NODEMCU INTERNET OF THINGS-BASED FIRE AUTOMATION DESIGN WITH BLYNK APPS NOTIFICATIONS

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ABSTRACT

The impact of fires causes quite large losses, often even causing fatalities. The method used in the system is monitoring the fire sensor which is used to detect a fire, the buzzer as a notification output in the form of sound, and the water pump as a fire extinguisher which will function after the fire sensor is on. detecting the presence of fire. to detect fire in realtime and 9 in the event of a fire with a research and development. Monitoring approach on fire sensors used to detect the presence of fire, buzzers as output notifications in the form of sound, and water pumps as a tool to extinguish fires which will function after the fire sensor detect the presence of fire.

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INTRODUCTION

Fire is a condition of buildings such as office buildings, factories, markets, houses, etc. caused by fire which often results in fatalities and or losses. [1][2] The onset of fire begins with a spark or ignition of the material by a heat source (fire). If the fire generated is very limited, these symptoms have not been declared as a fire. [3] However, if the fire is detected by sparks and spreading, the symptoms can be said to be a fire. Almost all residences or places of business, restaurants, use LPG gas cylinders for everyday cooking purposes. We can see at the present time the many problems caused by these gas cylinders, one of which is a fire caused by a leak in the gas cylinder. Fires are often heard as a result of gas cylinders. LPG exploded.

Fires can be caused by two factors, namely human negligence and alarm factors. [4] The DKI Jakarta Provincial Fire Management and Rescue Service recorded 1,088 fire cases. Fires were caused by electricity with 640 cases, cigarettes with 19 cases, stoves with 132 cases and other causes with 297 cases. One of the causes of delays in fire control and self-rescue in the event of a fire is a condition in which the system and equipment malfunction to detect a fire and provide early warning. [5] Current technological developments are very supportive

for creating automation systems to overcome delays in handling fires, thereby reducing the risk of material loss and loss of life. The design of an Internet of Things-based automatic fire extinguisher prototype is an electronic system designed to handle fire risks by detecting the presence of fire sources and extinguishing them automatically. [6]

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Currently, several programs to develop products based on the Internet of Things are provided by many companies. where all electronic devices connected to the internet are easily accessible wherever and whenever is the term for the Internet of Things. [7] This automatic fire extinguisher prototype uses the NodeMCU microcontroller as the brain that controls the fire extinguisher program that is executed. Other devices in making this prototype use a fire sensor to detect the presence of fire, a buzzer as a notification using sound output, and a water pump as a tool to extinguish fires after the fire sensor detects the presence of fire. This prototype is also connected to an Android smartphone using the Blynk application to inform in the event of a fire. [5] Monitoring approach on fire sensors used to detect the presence of fire, buzzers as output notifications in the form of sound, and water pumps as a tool to extinguish

fires which will function after the fire sensor detect the presence of fire.

RESEARCH METHOD

The method implemented in this study is Research and Development (R&D). R&D is "a process flow in order to develop a new product or perfect an existing product so that it can be accounted for". The product resulting from this research is "Automatic Fire Extinguisher Prototype using NodeMCU and Blynk Android Application." The time period for this research is 6 months from March 13 2021 to August 7 2021. The research was conducted at the author's house which is located in Kel. Bintara Jaya Kec. West Bekasi, Bekasi City, 17136.

Literature Study

In previous research it became one of the references in conducting research to obtain and review from research conducted as a literature review of related research. The research related to discussing fire protection is clearly for the purpose of safety in human life because mishandling of fire sources can be a cause of serious accidents where this research proposes a smoke detector system and temperature sensor to help detect a fire.[8] This research proposes a fire extinguisher robot that is used to extinguish fires in general and in handling fires in closed areas.[9] In research discussing fire detectors, it will be designed using a flame sensor, MQ2 gas sensor, and DHT11 temperature sensor so that Android-based cell phone users can receive data.[10] in this study discusses being able to monitor the potential for fire due to the presence of fire[5] and this study proposes a gas leak detection system to prevent fires that can be accessed through an android application.[1] Furthermore, this study discusses as a detector of gas leaks with notifications in the form of SMS.[11] and research discussing if a fire is detected, a buzzer will sound and the system will send a notification via e-mail.[12]

Prototype planning plays an important role in facilitating prototype design by elaborating the required components. are as follows:

1. NodeMCU microcontroller

The NodeMCU V3 microcontroller as the control center is connected to other components such as fire sensors, relay modules, power supply modules, buzzers and electric gallon water pumps. [11]

Flame sensors (Flame Detectors)
3 pin fire sensor as input which functions to detect the presence of fire on the prototype.
[13]

3. Buzzers

The buzzer is used as a fire alarm notification. The buzzer will output a sound if the fire sensor detects a flame. [14]

4. Relay module

The 4 channel relay module functions as an on/off switch on the electric gallon water pump on the prototype [14- 15].

