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# *CIGARETTE SMOKE DETECTION AND CLEANER BASED ON INTERNET OF THINGS (IOT) USING ARDUINO MICROCONTROLLER AND MQ-2 SENSOR*

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***ABSTRACT***
*The detector and neutralize cigarette smoke in the STMIK Hang Tuah Pekanbaru there is no. To simplify detector and neutralize cigarette smoke in the campus area made a system detector and neutralize cigarette smoke Arduino Uno microcontroller based using an notification IoT. The whole tool is divided into several parts, consisting of sensor mq-2, module ESP8266-01S, module LCD, microcontroller arduino uno, buzzer, and DC FAN. This tool works when module ESP8266-01S looking for the nearest internet network and sensor mq-2 detect cigarette smoke, from module ESP8266-01S and sensor mq-2 then to Arduino Uno microcontroller to process, from Arduino Uno microcontroller then Turn on buzzer as a warning alarm and Turn on DC FAN as a fan to neutralize cigarette smoke which then transfers data through module ESP8266-01S to the website and give notification the room detected cigarette smoke to the smartphone head of equipment and officers. The results showed that the smoke content was more than 300 detected as cigarette smoke, because it has been to test the system to several prototypes and 2hen there is no cigarette smoke was value is less than 300.*

***Keywords :*** *Sensor Mq-2, Arduino Uno, Module ESP8266-01S, Module LCD, Buzzer, DC FAN.*

## 1. Introduction

The smoking habit is something that is commonly found in public places(Imtiaz, et. al., 2019) and (Zhang, et. al., 2018). Considering the many diseases caused by cigarette smoke, the government continues to strive to improve the prevention of smoking bans in public places by making a policy on smoke-free areas in accordance with Law Number 36 of 2009 concerning Health (Amin, et.al., 2018) also including the No Smoking Area regulations in Section Seventeenth, Security Addictive substances, Article 115 paragraph (1) (Sanger, et. al., 2019) Non-smoking areas include: health service facilities, places for teaching and learning, places for children to play, places of worship, public transportation, workplaces and public places and other designated places (Panpaeng, et. al., 2018). In accordance with the policy on smoke-free areas as described above, smoke-free areas must be implemented in office buildings, education centers, hospitals, and also other public places (Irawan, et. al., 2019).

STMIK Hang Tuah Pekanbaru is one of the agencies engaged in the education sector that enforces smoke-free zone regulations. STMIK Hang Tuah Pekanbaru has given a written warning about smoking prohibition which is affixed to campus walls was studied by ping. However, there are still those who smoke free in the campus environment, especially in the campus area(Ping, et. al., 2010). This is very detrimental for passive smokers in these areas. Security officers have repeatedly warned those who smoke in the STMIK Hang Tuah Pekanbaru environment but the existing written warnings are also not obeyed by those who smoke and this results in security officers being unable to monitor so that the air around the campus area is contaminated by cigarette smoke which is very dangerous for secondhand smoke (Sanger, 2019).

This problem can be overcome with an automatic device that can detect smoke with an alarm warning and can help manage air circulation in a room using the MQ-2 sensor and the Arduino Uno Microcontroller. Researchers want to develop smoke detection and neutralizing

methods using Internet of Things (IoT) services. With the Internet of Things (IoT) service, data collection on smoke levels will be sent via the internet to an online website which then sends a notification alert to the smartphone application in charge of room security. The application of this technology can be an alternative to detect and neutralize smoke in the STMIK Hang Tuah Pekanbaru room.

## 2. Literature Review

### Arduino Uno ATMega 328P

Arduino UNO Atmega 328 is an 8-bit microcontroller chip based on AVR-RISC made by Atmel which has 32 KB of ISP flash memory with read / write capabilities, 1 KB EEPROM, 2 KB SRAM and because of this 32 KB Flash memory capacity then this chip is named ATmega328 and the complete features contained in the Arduino UNO module make this module easy to use, just by connecting the Arduino UNO module with a PC using a USB cable or using a DC-DC adapter. Arduino UNO has 14 input / output pins of which 6 pins can be used as PWM outputs, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP head, and a reset button (Handoko, 2017).

