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CONTROL SMARTHOME DISTANCE CONTROL BASED FUZZY LOGIC

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Abstract

SmartHome (smart home) is a part of IoT where all everyday objects or furniture that are familiar with people's lives are "smarted" due to the integration of technology in the form of a versatile microcontroller. In terms of Smart Home, IoT will be present in the form of items that are often found in ordinary people's homes. This research was conducted to develop a system that can assist in performing operations on electronic equipment used daily at home with a smartphone as its control. This research includes the stages of the prototype and system development method that will be developed using the Arduino Uno ATMEGA328 microcontroller hardware, NodeMCU (ESP8266), Bluetooth as the main control system connected to the internet network using a wireless router and as software for control of the system designed using Android-based application, namely the MIT Application Inventor open source application. In conducting experiments to show that this control system is able to work properly as expected so that users can turn off and on electronic devices such as lights, fans and others.

Keywords: Smarthome, Fuzzy Logic, Investor Distance Control

1. Introduction

In the era of the development of analog technology, electrical devices are generally controlled manually by the user. Automation Electronic devices as a system make it easier for humans to do things routine activities of daily living. System automation discussed in this study is a system related to home control activities in a 'Smart Home' technology.The rapid development of digital technology has contributed to the development of computer technology. Today, many electrical devices work in an integrated manner with computer systems. This of course will greatly assist human work in operating these electrical devices. One of the research that is currently being developed is regarding the Smart Home Auto Control System. Smart Home Automatic Control System Device is a device that has a very sophisticated system for controlling lights and other electronic equipment, multimedia devices to turn on and off only with a smartphone in the hand and several other functions.

A home automation system that uses WI-FI technology has three main components; a web server that displays the system, monitors the user's home and hardware interface modules, the alarm input PCB, and the output actuator PCB, which provides the appropriate interface for the sensors and actuators of the home automation system. This system is better from a scalability and flexibility point of view than commercially available home automation systems. Users can use the same technology to log into web-based application servers. If the server is connected to the internet, users can access web server-based applications via the internet using a compatible web browser (Ahmed, 2012).

Smart Home is a combined application of technology and services devoted to the home environment with certain functions that aim to improve the safety, efficiency and comfort of its residents. A smart home system usually consists of monitoring devices, control devices and automatically there are several devices that can be accessed using a computer. (Tri Fajar, 2009).

Arduino according to (Kadir, 2013) Arduino uno is a product labeled Arduino which is actually an electronic board containing an ATMega328 microcontroller (a functional chip that acts like a computer). This device can be used to realize electronic circuits from simple to complex.

2. Materials and Methods

2.1. Arduino Uno and NodeMCU (ESP8266)

Arduino is a microcontroller board using the ATmega 328. The Arduino Uno board consists of 14 digital input/output pins (6 can be used as PWM outputs), 6 analog input pins, a 16 MHz ceramic resonator, a USB port, a *power jack*, a *ICSP header*, and a button *reset*. Arduino Uno uses an ATmega16U2 programmed as a USB to serial converter, has an operating power of 5V and a power input of 7-12V with a power limit of 6-20V.

ESP8266 is a wifi module that functions as an additional device for microcontrollers such as Arduino so that it can connect directly to wifi and make TCP/IP connections. This module requires around 3.3v of power and has three wifi modes, namely Station, Access Point and Both. This module is also equipped with a processor, memory and GPIO where the number of pins depends on the type of ESP8266 that we use. So that this module can stand alone without using any microcontroller because it already has equipment like a microcontroller.

2.2. Bluetooth 4.0 and Relay

Bluetooth 4.0 is a technologyBluetooth the latest version with the main advantages of energy saving officially adopted by BluetoothSpecial Interest Group(GIS) in year2010.TechnologywirelessThis new device can be used in various devices with low energy consumption, in contrast to the previous bluetooth specifications. The adoption of Bluetooth 4.0 devices will enable improvements that include minimum energy usage levels, average idle (static) mode power consumption, and the ability to function for years on standard coin-cell batteries.

Relay Module is a very practical module to use as the main automatic switch for 5 channel projects with microcontroller based electronic circuits. This module turns on/off other electronic devices powered by AC 240VAC mains or DC high voltage devices (up to 28VDC), such as High Power DC motors. It has a maximum current of 7 Ampere for each channel.

