Design of Electronic Instruments as Tools Air Pollution Detection

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ABSTRACT
Carbon monoxide gas pollution as exhaust gas increases every year along with the increase in the number of motorized vehicle users. Carbon monoxide has harmful effects on the environment and human health and even leads to death. In this study, a CO gas gauge was created using the MQ-9 CO gas sensor to detect and measure the concentration of CO gas in the air. This device uses HC-05 wireless technology so that it can be used from a distance that does not endanger researchers from inhaling gas. The calibrated device is then tested at a different location to detect and measure the amount of CO gas at that location. The data from the sensor is processed by Arduino and the results are displayed on the LCD and sent from wireless HC-05 to the Android application. The results of testing in several locations, obtained data on the concentration of CO gas of 27 ppm in areas with no potential for pollution and 62 ppm in areas with potential there is pollution. The method to be used is a method of designing and manufacturing real tools. The research will start from determining the subject matter, then collecting related literature materials. Furthermore, the design and manufacture of instrument tools are carried out so that they can be integrated with an Android-based system. During the process of system design and implementation, data collection of problems and troubleshooting will be carried out and then analyzed until a conclusion is reached, which will be documented.

Keywords: *CO gas, android, pollution, instrument tools, system implementation*

1. PREMILINARY

Air is the most important factor in life, but with the increasing development of cities and industrial centers, air quality has changed. What used to be fresh, is now dry and dirty. This change occurs as a result of air pollution. Air pollution can be interpreted as a decrease in air quality, so that the air experiences a decrease in quality in its use and ultimately can no longer be used as it should be in accordance with its function. threatens human life. The causes of air pollution, approximately 70%, come from the incomplete combustion process of fuels produced through factory machines, power plants and motor vehicles. The resulting substances include CO2 (carbon dioxide), SOx (sulfur oxides), NOx (nitrogen oxides), and carbon monoxide (CO). Carbon Monoxide (CO) is a gas that is colorless, odorless, and tasteless. It consists of one carbon atom covalently bonded to one oxygen atom. In this bond, there are two covalent bonds and one coordinating covalent bond between the carbon and oxygen atoms.

Carbon Monoxide (CO) can have a negative impact on the human body. The signs and symptoms of CO poisoning vary depending on the level of COHb in the blood. Someone who is poisoned with Carbon Monoxide (CO) will experience symptoms of headaches, mental dullness, dizziness, weakness, nausea, vomiting, loss of muscle control, followed by a decrease in pulse and respiratory rate, fainting, and even death. To find out the level of air pollution, a detecting device for air pollution levels is needed that functions as a monitor for pollution levels and for early detection in air pollution, so that it becomes a reference for making programs to tackle the air pollution problem.

The number of vehicles passing by, both coming and leaving the city of Bandung, causes the air around it to feel hot and dusty. In addition, a tool that can detect air pollution levels is not installed, so an idea emerged to make a design for detecting air pollution levels using a gas sensor with wireless technology. To detect carbon monoxide (CO) gas, a sensor that is sensitive to carbon monoxide gas is needed, such as: the gas sensor TGS2600, TGS2442, TGS5042 and MQ-7. However, in this study using the MQ-7 gas sensor. The advantages of the MQ-7 gas sensor are its high sensitivity to carbon monoxide (CO), stability, and long life.

This research will discuss the problem of how to design an electronic device to detect air pollution levels in the form of carbon monoxide (CO) using the MQ-7 gas sensor with HC-05 wireless technology. This tool can detect whether the area is polluted by air pollution in the form of carbon monoxide.

The results of this detection are displayed on the monitor screen of electronic instruments that will be designed to be built or on mobile phones based on Android. The graph of changes in air pollution levels from time to time in that place can be seen on an Android-based mobile phone with a feature called Blynk which is taken and entered from the play store site.