### MQ-2 sensor

The MQ-2 sensor is an electronic component for detecting levels of hydrocarbon gases such as smoke. This sensor has high sensitivity and fast response. The output produced by this sensor is in the form of an analog signal, this sensor also requires a direct current (DC) voltage of 5V (Ramady, et. al., 2020).

### Internet of Things (IoT)

Internet of Things (IoT) is a structure in which objects, people are provided with an exclusive identity and the ability to move data through a network without requiring two directions between humans, namely source to destination or human-to-computer interaction. IoT is a promising technological development, IoT can optimize life with smart sensors and objects that have networks and work together on the internet. Various everyday tools with smart sensors have been created and controlled via the internet. Through smart sensors, analog data is converted into digital data and then sent to the processor in real time. Thus, remote controlled equipment automation can be carried out in an IoT architecture (Wilianto & Kurniawan, 2018).

## 3. Research Methods

Researchers use the waterfall method because step by step they have to wait for the completion of the previous stage and go sequentially. The essence of the waterfall method is that the work of a system is carried out sequentially or linearly. So each stage must be completed first in full before moving on to the next stage to avoid repetition of the stages. Broadly speaking, the waterfall method has the following steps: Requirements Analysis and Definition, System and Software Design, Implementation, Integration and System Testing, Operation and Maintenance.

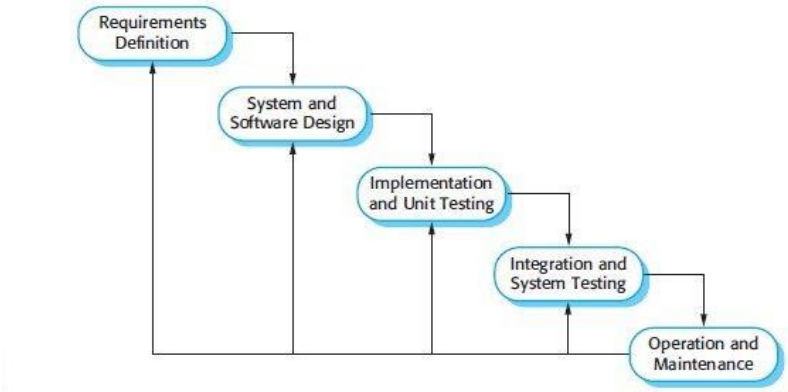

Fig.1. Waterfall Model

Following are the stages of the Sequential Linear Model Development / Waterfall Development Model according to Ian Sommerville:

1. Requirements Analysis and Definition

Here the researcher collects complete data then performs an analysis and defines the needs to be used in the form of an MQ-2 sensor as a smoke detector and a fan as a smoke neutralizer connected to the Arduino microcontroller. The system to be created will be applied to the campus lobby and canteen.

2. System and Software Design

At the System and Software Design Stage, the researcher describes the design of the system to be built in accordance with the data analysis carried out, namely when someone smokes in the lobby and campus canteen, the device can automatically detect smoke with an alarm warning and can help manage air circulation in a room by using the MQ-2 sensor and the Arduino Uno Microcontroller. Researchers want to develop smoke detection and neutralizing methods using Internet of Things (IoT) services. With the Internet of Things (IoT) service, data collection on smoke levels will be sent via the internet to an online website which then sends a notification alert to the smartphone application in charge of room security. In modeling the system, researchers use procedural concepts.

3. Implementation

In this implementation stage, the programs in the previous stages were translated into codes using a programming language. In this system the programming language used is C ++.

4. Integration and System Testing

In the Integration and System Testing stage, the integration of modules that have been made and tested is to determine whether the system that has been built is in accordance with the design and whether there are still errors or not.

5. Operation and Maintenance

In this Operation and Maintenance stage, a system that has been run must be maintained. Maintenance also includes fixing errors that could not be found in the previous stage.

## 4. Results and Discussions

### Hardware Design

Hardware design is a design or a series of tools used to build prototypes of Cigarette Smoke Detection and Neutralization Based on IoT Notifications using Arduino Microcontroller and MQ-2 Sensor in the campus area of STMIK Hang Tuah Pekanbaru.