2.3. Voice Recognition and DC Pump

Voice recognition (speaker recognition) is a process to recognize someone by recognizing the voice of that person. Automatic speaker recognition is the use of a machine to recognize a person from a spoken phrase. This system can function in two modes, namely recognizing a special person or proving the identity claimed by someone.

The pump uses mechanical energy to draw liquid in and dump it all over the exit by pressing it. Pump energy sources mainly include wind power, manual operation, electricity & machinery.

2.4. Incandescent LED and Fan

Incandescent lamps are artificial light sources that are produced by passing an electric current through a filament which then heats up and produces light. The glass that envelops the hot filament prevents air from coming into contact with it so that the filament will not be directly damaged by oxidation.

Fans are used to generate wind. General function is for air conditioning, air freshener, ventilation, dryer (Generally using heat-generating components).

3. Results and Discussion

The type of research used in this case is experimental research, namely research conducted to find out and find out how a certain variable affects other variables in a controlled condition sequentially and systematically. As for solving the problem, it is donesome research methods are as follows:

Figure 1. Research Method

Framework is a basic conceptual structure that is used to solve or handle a complex problem. The work procedures carried out in the implementation of this research are as follows:

1. Preparation phase. Research activities are focused on literature studies, enrichment of research content and context, and field surveys. From this stage, initial data is obtained, namely understanding, the data used.
2. Design stage. At this stage, the system design includes:
   a. Application of the method.
   b. Analysis of test data and methods used.
3. Implementation and Testing Phase. This stage is intended as a step of testing the performance of the method.
4. Completion stage. The stage where records of activities and research results are documented.

In this chapter we will discuss about testing based on system planning that is made by the program, testing is displayed to the system. and this test is carried out to find out whether the prototype can function properly as desired. From the test, data and evidence will be obtained that the system that has been made can work well.

3.1. Analysis of the value of the system

Analysis of the value of this system to determine the performance of each component that has been assembled according to specifications. The results of this test can be expected to be able to produce data that can be used to make the original and to find out whether this prototype can work in accordance with what has been made, the tests carried out are on the power supply, ESP8266, Relay, BT 0.4, power testing supply, ESP32, Relay, and BT 0.4 will be shown on**Table 1.**

Table 1. Ptest power supply, ESP8266, Relay, and BT 4.0

No	Measurement on	Instrumen	V-out (Volt)	V-out Rated (Volt)	Voltage difference	Average (%)
1	Power supply	1	12	11.6	0.4	2.5%
		2	12	11.7	0.3	
		3	12	11.7	0.3	
		4	12	11.5	0.5	
		5	12	11.8	0.2	
		6	12	11.7	0.3	
		7	12	11.7	0.3	
		8	12	11.7	0.3	

		9	12	11.6	0.4	
		10	12	11.7	0.3	
		1	3.3	3.3	0	
		2	3.3	3.3	0	
		3	3.3	3.3	0	
		4	3.3	3.3	0	
2	ESP8266	5	3.3	3.3	0	1%
		6	3.3	3.3	0	
		7	3.3	3.3	0	
		8	3.3	3.3	0	
		9	3.3	3.3	0	
		10	3.3	3.3	0	
3	Blueto oth	1	3.3	3.3	0	1%
		2	3.3	3.3	0	
		3	3.3	3.3	0	
		4	3.3	3.3	0	
		5	3.3	3.3	0	
		6	3.3	3.3	0	
		7	3.3	3.3	0	
		8	3.3	3.3	0	
		9	3.3	3.3	0	
		10	3.3	3.3	0	
4	Relay	1	5	5	0	1%
		2	5	5	0	
		3	5	5	0	
		4	5	5	0	
		5	5	5	0	
		6	5	5	0	
		7	5	5	0	
		8	5	5	0	
		9	5	5	0	
		10	5	5	0	

Testing 12V Power Supply, ESP8266, Bluetooth and Relay. The Power Supply on the IoT-Based Smart Home system prototype with a smartphone using this NodeMCU uses a 12V power supply that allows the circuit to get a power source under any circumstances. Measurements on the power supply were carried out 10 times which can be seen in Table 3.1. The power supply test shows the figure of 11.7 volts. The results obtained show that the voltage measured at the power supply is different from the actual test. Unlike the ESP8266, Bluetooth and Relay show the same results as they actually are.As an example to find out the size of the test, the author takes a sample from the test in Table 4.1 which produces the following calculations:

$\frac{0,3}{12}$ X 100% = X 100% = = 2.5% On Power Supply……..…….. (1)

$\frac{3,3}{3,3}$ X 100% = x 100% = 1% On ESP8266…… (2)

$\frac{5}{5}X100\%$ =X 100% = x 100% = 1% Bluetooth 4.0……. (3)

$\frac{5}{5}$ X 100% = x 100% = 1% On Relay …… (4)

Testing the 5 channel 5V relay module will be shown in table 2.

