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IoT-based Smart-homes to Increase Home Selling Price

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Abstract

Smarthome is a system that has been programmed and can work with the help of a microcontroller to integrate and control a device or home appliance automatically and efficiently. The purpose of creating this technology is to facilitate energy savings, get comfort and be able to control it only with a smartphone. In the research entitled "IoT based Smart Home Automation System using Sensor Node". This stage of development will use several microcontrollers as sensor nodes. Microcontroller nodes will control such as lights, doors, fans. In this study, it used several types of sensors such as RFID, reed switch, temperature and microcontrollers that will be used by the ESP8266 MCU Node. All data from sensor readings will be sent to the Blynk server. As a data viewer and control center will use the Blynk application. This can also increase the selling price of the house to be sold by the developer.

Keywords : IoT, Smart-home, Blynk server

1 Introduction

Internet of Think (IoT), one of the most demanded word in the field of Information Technology[1]. This present real-world mechanism is being set up with brains and processing capacity so they can design themselves appropriately. Sensors appended to implanted gadgets alongside the low power remote network can encourage remotely screening and controlling the gadgets. This structures a vital part of Internet of things (IoT) network[2]. The concept of IoT is an interconnection between a controlled device and a controller that can be connected via the internet. With the massive development of IoT[3], making IoT devices will be easier. It is estimated that by 2020 there will be more than 50 million things connected to the Internet[4].

Blynk is a very popular IoT application for connecting devices to the cloud. This makes it easier for IoT to grow rapidly. In terms of controlling the light on/off remotely[5], it can be done through the Blynk application. And can monitor power usage, temperature in real time In this study will show how the combined application between Blynk and ESP8266 to create a price- and performance-efficient smart-home. The purpose of using the ESP8266 is that the platform of the microcontroller is already very popular and there is already wifi connectivity in the controller. As well as the use of ESP8266 as a control node that can be set for certain uses. NodeMCU got the data and transmitted with Wi-Fi module remotely and the devices are controlled through Blynk application[6]. This transmitted information monitor and controlled by utilizing concept of IoT[7].

The equipment that will be made on this smart-home is in the form of automatic light control. Control system for turning on the automatic fan. And there will be provided several power plugs that can be controlled using the Blynk App. As well as on the security side, NFC cards and readers will be used instead of door locks[8].

The residential layout will be used for type 36, 60 and 72. This layout is the most sold layout in Indonesia. According to BI, data on home sales in the second quarter of 2022 was observed to grow by 15.25%[9], this indicates that the growth of home purchases in Indonesia is high. This can be used by developers to implement IoT-based equipment to be able to increase the selling price of houses.

2 Method

In this section, we will explain the process of the system. We take data from the sensor in the form of temperature (°C), and UID data. Temperature and humidity data will be sent to Blynk server so that users can monitor room temperature through the application. At room temperature control automatically, the system will read the temperature data at that time and then the blynk server will determine to turn the fan on and off. In the controlling and lamp automatically, the system will use automation in the time-based Blynk app[10]-[12]. On controlling solenoid door lock will be used NFC reader to read UID data.

The system will use ESP8266 as microcontroller[13]-[15], DHT11 as temperature sensor, RC522 as NFC Reader, Relay as actuator, solenoid door lock as door locking actuator, reed switch sensor as detecting door position[16]-[18] and Blynk application as controller and display.

