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Design and Construction of Smart House Prototype Based Internet of Things (Iot) Using Esp8266

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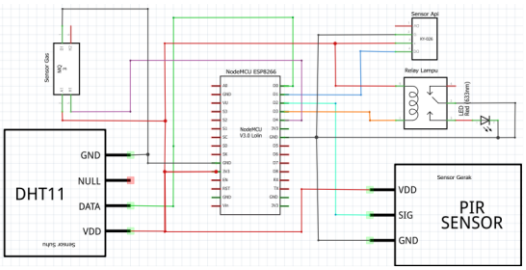
Abstract- IoT (Internet of Things) is a concept that aims to expand the benefits of continuously connected internet connectivity continuously. IoT can be used at home as a smart home system for controlling electronic equipment that can be operated by means ofinternet connection (WiFi). This IoT-based smart home system uses ESP 8266 microcontroller as hardware and blynk application as a tool controller and control. This system consists of a lamp controller, knowing humidity and room temperature, detection of human movement at home abandoned, early detection of fire sources to prevent house fires, and LPG gas leak detector for home security. There are four sensors used are PIR sensors to detect human movement, MQ2 sensor to detect LPG gas leaks, flame sensor to detect LPG gas leaks early detection of fire, and the DHT11 sensor to determine humidity and temperature. The design of this system uses a relay which is used as a liaison lamp with system.

Keywords— Smart home, IoT, ESP 8266, Blynk

I. INTRODUCTION (*HEADING 1*)

In the current era of globalization, the development of science and technology (IPTEK) is increasingly advanced, especially in the field of automation. These advances bring tremendous benefits to humans. Types of work that previously required considerable physical ability, now relatively can be replaced by automatic machines, of course this technology can help and facilitate human work to be more effective and efficient. The internet is one of the examples of technology that has been used by all circles of society. Internet is developing very fast. Internet users are not limited to adults only but are also used by young people. There are so many benefits of the internet for human life, including adding insight and knowledge and facilitate human work. With these developments, an innovation was developed where all of these technological tools can be controlled remotely via the internet to make it more efficient efficient and save time by using IoT (Internet of Things) by designing and implementing smart home systems. The use of IoT in the leasing house allows to control, monitors, and automation of many electronic devices in the house remotely (Ambarita, 2009). The problems that are often faced by homeowners are: scared when leaving the house. Because when the house is abandoned, the homeowner will sometimes think about whether any electronic devices are still alive or have all been turned off and whether the house is in a safe condition. Automation of electronic devices as solution 2 makes it easier for humans to carry out routine activities in daily activities. The automation discussed in this study is the 'Smart Home' technology (Rahayu & Nurdin, 2019). Smart home is a system that can control household electronic equipment using an application on a smartphone. Control of electronic equipment can be done remotely. This system can make it easier for users to control household electronic equipment such as turning on and off lights, knowing the humidity and temperature in the room, detecting human movement, detecting sparks, and LPG gas leak detector so that it can increase the security of the house. This system uses ESP 8266 as hardware and the blynk application to control (Muslihudin et al., 2018).



II. METHODS

The design stages of the "Prototype Design" Internet of Things (IoT) Based Smart Home Using ESP 8266." starting from the design design, material acquisition and manufacture as well as run-up props,.

Fig.1 cable circuit

The explanation of each system diagram is as follows:

a. ESP8266 microcontroller, is used as a controller of the sensor circuit and lights.
b. PIR sensor, used to read the movement of people in the house when the owner left.
c. Relays and lights are used to illuminate homes that can be remotely turned on and off online.

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d. The DHT11 sensor is used to read the humidity and temperature in the room which will be displayed on the blynk application on a smartphone.
e. Flame sensor, is used to detect flames to prevent fires from occurring.
f. MQ-2 sensor, used to detect LPG gas leaks to avoid explosions and fires.

The Internet is a global information system that is logically connected by a globally unique address based on the Internet Protocol (IP), supports communication using TCP/IP, provides, uses, and makes it accessible both in general and in particular.