- 5. Power supply module used to provide additional power supply according to the needs of components that require greater power. In this prototype, the component that requires more power is an electric gallon water pump.
- 6. Water pump

USB rechargeable electric gallon water pump with 5-volt power is used as a fire extinguisher on the prototype, and will function when the fire sensor successfully detects a flame. [12]

7. The Blynk app

The Blynk android application version V.2.27.30 is used as a remote notification on a smartphone if the NodeMCU microcontroller sends a signal of a fire. [5]

The block diagram of the design of an automatic fire extinguisher prototype consists of input, microcontroller and output. The input is connected to NodeMCU as a data processor, where the input on this prototype is a fire sensor. Then NodeMCU as a microcontroller sends data from the fire sensor to the buzzer and the Blynk Android application as an alarm if a fire occurs, and an electric gallon water pump will actively sprinkle or extinguish the fire in the area where the fire is detected. The working process of the prototype is shown in Figure 1 as follows:



Figure 1. Diagram Block

Research Flow

At this stage has a process flow that must be implemented to get the desired results. The flow of this research is shown in Figure 2.



Figure 2. Research Process Flow

RESULTS

From the results of the image above, the automatic fire extinguisher prototype flowchart is as follows:

- 1. The prototype will turn on by getting a power supply.
- 2. NodeMCU microcontroller will check the configured internet connection.
- 3. If an internet connection is detected, the prototype will carry out an initial test and proceed to the next stage, if not, check the internet configuration again.
- 4. The fire sensor will detect the presence of a flame.
- 5. After the fire is detected by the sensor, NodeMCU will send or upload a notification to the Blynk android application.
- 6. The Blynk and buzzer android application will display a fire notification.
- 7. Then the water pump turns on and functions to extinguish the fire.



Figure 3. Process Flow Simulation

The design of this tool was carried out by the author to facilitate the manufacture of automatic fire extinguisher prototypes. Prototype design is done by connecting all the required components into a single prototype unit. Flame sensors or flame detectors, buzzers are connected directly to the pins on the NodeMCU. Water pumps that require more power are first connected to the power supply module and then connected to the relay module as an on/off switch. Then the power supply module and relay module are connected to the NodeMCU microcontroller.



Figure 4. Overall Prototype Hardware diagram

The design of the tool simulation design is shown in Figure 5.



Figure 5. Design Planning

Automatic fire extinguishers are made as an innovation from fire extinguisher detectors by utilizing Internet of Things technology. This automatic fire extinguisher prototype can be a solution in handling fires that can be applied to buildings. By utilizing laptops, microcontrollers, and android applications, fires can be detected and known in real-time using a smartphone.

The components used in this study consist of NodeMCU as a microcontroller, a fire sensor as input, a buzzer as a sound notification output, the Blynk application as a real-time notification that is directly connected to a smartphone and an electric gallon water pump that functions to circulate water to carry out extinguish if the sensor successfully detects a flame. To run the water pump automatically, additional components are needed, namely the relay module.



Figure 6. Fire Detection Simulation Tool Results

Tests were carried out directly on the entire prototype using a candle flame, 3 watt red LED light, 7 watt white LED light and 9 watt yellow LED light with a distance of 10 cm to 50 cm each on the fire sensor which is the input to the prototype.