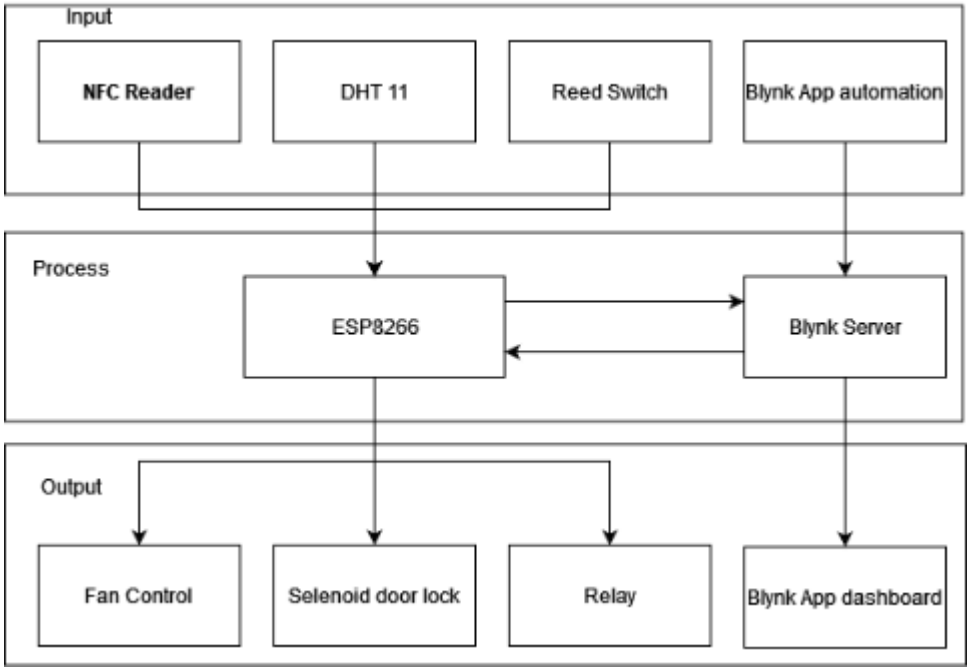

Figure 1: Block Diagram Purpose System

In figure 1, a system like the block program above will be proposed. The ESP8266 will accept input from an NFC reader, DHT 11 and a reed switch. All sensor data will be sent to the Blynk App. The Blynk app will automate based on the parameters that have been set. The results of such automation will be sent to the ESP8266 to activate the actuator.

2.1 Hardware Design on room temperature controllers and lamps

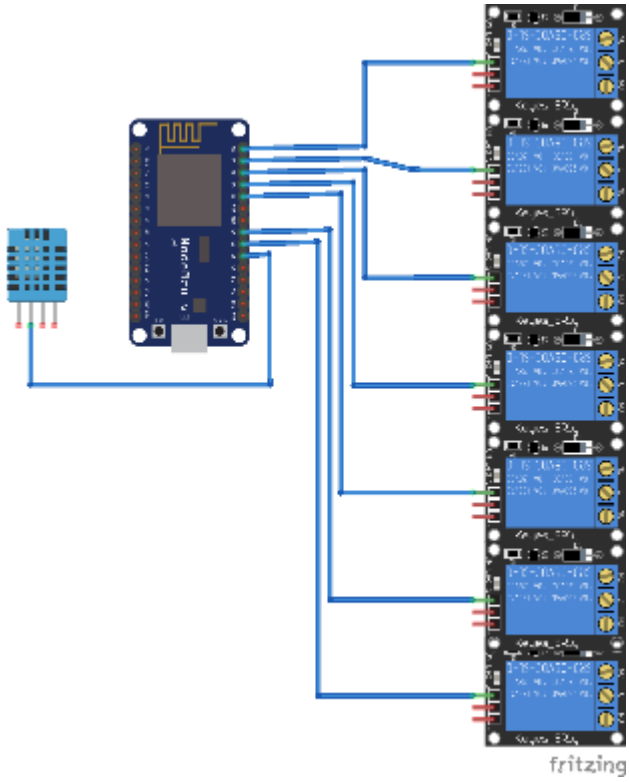

Figure 2: Power meter and relay control

In figure 2 above the DHT 11 sensor will read the temperature data[19]-[21]. If the temperature exceeds or is equal to 28°C then, the blynk server sends a command to turn on the fan using a relay that is connect to pin D6 of the ESP8266 and if the temperature has dropped to a temperature of 27°C [22] then the Blynk server will send a command to the ESP8266 to turn off the fan. In automatic light control will use the automation system of the Blynk application based on time[23]. And there are two light controls and two power plugs that can be controlled by the user through the Blynk application dashboard.

