Design Measuring Instrument Dust Based Internet of Things

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Abstract. Dust is one of the causes of decreased air quality, for it needs a remote-controlled dust gauge and bias store data measurement results. During this measuring device there is no data storage facility of measurement results, for the need for storage of data measurement results. Storage of measured data using internet of things displayed through PC. So no longer need to dating record to the measurement of dust, simply see the results of measurements through the PC, which can be seen bias measurements an minutes. In building this dust meter using NODEMCU, sensor type gp2y1010au0f sharp, step down, 16x2 LCD. Measurement of dust is done at campus area 2 at four point location that is canteen, entrance of campus 2, electro laboratory warehouse and front page of campus 2. Measurement of dust conducted on 22 and 23 March 2018 at 12:51-12:55, 13:13-13:17, 06:58-07:02, 07:43-07:47, 05:51-05:55, 06:01-06:07, 00:00-00:04, and 00:42-00:46. The result of measurement of dust at campus area 2 at the entrance of the parking at 13:13-13:17 dust concentration tends to rise from 0.1-0.3 when the students come home. The canteen area at 12:15-12:55 concentration of dust tends to rise, that is 0.08-0.1 mg/m³ when the student breaks college.

1. Introduction

Along with the current development of the technology field can’t be separated from the use of motor vehicles for the mobility of daily activities and in social relationships, society can’t be separated from using Mobile / HP The use of automobiles can lead to air pollution from non-environmentally friendly fuel. Air pollution by dust can harm human health which affects the reductions labour productivity, which can lead to long-term economic losses as well as economic problems and social problems in society [1-6]. Technological developments in the field of electronics today use the Internet in the data processing of sensor inputs. Internet of Things (IOT) is a technology connected to various data terminals over an Internet network or other telecommunication network [7-11].

For the need to automatically monitor air pollution, you know the concentration of air pollution directly, one of them air pollution by dust. The design of this dust meter consists of hardware and part of the server, this hardware is a wifi module as a communication tool. Dust sensor type gp2y1010au0f as a dust concentration detector, data output from sensor processed by microcontroller, which was then sent to IP (Internet Protocol) so happens communication between wireless module [10].

Earlier investigations on the measurement of the dust concentration can’t yet save the concentration data of the measurement results directly. This dust concentration measurement study can measure in real time and the measurement data can be stored directly on the computer web server or mobile phone.
and displayed directly on the LCD. Thus, every minute the dust concentration in a measuring range can be measured.

2. **Material and method**

The research into the design of the Internet of Things (IOT) dust gauge starts from the research of electrostatic precipitator design (ESP) as a microcontroller based dust meter. Furthermore, the development of measuring devices based on outdoor SMS Gateway with the same dust sensor [12-14]. The current research design can be shown in Figure 1 [13-15].

![Figure 1. System block diagram.](image_url)

Figure 1 shows the components used in the development of the measurement of the dust-based Internet of Things (IOT), i.e. dust sensor gp2y1010au0f as a dust detector, NodeMCU as a web server. When IP addresses are accessible, sensors send NodeMCU data to things that connect measurement results to a computer or mobile phone. The data from NodeMCU also show the measurement results via the LCD, as the results of the measurements are displayed directly. Power sources components use 9 volt battery and step down.

3. **Data collection**

This research was conducted on the campus site 2 Universitas Muhammadiyah Sidoarjo Jl. Gelam No. 250 Candi Sidoarjo Jatim Indonesia. The measurements were carried out on four campus areas, namely canteen area, park entrance on the 2nd floor, laboratory building for electrical engineering and campus garden. The test was held on March 22nd and 23rd, 2018 at 12: 51-12: 55, 13: 13-13: 17, 06:58, -07: 02, 07: 43-07: 47, and 05: 51-05 performed: 55, 06: 01-06: 07, 00: 00-00: 04, 00: 42-00: 46.

4. **Results and discussion**

Figure 2 shows a graphical representation of the results of the IOT test on March 22, 2018 from a test of Measurement 1 in the Canteen area at 12: 52-12: 55, the highest reading at 12:53 when the college student came home. Trial 2 at the entrance of the second floor parking area during the day, ie at 13:17 concentration of dust 0.3 saat college students go home. Trial 3 at 06: 58:07-02: 07: 43-07: 47 and 05: 51-05 performed: 55, 06: 01-06: 07, 00: 00-00: 04, 00: 42-00: 46.

Figure 3 shows a graphical representation of the measurement results at the IOT on March 23, 2018 in the canteen area and the second floor parking area. In the cafeteria at 05: 51-05: 55 the highest dust concentration is 0.2 hours 05:52, while on the parking area 2 at 06: 13-06: 17 the highest dust concentration is 0.12 hours 06:13. Attempt 3 and 4 areas of the Electrical Engineering Laboratory and front page of the campus. In the electrotechnical laboratory at 00: 00-00: 04 the highest dust concentration is 0.12 at 00:02, while in the front of the campus 00: 42-00: 46 the highest dust concentration is 0.13 at 00:46.
Figure 2. Graph of measurement testing 1.
Based on the results of an Internet of Things measurement test in two days in four different locations at different locations within the campus area, measurements were taken in the morning, at noon and in the evening. The morning dust concentration was between 0.02 and 0.25 o'clock. At 5:52 am, cleaners started working on campus to clean up the campus area. At 13:17 o'clock, the dust concentration is 0.3, so many students come home from campus so it affects the existence of a car over the campus area. At

**Figure 3.** Graph of measurement testing 2.
night, the highest dust concentration is 0.13 at 00:44. The results of all dust concentration measurements are considered safe, as they are still below the standard of air quality.

Previous studies using the Internet of Things with the NodeMCU web server to measure the water level in tanks with ultrasonic sensors are similar to this research used to measure real-time data \[10, 14\]. A network connecting various objects with an identifiable identity and IP address is the Internet of Things (IoT), which leads to the communication and exchange of information about itself and the environment it perceives. Object measurements with IoT can create services and work together to achieve a common goal. IoT has been able to change the definition of the Internet as a computer anywhere, anytime, like any computer or service. One flaw in the IoT implementation is security and privacy issues. Therefore, cryptography is required to enable IOT to be used in daily life \[9\]. Monitoring of pollution is necessary to ensure that no adverse environmental effects on human health, animals, plants and the natural environment itself occur. The effects of dust exposure in humans can lead to respiratory diseases leading to increased respiratory disease \[4\]. The Internet of Things (IOT) is also used in smart home design to control the lights that are integrated through the relay \[15\].

5. Conclusions

Based on IOT-based dust measurements with NodeMCU V1.0 and gp2y1010au0f, the dust sensor can be summarized as follows: The IOT-based dust measurement design can work optimally and accurately measure the dust concentration in real time. The measurement data displayed on the LCD is the same as that sent by NodeMCU to the web server. Concentration of dust in campus area 2 University of Muhammadiyah Sidoarjo at noon at 13:17 greatest when students come home from college. The disadvantage of this measurement is that a device can be used at different times. For future improvements, it can use multiple devices in different places and at the same time. Display on web server dynamically equipped with GPS during the measurement.

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