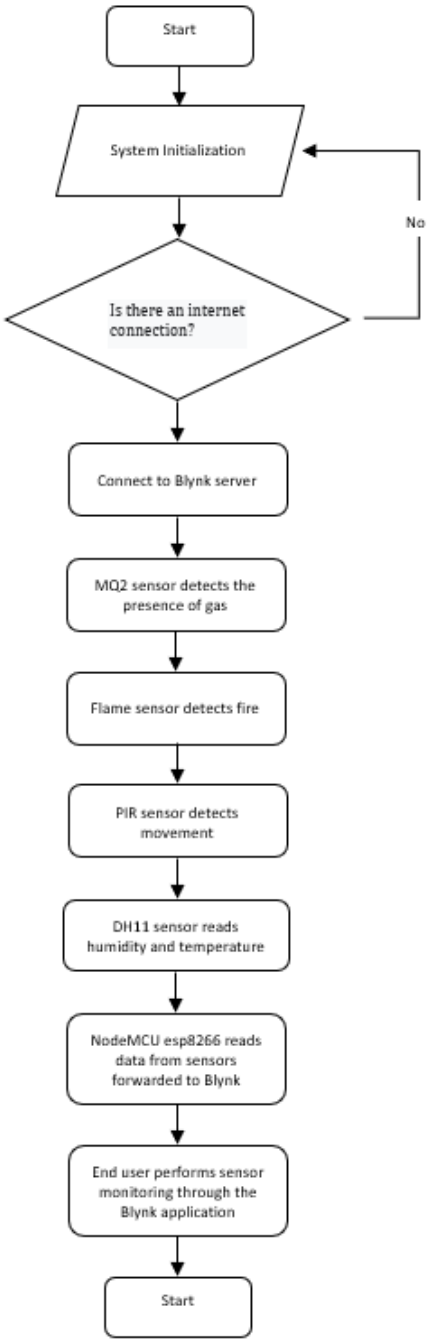

Fig.2 Flowchart of the designed system

This tool is designed to make it easier to control the situation in the house with a smart home system through a smartphone application. So that when the house is empty, residents can monitor it through an application that has been made.

The application is designed to be able to monitor the state of the house starting from movements around the house which will later provide direct notifications on the application. Detecting gas leaks, fires, besides being able to control the on and off lights on the terrace of the house and can determine the temperature and humidity in the

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room. The way the tool works is that when the tool is turned on, make sure the system can turn on and work properly.

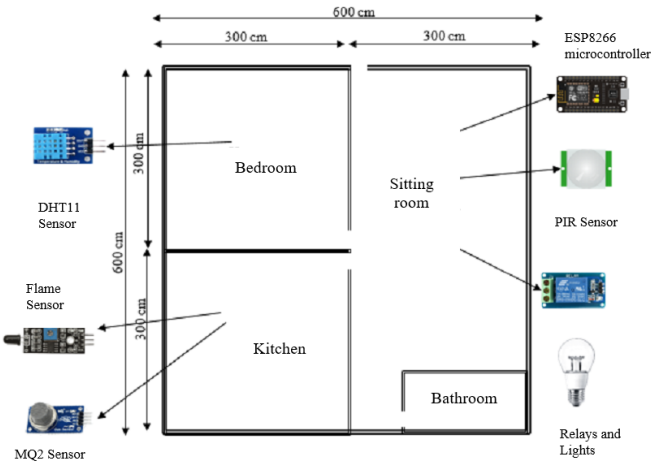

Fig.3 smart home concept

III. Results and Discussion

By designing a Smart Home Prototype Design Based on Internet Of Things (IoT) Using ESP8266, it can be concluded as follows:

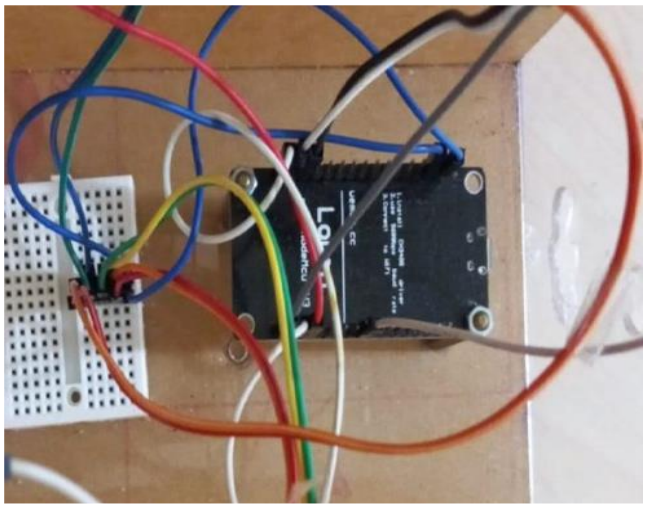

Fig. 4 ESP testing

In the table below, look for tool errors in lab tests by taking data from automatic temperature measuring devices with conventional temperature measuring devices in stages by knowing the difference and error percentage.