2.2 Hardware Design on door security system

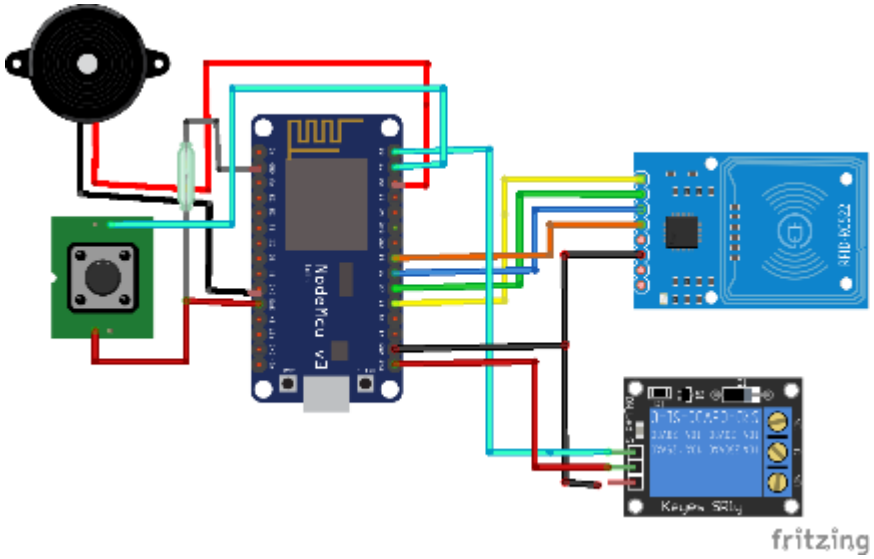

Figure 3: Connention Diagram for door security

In figure 3 above is the hardware design of the door security system. NFC RC522[24],[25] is connected to microcontroller ESP8266.UID data from the NFC card is stored in the ESP8266 internal database because blynk server can't save UID data. There is also a reed switch that is connected to pin A0 ESP8266 to detect the state of the door closed or open. There is also a push button that is used to open the door from the inside so there is no need to open the Blynk application if you want to leave the house. The relay here is connected to pin D0 on the ESP8266, the relay functions as an on / off switch on the selenoid door lock. When the door is forcibly opened, the microcontroller will send a notification to the application and will also activate the buzzer as a red flag. If the door opens according to the procedure then the buzzer will not sound and will not send a notification in the blynk app.

2.3 Blynk App

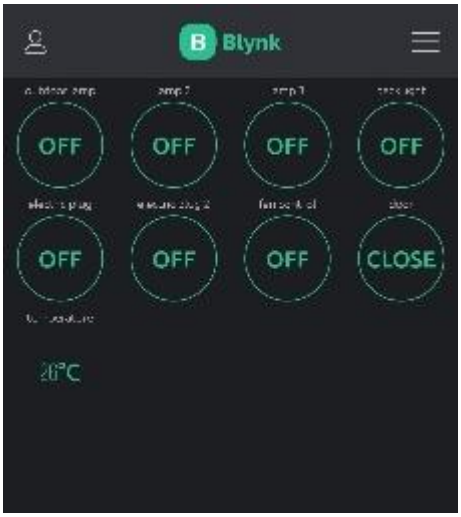

Figure 4: Blynk App Dashboard

Figure 4 above displays the dashboard of the Blynk application which can be used to display current temperature conditions and can control the actuator and can be used to open doors. In figure 5 above, automatic light control is carried out in the Blynk application, the light will turn on at 17:30 and will turn off at 05:30. While in figure 6 above will automate the fan, if the temperature is above or equal to 28 °C then the fan turns on and if at a temperature below 28°C then the fan will turn off.