### Arduino Microcontroller Circuit with MQ-2 Sensor

This MQ-2 sensor functions as a cigarette smoke detector which is connected to the Arduino Microcontroller so that it can detect cigarette smoke levels around the installed sensor area.

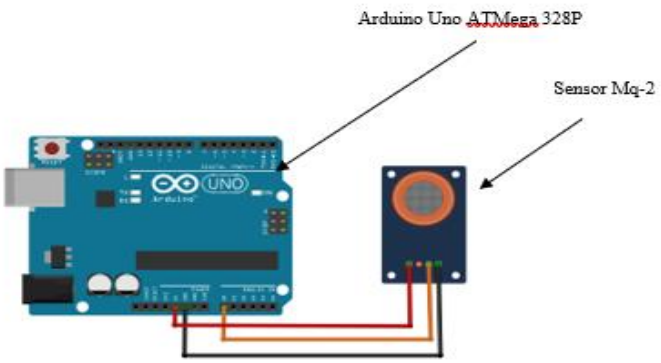


Fig. 2. Arduino Microcontroller Circuit with MQ-2 Sensor

### Arduino Microcontroller Circuit with DC Fan and Buzzer

This DC Fan functions as a cigarette smoke neutralizer which is connected to the Arduino Microcontroller so that it can neutralize cigarette smoke around the installed sensor

area and this Buzzer functions as a warning alarm connected to the Arduino Microcontroller so that it can warn those who have smoked around the sensor.

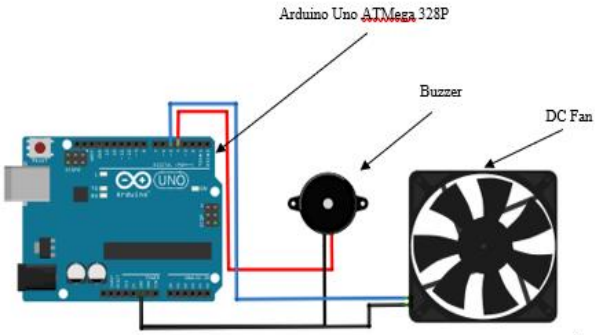


Fig. 3. Arduino Microcontroller Circuit with DC Fan and Buzzer

**Arduino Microcontroller Circuit with LCD Module**

This LCD module functions as a medium for providing information that is connected to the Arduino Microcontroller in order to provide information about smoke-free conditions in the area where the sensor is attached.

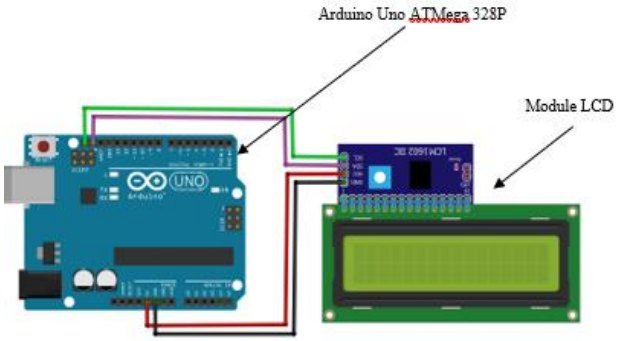


Fig. 4. Arduino Microcontroller Circuit with LCD Module

**Arduino Uno Microcontroller Circuit with ESP8266-01S Module**

This ESP8266-01S module functions as an internet network connector that is connected to the Arduino Microcontroller to send smoke level data and send notifications that are sent to the Smartphone.

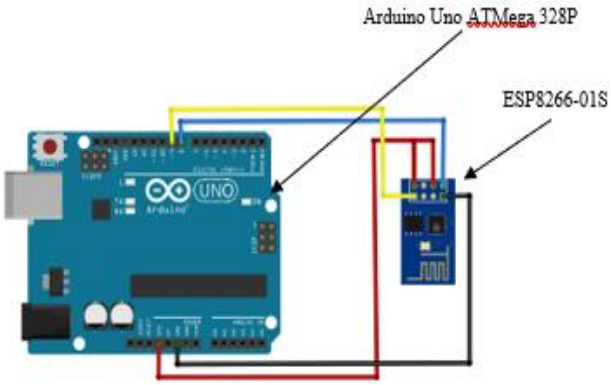


Fig. 5. Arduino Microcontroller Circuit with ESP8266-01S Module

**The whole set of hardware configurations**

The image below is a whole series of Cigarette Smoke Detection and Neutralization tools based on IoT Notifications using an Arduino Microcontroller and MQ-2 Sensor.

