Design of Gas Detector and Fire Detector Based Internet of Things Using Arduino Uno

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INTISARI

Pembuatan alat ini bertujuan untuk membuat alat pendeteksi kebocoran gas dan pendeteksi api berbasis *internet of things* menggunakan arduino. Pembuatan alat ini menggunakan beberapa komponen seperti sensor MQ2, sensor api, arduino uno,nodeMCU ESP8266, Buzzer,Exhaust fan dan juga smartphone. agar Peran LPG (Liquefiet Petroleum Gas) pada saat ini sangatlah penting bagi kehidupan manusia Pada alat ini terdapat dua buah sensor yaitu sensor MQ2 dan sensor api serta fan dan buzzer sebagai indikator. Sedangkan untuk mikrokontroler menggunakan arduino uno dan NodeMCU ESP8266. Prinsip kerja alat ini monitoring lewat handphone selalu aktif untuk mengetahui keadaan, sekitar ketika sensor mq2 mendeteksi adanya gas maka fan akan berputar sebagai langkah awal agar gas tidak menyebar keseluruh ruangan dan ketika sensor api mendeteksi adanya api maka buzzer akan berbunyi dan diimplementasikan langsung diruangan atau dapur,dari hasil implementasi alat bekerja sesuai dengan yang dirancang ketika sensor mq2 mendeteksi adanya gas maka fan akan berputar sebagai langkah awal agar gas tidak menyebar keseluruh ruangan dan ketika sensor api mendeteksi adanya api maka buzzer akan berbunyi dengan sistem monitoring untuk pemberitahuan dalam kondisi jarak jauh.

Kata Kunci: LPG, Sensor MQ2, sensor Api, Arduino Uno, NodeMCE ESP8266

ABSTRACT

The purpose of making this tool is to make a gas leak detector and internet of things-based fire detector using Arduino. The manufacture of this tool uses several components such as the MQ2 sensor, sensor flame, Arduino Uno, ESP8266 MCU node, Buzzer, Exhaust fan, and also a smartphone. so that the role of LPG (Liquefied Petroleum Gas) at this time is very important for human life. In this tool, there are two sensors, namely the MQ2 sensor and the sensor flame as well as the fan and buzzer as indicators. As for the microcontroller using Arduino Uno and NodeMCU ESP8266. The working principle of this tool is monitoring via a cellphone that is always active to find out the situation, around when the mq2 sensor detects the presence of gas, the fan will rotate as a first step so that the gas does not spread throughout the room and when the sensor flame detects a fire, the buzzer will sound and implemented directly in the room or kitchen, from the results of the implementation of the tool working as designed when sensor mq2 detects gas, the fan will rotate as a first step so that the gas does not spread throughout the room and when sensor flame detects a fire, the buzzer will sound with a monitoring system to remote notification.

Keywords: LPG, SensorMQ, Sensor Flame, Arduino Uno, NodeMCU ESP8266

INTRODUCTION

The role of *Liquefied Petroleum Gas* (LPG) at this time is very important for human life, both at home and in industry, and LPG gas, besides being cheap, is easier to use. However, LPG gas can have a negative impact such as a fire disaster. when there was a fire. Not only losses in the form of fires that occur, but also for human health which can even cause considerable losses if not used carefully, such

as shortness of breath, allergies, and even confusion.

The *internet of things*-based gas leak detector and fire detector uses Arduino Uno and nodeMCU ESP8266 as well as three sensors consisting of an MQ2 sensor and a fire sensor. If the gas sensor detects a leaking gas, the smartphone will notify the state of the house, as well as the fan, will spin to suck up the gas so it doesn't spread throughout the room. For the fire sensor to detect when there is a fire, the smartphone will also provide a notification to find out the state of the kitchen and the buzzer will automatically sound as a notification indicator if there is a fire or the compote has not been turned off.