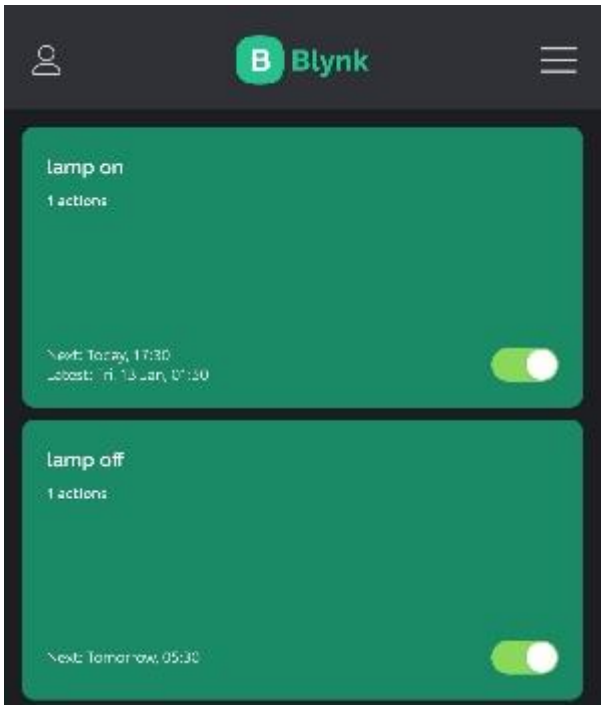

Figure 5: Automatizing Lamp By BLynk App

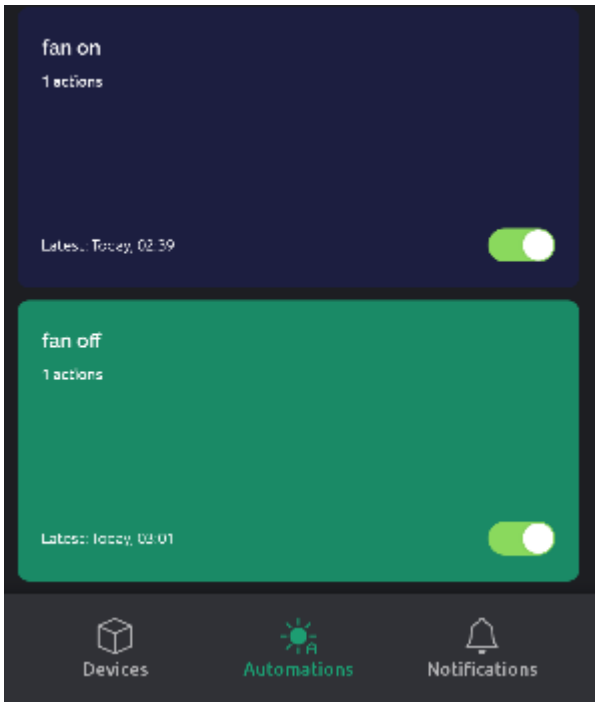

Figure 6: Automatizing Fan By Blynk App

2.4 House types and IoT needs

Table 1: Housing Type and Tool Requirements

Home Type	Door Security	Automatic Lamp (piece)	Automatic Room Temperature	Electric Plug Control(piece)	Lamp Control by App(piece)	Material Price (Rupiah)	Installation Price (Rupiah)
36	V	1	V	1	1	3.000.000	1.500.000
60	V	2	V	2	2	3.500.000	2.000.000
72	V	2	V	2	2	4.000.000	2.500.000

2.5 Experiment System

Table 2: Switch System Test

Switch on Blynk App	Microcontroller system performance
Lamp 1	Good
Lamp 2	Good
Electrical Socket 1	Good
Electrical Socket 2	Good