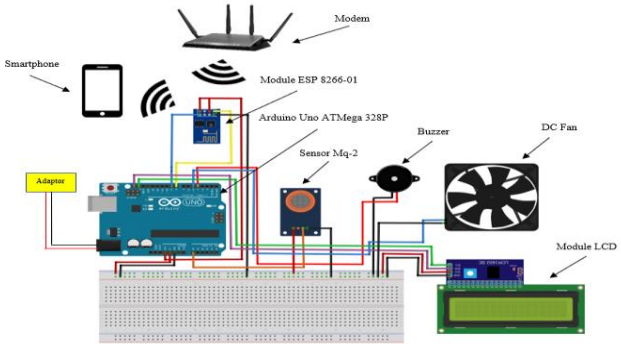


Fig. 6. The entire series of hardware configurations

Implementation is one of the stages in system development, where this stage is the stage of placing a cigarette smoke detection and neutralizing system in the campus area so that it is ready for operation and can be seen as an effort to realize the system that has been designed.

**Implementation of Smoke Graph Website**

**Warning Notification Display**

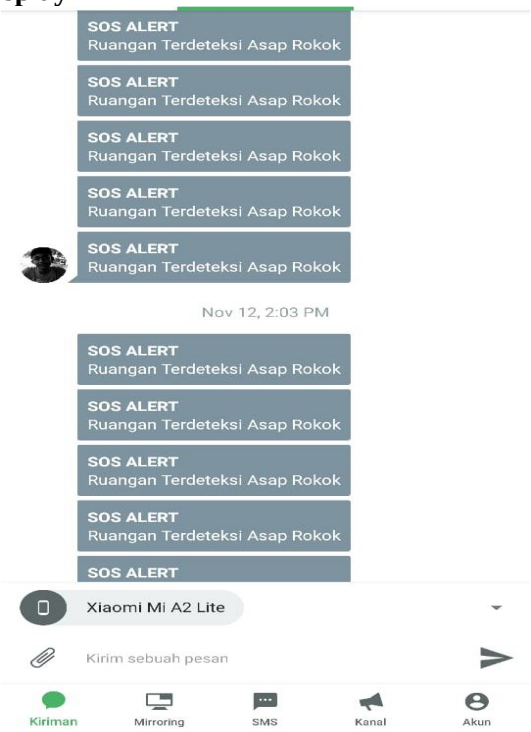


Fig. 7. Warning Notification Display

In the warning notification display there is a room warning message detected cigarette smoke sent from the smoke detection and neutralizing device to the pushbullet application

**Website Display Smoke Graph**

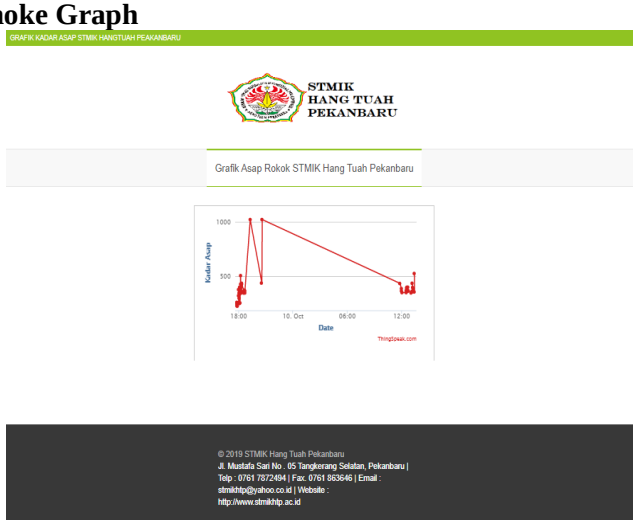


Fig. 8. Graphic Website Display

On the graphical website display, there is a graph of smoke levels detected by cigarette smoke that can be accessed anywhere

**Implementation of Smoke Detection And Neutralization Tools**


Fig.9. Implementation of Smoke Detection and Neutralization Tools

**System Testing**

Testing the Arduino Uno system on the cigarette smoke detection and neutralizing system in the campus area can be done with the following steps:

1. Connect the electric current source to the cigarette smoke detection and neutralizer hardware circuit
2. After that the cigarette smoke detection and neutralizing system will light up like the supporting devices, namely the Arduino Uno, the MQ-2 Sensor, the ESP8266-01S Module, and the Liquid Crystal Display (LCD) Module.