The manufacture of this tool is the development of a previously existing tool, this tool with the title of making a call-based gas leak tool, and the author develops it with the title of making a gas leak detector and *internet of things* -based fire detector using Arduino Uno. (Mifza Ferdian Putra 2017:1-2)

METHOD

In making a design tool for leak detection tools, bro and *internet of things* -based fire detectors,the method implementation, it begins by designing a system block diagram as shown in Figure 1 below :
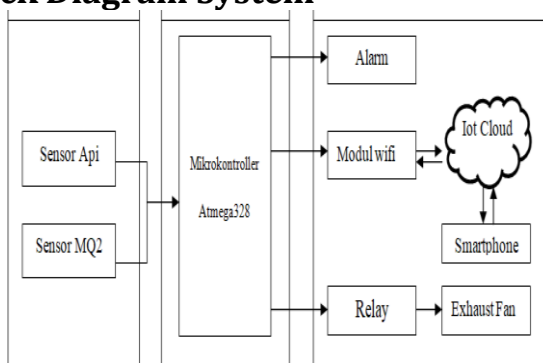
Block Diagram System

Figure 1. System Block Diagram System

1. Sensor Flame

Functions as a sensor that detects the presence of fire, the physical form is as shown in Figure 2 below:

Figure 2. Sensor Flame

Sensor flame is a sensor that can detect the presence of fire and convert it to an analog representation. Fire sensors are also useful or light sources. The light source that can be detected is one with a wavelength between 760 nm to 1100 nm and this sensor is capable of detecting light at a distance between 20 cm and 100 cm. (Abdul Kadir 2018: 313). [1]

2. Sensor MQ2

Serves as a detector when there is a gas MQ2 sensor is a sensitivity sensor to detect methane, artificial gas, LPG (*Liquefied Petroleum Gas*)and, cigarette smoke. (Abdul Kadir 2018:351) [2].

Figure. 3 Sensor MQ2

3. Atmega328. Microcontroller

The Microcontroller is a chip that functions as an electronic circuit controller and in general, can store circuits. (Ferdian Putra 2017:1-2). [3]

Figure 5. Microcontroller Atmega328

4. NodeMCU ESP8826

Functions as the main controller of the circuit as well as the monitoring system that is connected directly to the *smartphone* [14], [15].
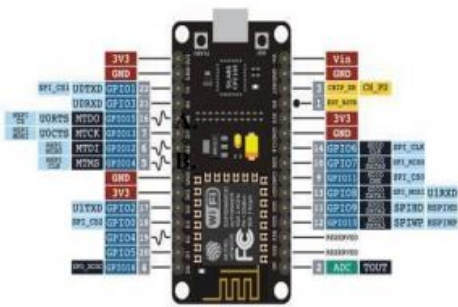
Figure 5. NodeMCU ES8266

NodeMCU can access WiFi, for example, the ability to connect to WiFi that is within range and this device can also create that can be used by other devices. (Muhammad Tio 2018: 5). [4]

5. Buzzers / Alarms

As a sound indicator when a fire occurs or a fire is detected. The function of the alarm is to notify in the event of danger and damage or unexpected events through the network to give clear warnings so that they can be anticipated.

Figure 6. Physical Form of Alarm

6. Exhaust Fan

As an indicator when a gas leak occurs, this fan rotates to suck gas out of the room. The fan serves to suck air from the room to be discharged out. This tool regulates air circulation in the room both at home and in industry.

Figure 7. Exhaust Fan
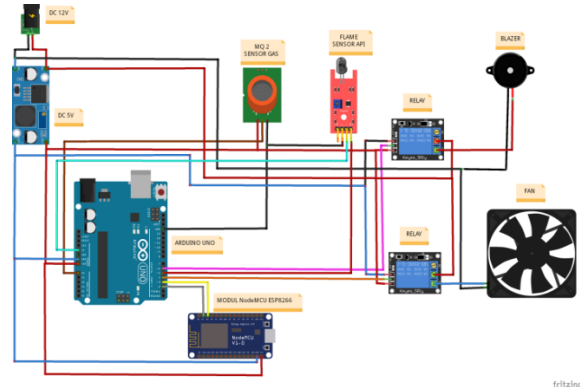
Planning System

1. Circuit System

Figure 9 . Circuit System

In this tool, there are two sensors, namely sensors MQ2 and flame sensors, sensor mq2 placed at the gas regulator and interrupted ng gas principle works when a gas leak sensor will immediately detect leakage of gas and *the smartphone* will directly monitor provides notification on the *smartphone* and exhaust fan will immediately spin sucking the gas out so as not to spread throughout the room.

