, the bot will give you a message.

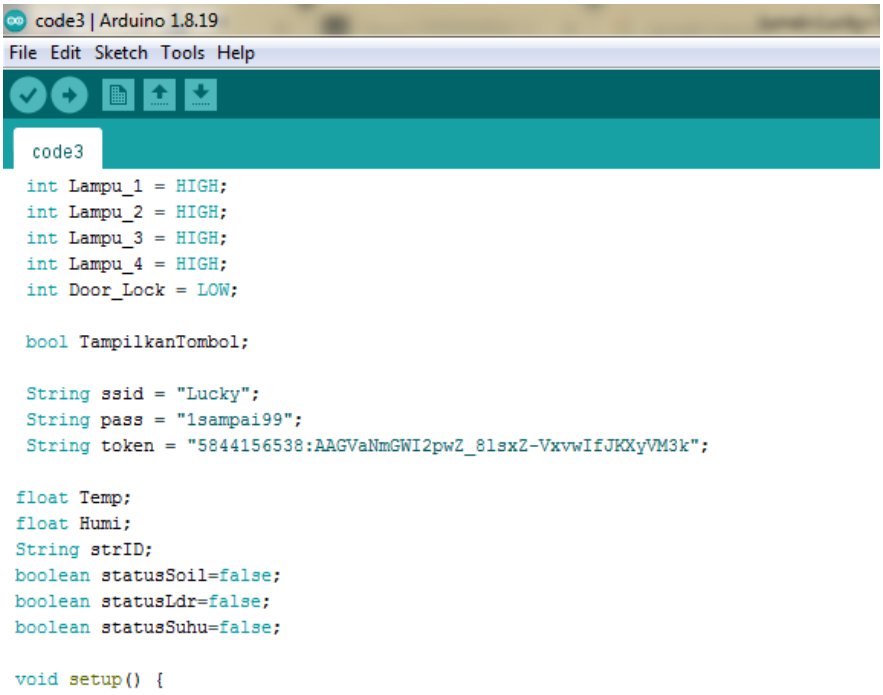

Figure 10. Display of how to connect a microcontroller to the internet and Telegram

In picture 10 there is SSID and PASS, enter the SSID of the wifi at home and PASS is the password for the wifi at home.

To connect with Telegram we must have a Telegram token bot, a bot is a third party that can run in Telegram. Users can send messages, commands, and requests inline. We can control bots using HTTPS to API telegram. [15]

To get bot token first open telegram, then search "@BotFather" to create and get the bot token. Then give the new bot any name, always remember to add "Bot" at the end of the name. After that the Bot has been created and completed get bot tokens as follows "5844156538:AAGVaNmGWI2pwZ_8lsxZ-VxvwIfJKXyVM3k" which will be used to connect the code The program on the Arduino software that has been created is as shown in Figure 11 [16].

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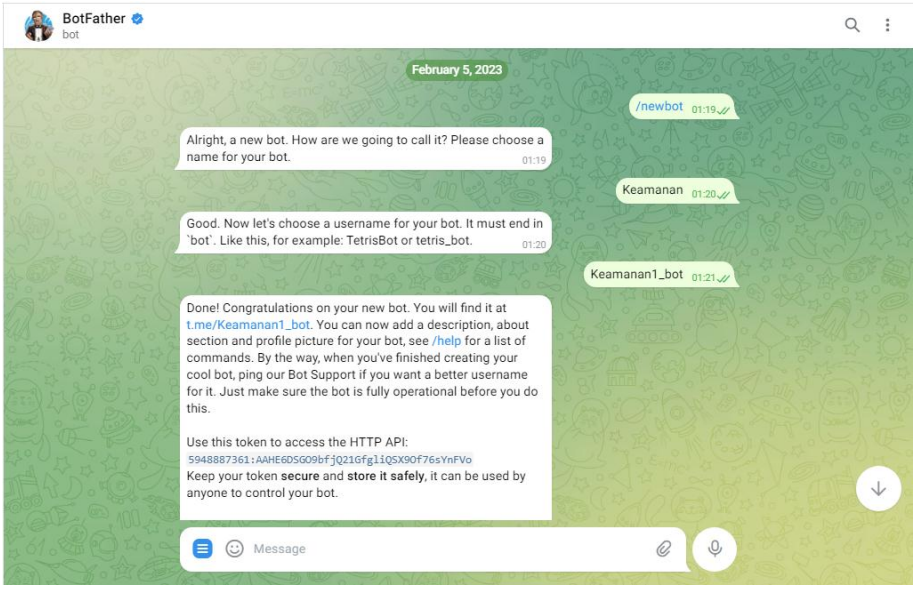

Figure 11. Display of how to create a bot token

Figure 12. Display of the program when starting on Telegram

Figure 13. Program Running Commands on Telegram

Figures 12 and 13 explain the display in the Telegram application where when running the tool we can choose which tool to run on the bottom button and the condition of the tool is also displayed before use.

VI. CONCLUSION

Smart home prototype design can be useful as a tool that will help people carry out daily activities, because this tool can control lights using telegrams and LDR sensors, this tool can control security systems using telegrams and RFID cards, this tool can control air conditioning using temperature sensor and this tool can water using a ground sensor using an esp32 microcontroller connected to the internet, this control device can be connected to a smartphone so that it can directly relate to conditions in the house. So it can be concluded that the tool that has been created adds comfort, safety and effectiveness.

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BIOGRAPHY

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