Table 2. Test Relay

Relay	Relay Condition	V-in (Volts)	Power Usage (Watt)	Note:
1	Life	5	5	Light on
	Die	0	0	Lights off
2	Life	5	5	Light on
	Die	0	0	Lights off
3	Life	5	5	Light on
	Die	0	0	Lights off
4	Life	5	5	Fan on
	Die	0	0	Fan off
5	Life	5	5	Pump on
	Die	0	0	Pump off

Relay testing is carried out to determine the voltage and power used in the prototype of the IoT-Based Smart Home system with smartphones using NodeMCU. 3 Relays are used to turn on the lights while 1 Relay is used to turn on the fan and 1 Relay to turn on the Pump.

3.2. System Prototype Testing

System prototype testing is carried out to determine whether or not the system that has been designed works well. Starting from*NodeMCU*, Bluetooth, Relay, and applications on Smartphones. To analyze the value of the system, we must find out whether the prototype that has been designed can work well, namely by analyzing the flow of electricity used.

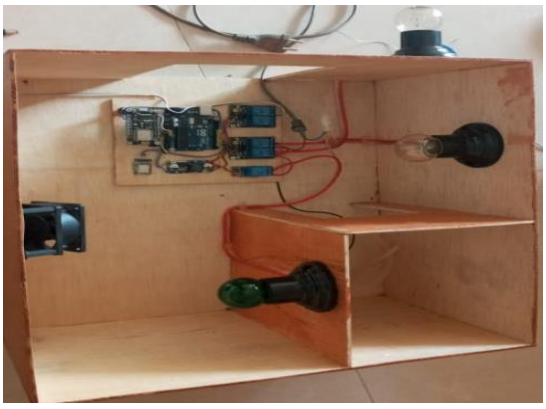
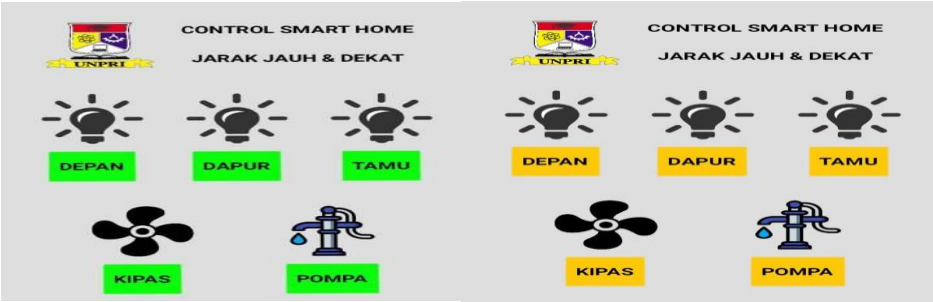


Figure 2. Smarthome prototype display

3.3. Communication Test

The communication test carried out is an application that has been provided on the Android smartphone platform with hardware using the internet network.



(a). Display when not connected (b). Display when connected
Figure 3. Test results on several electronic devices

3.4. Full Test

In control testing, which is to ensure that the display on the smartphone application, namely the light, fan and pump buttons, is in accordance with the designed functions, it will be shown in Table 3.

Table 3. Full Test

No	Key Input	Button Output	Button Status	Note:
1	Front lamp	Light On	On	Corresponding
		Lights off	Off	Corresponding
2	Guest Lamp	Light On	On	Corresponding
		Lights off	Off	Corresponding
3	Kitchen Lights	Light On	On	Corresponding
		Lights off	Off	Corresponding
4	Fan	Live Fan	On	Corresponding
		Fan Off	Off	Corresponding
5	Water pump	Pump Live	On	Corresponding
		Pump Off	Off	Corresponding

From the table above, we can see that the button input on the smartphone application is in accordance with the output in the prototype.

4. Conclusions

Based on the results of the design of the automatic control system the author uses ESP8266, Bluetooth, and voice recognition which functions as a liaison between the application and electronic equipment and in connecting ethernet requires an internet network so that you can use this application at any distance because it uses a wide internet network. The results obtained in the design of this system are that it can control electronic equipment automatically via a smartphone.

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