Sensor Flame is also on the regulator or at a predetermined distance when a fire is detected, the *smartphone* will immediately monitor it through the application, providing notifications on the *smartphone* and the buzzer as a sound indicator as a notification of a fire or forgetting to turn off the stove.
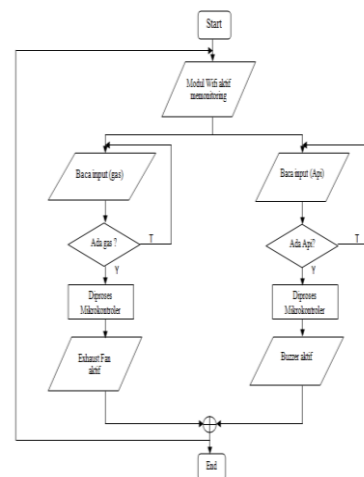
2. *Flowchart*

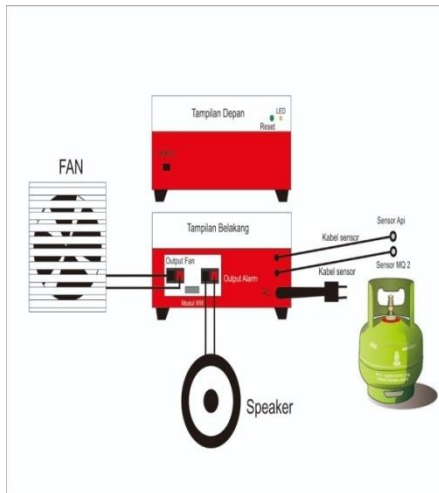Figure 10. *flowchart* System

3. Specifications Tool

Figure 11. Specifications Tool

4. Program Arduino

The application used to create programs on this tool is the Arduino *Arduino Integrated Development Environment* (IDE). Here is an example of making a program using the Arduino IDE. As shown below:

Figure 11. Listing Program

RESULTS AND DISCUSSION

The shape of the physical results of realization tools gas leakage detection and fire detection-based *internet of things*. Data from sensor readings are sent to the *Smartphone* using the wifi module NodeMCUESP8862 and Arduino Uno as processing receiver data. Detectors gas and fire detectors are used to prevent fires from occurring because there are often delays in detecting gas leaks.

Figure 13. Physical Form. Tool

1. Measurement sensor MQ2

Sensor MQ2 testing is carried out on the input pin D5, with the MQ2 input voltage of 3 Vdc. as in table 1 below:

Table 1. measurement sensor MQ2

Logika Port	Condition	Rated Voltage (V)
MQ2 pin 14 (D5)	Don't Gas (0)	0
	gas (1)	
		2,2

The results of the test tool when MQ2 does not detect gas then the fan will not turn on and vice versa when MQ2 detects gas then the fan will rotate to suck gas out.

Table 2. Measurement of Sensitivity Sensor MQ2

Distance	sensitivity of the MQ2 sensor to objects (gas)	
	Detected	Not detected
1 cm	✓	
2 cm	✓	
3 cm	✓	
4 cm	✓	

5 cm	✓	
6 cm		✓
7 cm		✓

In The table above, it can be concluded that in this tool the MQ2 sensor will detect gas rarely less than 5cm, at a distance of more than 5cm the sensor cannot detect gas leaks.

2. Measurement sensor flame

The test on the fire sensor uses a voltage of 3 Vdc, here are the measurement results.

Table 3 . Measurement sensor flame

Port Logic	Port Logic	Rated Voltage (V)
Fire pin 5 (D1)	No fire (0)	0
	There's a fire (1)	2.2

The results of testing the fire sensor circuit, the sensor detects a fire, the buzzer will be active and when the sensor does not detect fire, the buzzer is not active. as in table 4 below :

Table 4 . sensor sensitivity distance test

Distance	sensitivity of the fire sensor to objects (fire)	
	Detected	Not detected
1 cm	✓	
2 cm	✓	
3 cm	✓	
4 cm	✓	
5 cm	✓	
6 cm		✓
7 cm		✓
8 cm		✓
9 cm		✓
10 cm		✓

At a distance of less than 5cm, the fire sensor can detect a fire, and at a distance of more than 5cm, the sensor can no longer detect a fire.

