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Air Pollution Detection Information System in The East Jakarta Industrial Environment Using Internet of Things Based Geography Information System Technology

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Abstract**—** *Technology is currently developing so rapidly, almost all activities of human life cannot be separated from the use of technology. With increasing technological developments, this can certainly be used to overcome air pollution problems. The system limitations that will be designed are a pollution detection system using the MQ2 and Telegram sensors based on the NodeMCU ESP8266. The detection system that will be implemented consists of installing MQ2 sensors, buzzers, LEDs and LCDs as well as a Telegram application to provide notifications. Based on the results of analysis and testing of pollution detection system tools using the MQ2 sensor and Telegram based on NodeMCU ESP8266, it can be concluded that the sensor will detect smoke around the sensor. If the smoke detected is more than 100 PPM, Telegram will send a warning notification along with the buzzer and LED lights. However, if the detected value is less than 100, Telegram will not send a notification and the buzzer and LED will not light up.*

I. INTRODUCTION

Technology is currently developing so rapidly, almost all activities of human life cannot be separated from the use of technology. With increasing technological developments, this can certainly be used to overcome air pollution problems.

Air is an important component for living things. Air quality must be maintained so that it can be used optimally. However, air quality is currently deteriorating due to air pollution. As a result, air quality decreases and its use decreases.

Sources of air pollution can come from various activities such as transportation, offices and industry. This activity is the biggest contribution to air pollution. Apart from that, air pollution can also be caused by natural activities such as forest fires and others. The resulting impact causes a decrease in air quality and has a negative impact on the health of living creatures.

The absence of an air pollution monitoring system makes air pollution difficult to control, so an environmental air pollution monitoring system is really needed in the industrial environment of East Jakarta.

To make this detection tool, researchers used the MQ2 sensor, which is a sensor that is sensitive to detecting smoke in the air so it can be used to detect air pollution. Telegram is a cloud-based multiplatform instant messaging application.

II. METHOD

The system limitations that will be designed are a pollution detection system using the MQ2 and Telegram sensors based on the NodeMCU ESP8266. The detection system that will be implemented consists of installing MQ2 sensors, buzzers, LEDs and LCDs as well as a Telegram application to provide notifications.

The MQ2 sensor functions to detect pollution in the form of smoke which has been connected to Telegram so that it can provide notifications when smoke is detected. The buzzer will sound when the sensor detects smoke, then the LED will light up when the sensor detects smoke and the LCD will display the smoke level value.

The ESP8266 NodeMCU is the input and output control center and is where the program is stored. Arduino IDE (Integrated Development Environment) is the software used to program the NodeMCU ESP8266. The Telegram application is used to provide notifications about pollution. Arduino IDE (Integrated Development Environment) is software used to design programs via Arduino, in other words Arduino IDE is a medium for Arduino board programs. The Arduino IDE functions as a text editor to edit, create and validate program code. Arduino IDE can also perform upload actions to the Arduino board. The program code used in the Arduino programming process can be called the Arduino "sketch" or can be said to be the Arduino source code.

Telegram is a cloud-based multiplatform instant messaging service application that focuses on speed and security. Telegram is designed to make it easier for users to send text, audio, video and image messages to each other safely. Not only safe, Telegram is also an instant or fast message sharing application.

This architectural design is part of the explanation made in a series to make it easier to understand the connections in the tools being made. The following is the architectural design of the NodeMCU ESP8266 based pollution detection tool at the Banjaran District Office.

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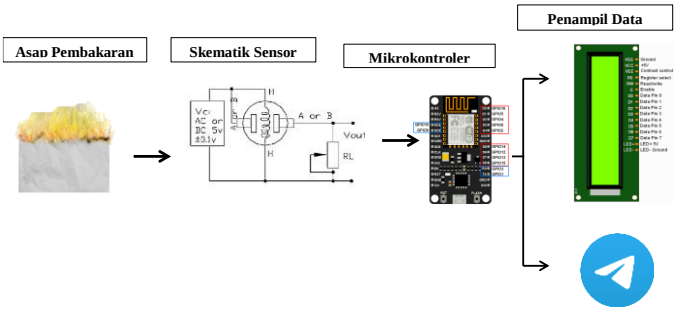

Figure 1 Architectural Design of NodeMCU ESP8266 Based Pollution Detection Tool

An overview of the data flow that occurs in the pollution detection system can be seen in the following flowchart.

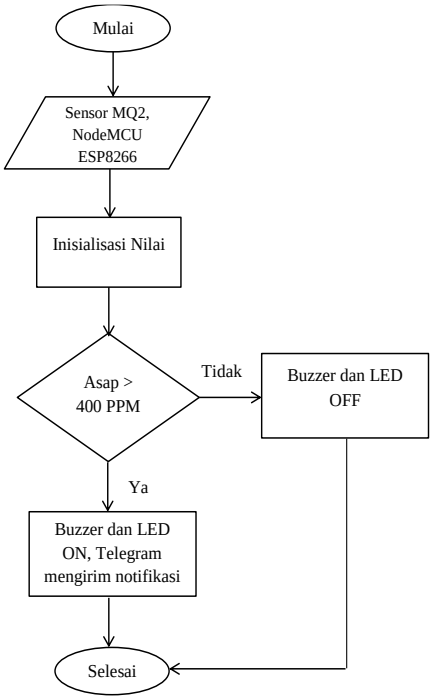

Figure 2 Pollution Detection System Flowchart

III. Result and Discussion

3.1. Ways of working

The way this system works is based on the circuit scheme that has been created. There is an MQ2 sensor as a pollution detector, buzzer and LED as an indicator. All the functions above will work well if everything is assembled according to the scheme and tools that have been programmed via the Arduino IDE software and Telegram application and connected to the internet so that all components will carry out their functions properly. The stages are:

- Connect the NodeMCU to the laptop USB
- Upload the code that has been created to NodeMCU
- After the coding has been uploaded, assemble all the components
- Display connected Telegram

3.2 Testing

Testing of the pollution detection system is carried out so that the program created meets expectations. This is done after the system is turned on and connected to a WiFi internet connection. Testing is carried out as follows.

The test was carried out by providing smoke around the MQ2 sensor. When it reaches a value of more than 100, a warning notification will appear from Telegram along with the buzzer and LED turning on.

TABLE 1 Table of MQ2 Sensor Testing

Smoke	Notifications	Buzzer sounds	LED On
<100 PPM	No	No	No
>100 PPM	Yes	Yes	Yes

3.3 Test Results

Based on the results of analysis and testing of pollution detection system tools using the MQ2 sensor and Telegram based on NodeMCU ESP8266, it can be concluded that the sensor will detect smoke around the sensor. If the smoke detected is more than 100 PPM, Telegram will send a warning notification along with the buzzer and LED lights. However, if the detected value is less than 100, Telegram will not send a notification and the buzzer and LED will not light up.

IV. Conclusion

The pollution detection tool created can be connected to the Telegram application and will send notifications containing unsafe air warnings if pollution reaches a value of more than 400 PPM. Everything is assembled according to the schematics and tools that have been programmed via the Arduino IDE and connected to the Telegram application. And connected to the internet so that all components will carry out their functions according to the program created.

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