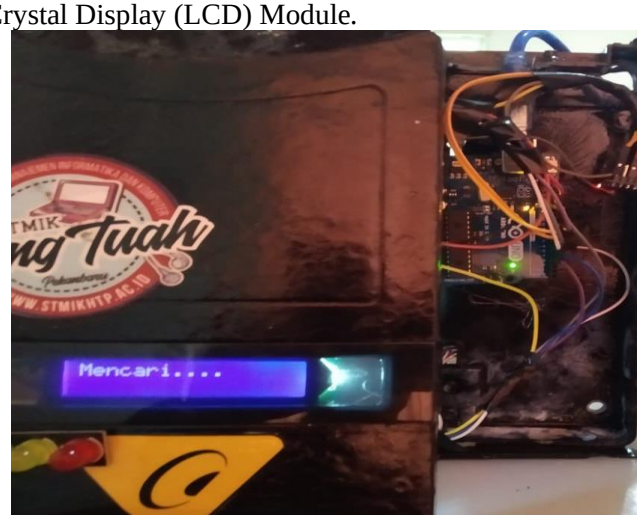


Fig. 10. System Devices Turns on

3. Then the cigarette smoke detection and neutralizing system will connect the internet network that has been set on the Arduino Uno microcontroller.


Fig. 11. Searching for a Connected Internet Network

4. After the cigarette smoke detection and neutralizing system is connected to the internet network, the mq-2 sensor is active and ready to detect cigarette smoke around the installed system.


Fig. 12. Active Mq-2 Sensor

5. When the cigarette smoke detection and neutralizing system detects the presence of cigarette smoke, the warning alarm and fan are activated automatically, then the system will send a notification of the detected smoke room and the system will send the smoke level value data to the website that can be seen by anyone.


Fig. 13. Cigarette Smoke Detecting System

The results of testing the smoke level value of the mq-2 sensor showed different conditions that occurred. In the absence of cigarette smoke, the level of cigarette smoke is less than 300, while the detected condition is cigarette smoke, the smoke level is more than 300. From the results of this test automatically when there is no cigarette smoke, the LCD display will display the words "Free Room There is cigarette smoke" accompanied by inactivity of the buzzer and fan. In the test results, the smoke level value of the mq-2 sensor is detected when cigarette smoke is detected, the system will automatically inform the LCD display "There is cigarette smoke" which is accompanied by an active buzzer as a warning alarm and a fan as a cigarette smoke neutralizer which then the system sends a notification. warning that the room is detected smoke and the system will send the smoke level value to the website in graphical form. Researchers used a smoke level value of more than 300 as detected cigarette smoke, because researchers had tested the system on several prototypes and when there was no cigarette smoke the smoke level value was less than 300.

## 5. Conclusion

Based on the results of the analysis, design and implementation that has been done. So some conclusions can be drawn including the following: The cigarette smoke detection and neutralizing system at STMIK Hang Tuah Pekanbaru uses the Mq-2 sensor as a cigarette smoke detector, the Arduino Uno microcontroller as a data processor, the Mq-2 sensor as a cigarette smoke detector, DC FAN as a neutralizer cigarette smoke, Buzzer as a warning alarm, Module ESP8266-01S as a connection to the internet network and data transfer to the website, and the LCD Module as a viewer and there is no cigarette that can work and function properly so that it is more efficient in detecting and neutralizing cigarette smoke. The cigarette smoke detection and neutralization system can make it easier for the Head of the Equipment Section and officers to monitor active smokers who smoke around the campus area without direct monitoring. By using a cigarette smoke detection and neutralizing system, it can reduce air contaminated by cigarette smoke which is very dangerous for second-hand smoke.

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