3. Measurement Microcontroller Atmega328

This circuit is composed of a 12 MHz crystal oscillator which functions to generate internal pulses and two 22 pF capacitors which function to stabilize the frequency. As in table 5 below:

Table 5 . Measurement ATmega328

port	Condition	Voltage (V)
Vcc	High (1)	2.8
Ground	Low (0)	0

4. Measurement of NodeMCU ESP8862

For testing the ESP8266 circuit is a data processing center and a tool control center. In this ESP8266 circuit, 4 ports are used to accommodate input or output data and are connected directly by the circuits of the controller. As in table 6 below:

Table 6 . Measurement NodeMCU ESP 8266

Port Logic	Condition	Rated Voltage (V)
NodeMCU	High (1)	2.8
	Low (0)	0

5. Buzzer Measurement

This circuit 1 buzzer is used, this buzzer is given a 3v voltage which is taken from Atmega. The following are the results of measurements on the circuit.

Table 7 . Buzzer measurement

Port Logic	Condition	Rated Voltage (V)
buzzer pin 4 (D2)	Low (0)	0
	High (1)	2,2

The results of testing the tool when the Fire Sensor detects a fire, the buzzer will be logic 1 and will sound.

6. Application testing

Testing the program using the Arduino IDE application, after making the program it will be downloaded from the laptop to the NodeMCU ESP8266 module.
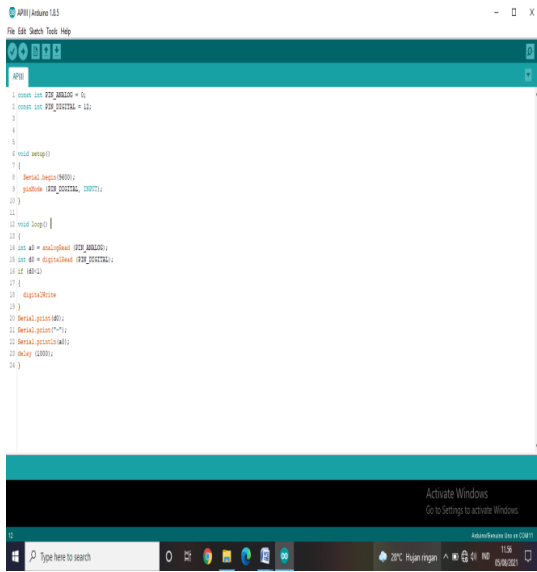
Figure 13. Application testing

7. Monitoring results via *smartphone*

Figure 14. Display on *smartphone*

8. The working principle of the whole system

The use of this tool using internet technology can make communication between devices faster and by utilizing connectivity periodically to make the device used an appropriate solution to existing problems and utilize Arduino as a microcontroller, sensor flame to detect when there is a fire and the data will be processed by Arduino to activate the alarm and the MQ2 sensor to detect a gas leak, the MQ2 sensor will detect it and the data will be processed by Arduino to activate the Exhaust

as a gas suction that will suck up the gas so it doesn't spread throughout the room. With this Exhaust, one of the quick countermeasures when the homeowner is outside and the Wifi Module is to send information to Android if the user monitors the situation remotely or at close range.

CONCLUSION

From the results of the manufacture and testing of gas leak detectors and fire detectors, it can be concluded, among others:

1. The Simulator is an *Arduino IDE* application for microcontrollers. *Software* is used to create and fill programs into *the* microcontroller *chip*.
2. This tool is designed to use the ATMega328 microcontroller and NodeMCU ESP8862 as the main controller.
3. This tool uses the MQ2 sensor as a gas detection sensor and a fire sensor as a fire detector when a fire occurs or forgets to turn off the stove when leaving the house.
4. This tool can be used to provide a warning indicator when there is a gas leak and buzzer fire as a sound indicator and an exhaust fan that will suck the gas out of the room so that the gas doesn't spread everywhere and a notification will be sent to the homeowner's smartphone through monitoring with existing applications.

SUGGESTION

1. Should this tool be added right battery that works when no bias voltage of the electricity grid.
2. For further development applied to stem its design to order to be good. Extra functions that maximize the function of the tool become better.
3. For the implementation of this tool with conditions and places that are not good, the internet network is not expected to use IoT-based, it can be replaced in the form of calls or massage only.

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