2. RESEARCH METHODS

Research in the design of an instrument for detecting air pollution levels is carried out with three design schemes, namely the design of the work scheme of the system to be made, the design of the circuit and the design of programming for connectivity with Android-based cellphones. The object that is censored in the form of a gas that causes air pollution in one place can be observed or seen on the monitor screen of the air pollution level detection instrument, whether it is still in a safe condition or not. In addition to being able to monitor the conditions for measuring data wages, air level detection instruments can also be seen on the Android-based mobile phone monitor. The procedures that must be followed in designing an air pollution detector, include:

3.1 Working Scheme System

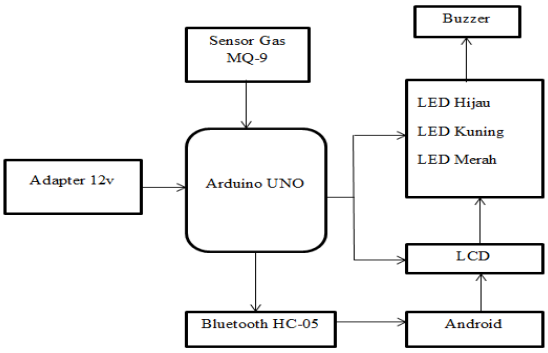


Figure 1. Block diagram of electronic instrument circuit

3.2 Electronic Instrument Design

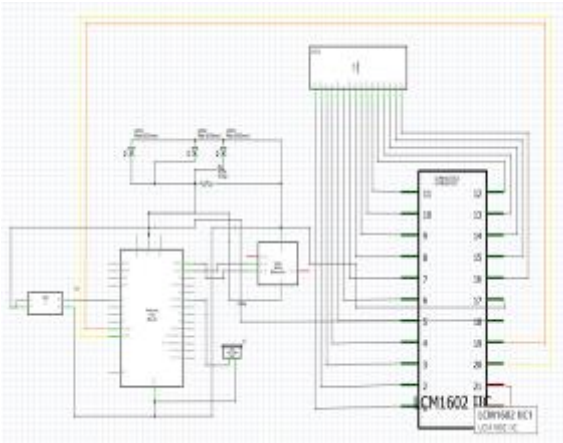


Figure 2. Lay out of electronic instrument circuit

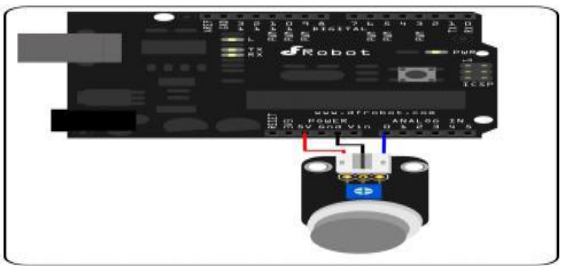


Figure 3. Installation of the MQ-7 gas pin to Arduino

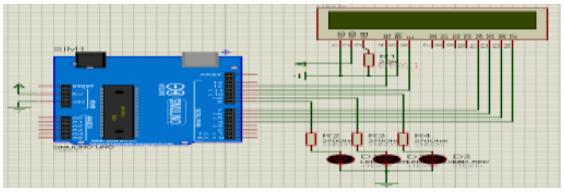


Figure 4. LCD and LED circuit

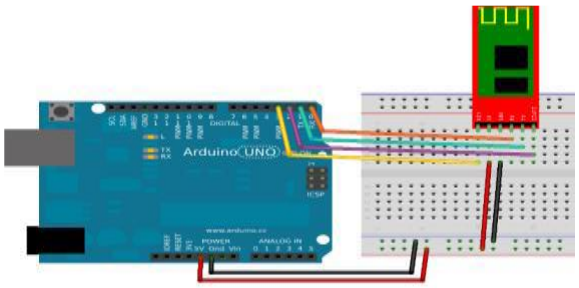
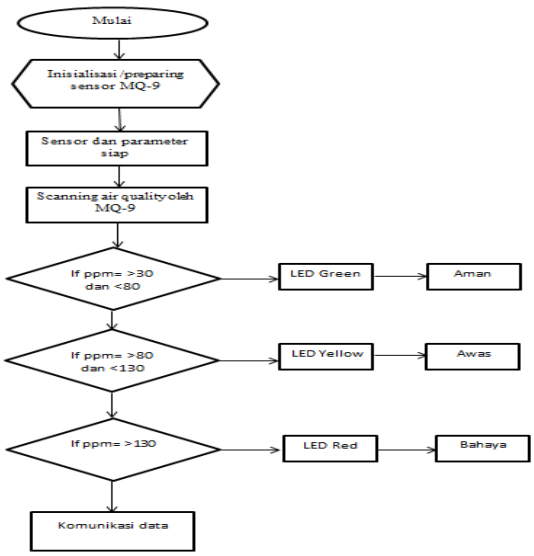