Table 3: Experiment on door security system

Door open method	Selenoid door lock position
Blynk application	Open positions
Push button	Open positions
Incorect UID	Closed positions
Corect UID	Open positions

Table 4: Automatic fan start test

Temperature	Fan Condition
Above or equal to 28°C	On
Below 28°C	Off

Table 5: Automatic light switch experiment

Time	Light conditions
05.30	Off
17.30	On

3 Results and Discussion

3.1 Price differences on home sales

Table 6: Price differences on home sales

Type	Price before using IoT(Rupiah)	Price after using IoT(Rupiah)
36	350 Million	360 Million
60	650 Million	665 Million
72	800 Million	820 Million

From the data from table 6 above, the IoT products made can benefit home developers from type 36 houses of 4.5 million, type 60 houses of 8.5 million, type 72 houses of 12.5 million. And for the home buyer side, which is already equipped with IoT, it will make it easier in several ways.

3.2 Result of running system

Table 7: Automatic Fan Control

No	Temperature (°C)	Application response	Fan condition
1	24	X	Off
2	25	X	Off
3	26	X	Off
4	27	X	Off
5	28	V	On
6	29	V	On
7	30	V	On

Table 8: Automatic Lamp

No	Time	Application response	Lamp condition
1	03.30	X	On
2	04.30	X	On
3	05.30	V	Off
4	14.30	X	Off
5	15.30	X	Off
6	16.30	X	Off
7	17.30	V	On

Table 9: Door Security System

No	Opening Method	Solenoid Door Response	Door Position	Blynk Notification
1	Correct UID tag	V	Open	X
2	Incorect UID tag	X	Close	X
3	Push Button	V	Open	X
4	Blynk Dashboard	V	Open	X
5	Force Opening Door	X	Close	V

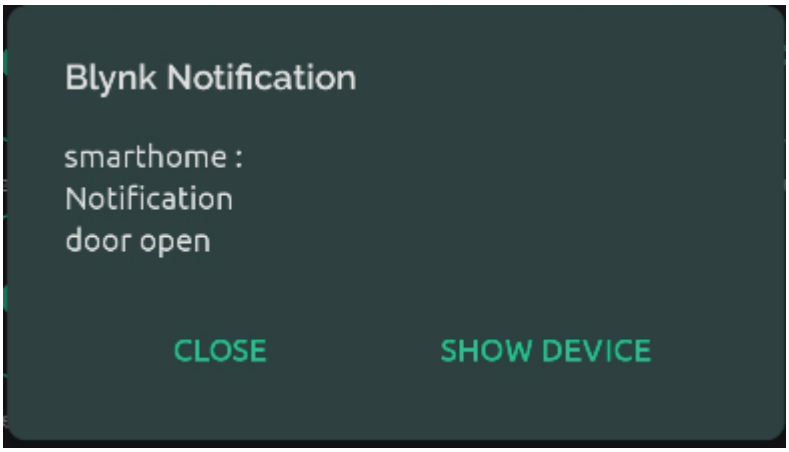

Figure 7: Screenshot of door open without permision

From figure 7 above the door does not open normally. ESP8266 will send a notification to the blynk server. The blynk server will forward to the blynk application owned by the owner. The user's phone will sound a ringtone reminding the owner if the door does not open normally.

4 Conclusion

From the results of table 9 the system has been tested and runs well on the door security system as evidenced by figure 7 if the door does not open normally then the alarm will sound and send a notification and if the door opens normally the alarm will not sound. The automatic temperature control system has run as desired at a temperature above or equal to 28 °C, the fan will turn on and at a temperature of 27 degrees the fan will turn off. In the control system the automatic light will turn on at 17.30 and will turn off at 05.30. For home developers, IoT implementation can be used to attract home buyers to be interested in buying a house that is already IoT-based. The cost of installing IoT itself ranges from 6 million to 7.5 million depending on the type of house. In this case housing developments can take advantage of this IoT installation margin with the profit of housing developers.

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