Prototype hardware testing was carried out to prove the correctness of the fire sensor detecting flames at a distance of 10cm to 50cm. Tests are carried out by comparing the flame of a candle with LED lights of various colors and different wattages. The test results are as follows:

Table 1. Test results

No	Object	Distance	Flame Sensor	Alert	Pump Water
1	Candle fire	10 cm	Detected	Beep	Function
		20 cm	Detected	Beep	Function
		30 cm	Detected	Beep	Function
		40 cm	Detected	Beep	Function
		50 cm	Detected	Beep	Function
2	LED Red	10 cm	Not Detected	Not	Not
	(3 watt)	20 cm	Not Detected	Not	Not
		30 cm	Not Detected	Not	Not
		40 cm	Not Detected	Not	Not
		50 cm	Not Detected	Not	Not
3	LED	10 cm	Not Detected	Not	Not
	White	20 cm	Not Detected	Not	Not
	(7 watt)	30 cm	Not Detected	Not	Not
	. ,	40 cm	Not Detected	Not	Not
		50 cm	Not Detected	Not	Not
4	LED	10 cm	Detected	Beep	Function
	Yellow	20 cm	Not Detected	Not	Not
	(9 Watt)	30 cm	Not Detected	Not	Not
	. ,	40 cm	Not Detected	Not	Not
		50 cm	Not Detected	Not	Not

DISCUSSION

From the results of the tests that have been carried out, it is proven that the prototype succeeded in detecting a flame at a distance of 10 cm to 50 cm. But the prototype also detects a yellow LED light with a size of 9 watts at a distance of 10 cm as a source of fire.

This can happen because the fire sensor on the prototype works by reading the color spectrum or wavelength of light from the flame and the wavelength of light produced by the LED lamp is close to or equal to the wavelength of light that can be detected by the fire sensor.

Based on the table of test results for the Blynk application that has been carried out by the author, the Blynk application can work according to its function, namely the Blynk application can provide notifications if the prototype successfully detects the presence of fire with a maximum distance of 50 cm from the fire sensor.

Table 2.	Test	results	Blynk	apps
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No	Objek	Distance	Blynk Apps
1	Candle fire	10 cm	Displays notifications
		20 cm	Displays notifications
		30 cm	Displays notifications
		40 cm	Displays notifications
		50 cm	Displays notifications
2	LED Red (3 watt)	10 cm	Not Displays notifications
		20 cm	Not Displays notifications
		30 cm	Not Displays notifications
		40 cm	Not Displays notifications
		50 cm	Not Displays notifications
3	LED White	10 cm	Not Displays notifications
	(7 watt)	20 cm	Not Displays notifications
		30 cm	Not Displays notifications
		40 cm	Not Displays notifications
		50 cm	Not Displays notifications
4	LED Yellow	10 cm	Displays notifications
	(9 Watt)	20 cm	Not Displays notifications
		30 cm	Not Displays notifications
		40 cm	Not Displays notifications
		50 cm	Not Displays notifications

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💿 СОМЗ	
1	
08:37:39.328 -> ST	ATUS AMAN
08:37:39.328 -> === 08:37:40.872 -> ===	
08:37:40.919 -> 102 08:37:40.919 -> 572	23 ATUS AMAN
08:37:40.966 -> ==	
08:37:42.464 -> === 08:37:42.510 -> 102	23
08:37:42.510 -> ST 08:37:42.557 -> ==	ATUS AMAN
08:37:44.055 -> ==	
08:37:44.102 -> 0 08:37:44.102 -> TE	RJADI KEBAKARAN
08:37:45.693 -> === 08:37:45.693 -> 103	23
08:37:45.693 -> ST	ATUS A
Autoscroll V Show t	imestamp

Figure 7. Serial Monitoring Status Results

CONCLUSION

From the results and discussion based on the writing done, it can be concluded that the Internet of Things-based fire extinguisher prototype is effective in detecting and dealing with fires automatically. Tests were carried out on prototypes using several objects such as candle flames, 3 watt red LED lights, 7 watt white LED lights and 9 watt yellow LED lights with the distance of each object on the flame sensor being a multiple of 10 cm from 10 cm to 50 cm. The results of the tests that have been carried out by the author show that the prototype successfully detects fires using a candle flame at a distance of 10 cm to 50 cm and extinguishes them automatically and successfully sends notifications to Android smartphones via the Blynk application in real-time. monitoring the fire sensor which is used to detect the presence of fire, the buzzer as a notification output in the form of sound, and the water pump as a tool to extinguish fires which will function after the fire sensor detects the presence of fire. The Blynk Android application is used to connect the prototype with an Android smartphone as a notification in the event of a fire.

For future research, you can add integrated variables with social media applications in the form of Telegram or WhatsApp notifications to make it easier for users

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