Figure 5. Bluetooth Hc-05 circuit

3.2 Flowchart Design Coding Program



3.3 Electronic Instrument Circuit Performance

Overall, the design of air pollution detectors consists of a series of MQ-7 sensors, a series of LEDs, Bluetooth hc-05 and an LCD circuit connected to the Arduino Uno microcontroller. The MQ-7 gas sensor is used as data input from Arduino Uno. The data is processed by an uploaded program so that it can read carbon monoxide in the air continuously. A gas sensor that has detected carbon monoxide will then be processed in Arduino so that the output is the value shown on the LCD and if what is shown on the LCD> 30 and <80 ppm then the LED is green, if the ppm is above 80 ppm then the LED will turn yellow and finally if the listed value exceeds 130 pp then the led will be red. Overall, the design of the pollution level detection tool used by 2 pieces of software, including the Arduino software, which functions to code the commands contained in the tool so that it can work, and the Blynk software functions to view graphs and values so that the data on an Android-based smartphone .

3. RESULT AND DISCUSSION

The process of measuring air pollution levels in certain areas using electronic instruments made in this study was carried out by means of a location survey to determine the quality conditions of pollution levels on the road. The Bluetooth instrument on the device will show that it is directly connected to the bluetooth smartphone. After that the user can see how much pollution levels appear on the appliance, if the pollution level is safe then the green LED will light up, if Beware the yellow LED will light up, if the pollution level reaches the danger level then the red LED will light up. The display of electronic instruments and their measurement results will be seen in two observation areas, namely at JL. Soekarno Hatta and Jl. Windows Sudirman Palembang. Data Display Testing Tools and Applications on Jl Soekarno Hatta Palembang is shown in Figure 6. The display on the tool shows 49 ppm, meaning the air is in a safe condition. In Figure 6, you can see at 14:24:57 WIB the concentration of CO gas in this area which has the potential to contain air pollution is quite large, this is because the traffic in the area is quite dense. The number of vehicles, especially trucks that cross the road, is quite large so that the value of CO gas concentration often varies according to the density conditions of vehicles at the location. The CO gas concentration was read at 49 ppm. Data Display Testing Tools and Applications on Jl Soekarno Hatta Palembang can be seen in Figure 7 where the data on the tool shows 52 ppm, meaning that the air is in a safe condition. In Figure 7, the data obtained at 14:24:27 WIB concentrations of CO gas in areas that have the potential for air pollution are quite large and higher, this is due to the traffic in that area is quite dense. There are quite a lot of vehicles, especially 4-wheeled vehicles crossing the road, so that the value of CO gas concentration often changes according to the density conditions of the vehicles at the location. The highest concentration of CO gas is 52ppm.