Table I. Testing of Relay Module

Application Button	Relay Condition	Lamp Condition
ON	Close	Light On
OFF	Open	Light Off

Table II. PIR sensor testing

Sampling Number	Distance (cm)	State	Description
1	0	There is no movement	Movement not deteced
2	10	There is movement	Movement detected
3	20	There is movement	Movement detected
4	30	There is movement	Movement detected
5	40	There is movement	Movement detected

Table III. DHT11 Sensor Test Results.

Sampling Number	Temperature (°C)		%Error	Humidity(%RH)		%Error
	Thermometer	Sensor Output		Hygrometer	Sensor Output	
1	27,4	27,1	0,01	86	84	0,02
2	27,5	27,3	0,01	98	95	0,03
3	28,5	27,6	0,03	86	82	0,05
4	27,5	27	0,02	85	83	0,02
5	26,5	26	0,02	88	85	0,03
6	27	26,5	0,02	87	84	0,03
7	26,5	25,4	0,04	87	86	0,01
8	26,2	26	0,01	84	83	0,01
9	27,5	27	0,02	85	84	0,01
10	28	27,5	0,02	84	82	0,02
11	26,6	26	0,02	83	81	0,02
12	26,4	26,2	0,01	88	86	0,02
Average Error %			0,22	Average Error %		0,30

Data retrieval was carried out for 60 minutes by taking data every 5 minutes and comparing it directly with a Clock Humidity Temperature measuring instrument equipped with a thermometer and hygrometer so that direct observations were obtained. As the results of the test, there are results that show the percentage error at the highest temperature value of 0.04% and the lowest value of 0.01%, while the percentage error of humidity with the highest value of 0.05% and the lowest value of 0.01%. From the results of these data, the average percentage error of temperature sensitivity is 0.22% and the average percentage error of humidity is 0.30%.

Table IV. Gas sensor test

Sampling Number	Distance(cm)	Metered gas(ppm)	Description
1	5	23,11	Gas detected
2	10	21	Gas detected
3	15	19	Gas detected
4	20	15	Gas detected
5	25	15,7	Gas detected
6	30	13,6	Gas detected
7	35	13	Gas detected
8	40	11,08	Gas not detected
9	45	10,08	Gas not detected
10	50	10	Gas not detected

In the resulting table, the MQ-2 sensor can detect gas if it is above 11 ppm. Responsiveness for detecting gas with a maximum sensor distance of 35 cm from a gas source takes 35 seconds. It is still categorized as still safe with a gas distance and sensor of 35 cm.

Table V. Flame sensor test.

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Sampling Number	Distance(cm)	State	Description
1	0	Normal	Fire not detected
2	5	There is fire	Fire detected
3	10	There is fire	Fire detected
4	15	There is fire	Fire detected
5	20	There is fire	Fire detected
6	25	There is fire	Fire detected
7	30	There is fire	Fire detected
8	35	There is fire	Fire detected
9	40	There is fire	Fire detected
10	45	There is fire	Fire detected

The flame sensor detects the presence of fire in the room. When a fire is detected, the sensor will send data in the form of a notification on a mobile phone that has been connected to the sensor.

The sensor shows that when a fire is not detected, no notification will be given to the mobile phone that is connected to the device. The data shows that the sensitivity of the fire detection sensor can respond up to 45 cm from the sensor installed.

The percentage of sensor accuracy in:

Test method:

1. Connect the circuit to the source.
2. Go to the Blynk app on android.
3. Look at the fire notification monitoring screen.
4. Give the trigger to the sensor by bringing the flame closer to the sensor.
5. Look at the monitoring display for notifications of fire detected.

IV. Conclusion

From testing in each series of components and testing the software mentioned above, a prototype is formed. Testing this tool can see the data given to each sensor via cellphone using a laptop and the blynk application as an intermediary between the design of the tool and the cellphone.

From the test results, it is concluded that the ESP8266 is functioning properly.

In this section, it is shown that the DHT11 module is working well, the results obtained from the DHT11 reading with a value that is not much different from using the Humidity Clock Temperature.

The test results show that MQ-2 is as expected, that is, if there is gas around the room, the sensor will respond quickly.

This test is carried out from the device to connecting to the IoT. In testing all the tools work well as designed, From the tools that must be supplied with electricity then the tools must be connected to the registered internet access.

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