Figure 6. Display Testing Tools and Applications on Jl Soekarno Hatta Palembang

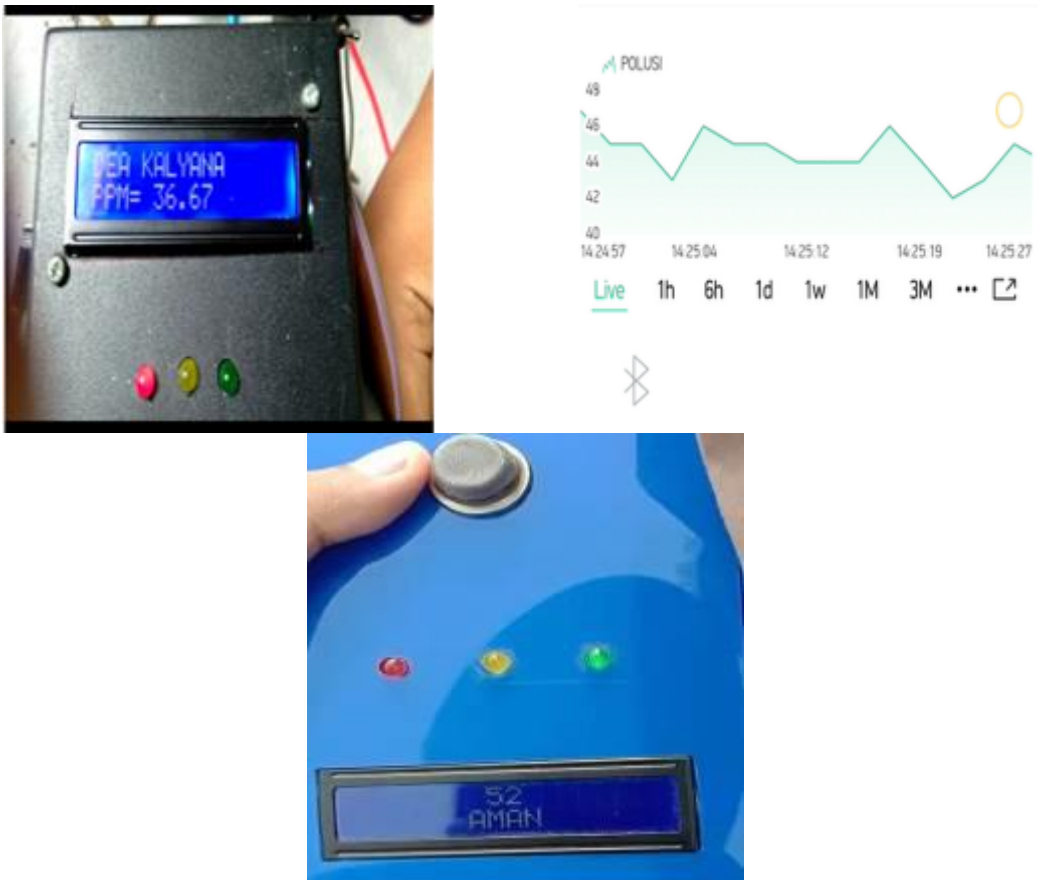


Figure 7. Display Testing Tools and Applications on Jl. Jendral Sudirman Palembang

4. CONCLUSIONS

The design of an air pollution detector can detect carbon monoxide in a certain area. Input from the gas sensor on the electronic instrument is processed through Arduino software, produces output on the LCD and LED and is sent to an Android-based cellphone in the form of a graphic display.

Hardware: the design of the air pollution detector consists of a series of MQ-9 sensors, a series of LEDs, Bluetooth hc-05 and an LCD circuit connected to the Arduino Uno microcontroller.

Software: design of the software pollution level detector used 2 pieces. among others, the Arduino software functions to code commands contained in the tool so that it can work, and the Blynk application which functions to connect Bluetooth from the device and connect to an Android cellphone displaying a graphic.

The results of the implementation of the air pollution level detector using the MQ-9 can identify harmful air levels (such as carbon monoxide levels) in exhaust gases in motorized vehicles, then provide indications and information to users via an android application with wireless HC-05 technology., with the air quality index / value> 10 and <80 the air is good,> 80 and <130 moderate air, while> 130 air is not healthy or danger

REFERENCES

[1] Data CO (Karbon Monoksida)*:http://komposisi.sains.lapan.go.id/htm/co.ht m* : (Diakses Pada Tanggal 4 September 2014)

[2] Indahwati, E., & Nurhayati. (2012 .) Rancang Bangun Alat Pegukur Konsentrasi Gas Karbon Monoksida (CO)-Menggunakan Sensor Gas MQ Berbasis Mikrokontroller 135 Dengan Komunikasi Serial . USART *ejournal*,20.

[3] Jenis – Jenis Mikrokontroller : *https://kelasrobot.com/jenis-jenis-microcontroller-arduino/* : (Diakses ada tanggal 5 Oktober 2019)

[4] Kadir, A. (2013). *Panduan Praktis Mempelajari Aplikasi Mikrokontroler dan Pemrogramannya menggunakan Arduino.* yogyakarta: Penerbit Andi.

[5] Karbon Monoksida : *https://indonesian.alibaba.com/product-detail/mq-9-carbon-monoxide-combustible-gas-sensor-alarm-module- mq9module60*

[6] Mengenal Arduino Software : *https://www.sinauarduino.com/artikel/mengenal-arduino-software-ide/* : (Diakses pada tanggal 15 Oktober 2019)

[7] Mukono, H. J. (2005). *Toksikologi Polutan Udara.* surabaya: Penerbit Airlangga University Press.

[8] Ogata, K., & Leksono, E. (1995). TEKNIK KONTROL AUTOMATIK (SISTEM PENGATURAN) jilid 1. jakarta: Erlangga.

[9] Rizki, F. (2011). *Alat Pendeteksi Polusi Udara Dari Gas Karbon monoksida (CO) pada Ruangan Berbasis Mikrokontroler AT89S51.* Surabaya: Universitas Pembangunan Nasional "Veteran" Jawa Timur