Water Quality Monitoring System of Bengkalis PDAM Based on The Internet of Things

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Abstract. PDAM is a company engaged in the distribution of clean water for the community. The water quality monitoring system for the Bengkalis PDAM for each household is still carried out manually. That is, it is still monitored by having to see it directly. If the monitoring system is replaced using a more modern design, it will greatly facilitate the users. One of the systems proposed to overcome these problems is an internet-based monitoring system of things. This system uses turbidity, pH, and LM35 sensors to detect water turbidity, water acidity and water temperature, which can be accessed anywhere and anytime. This system makes it easy to monitor PDAM water quality. The system created uses the Django base python framework and SQLite as the database. This system was tested on several PDAM water samples in Bengkalis City. The results of the output data of the turbidity sensor, pH sensor and LM35 sensor are displayed on the website as graphs and numbers.

Keywords: Monitoring System, PDAM Water, Internet of Things, Quality.

1 Introduction

Water is the main source of need for human survival [1]. Water is a source of life that is needed by every living thing. However, as the population increases, the water demand also increases. As a result of the decline in groundwater quality, many people have switched to using PDAM water to meet their daily needs [2]. PDAM is a company engaged in the distribution of clean water for the community [3]. Even so, the PDAM has not been able to serve the needs of clean water for the whole community. Many facts are found in the field that the water content distributed by the PDAM is contaminated chemically, bacteriologically and physiologically. Physiologically, the parameters encountered were changes in colour, smell, taste, temperature and turbidity [4][5].

Monitoring water quality is very important to maintain water quality so that it impacts survival. Monitoring the quality of PDAM water in every household is still being carried out manually. That is, it is still being monitored by having to look directly at it. Monitoring cannot be done digitally by utilizing technological developments. With the above problems, a PDAM water quality monitoring system based on the Internet of Things is proposed.

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Internet of Things (IoT) is defined as the network of physical objects/things - devices, vehicles, buildings embedded with sensor, micro-controller, and network connectivity that enables these objects to collect and exchange data. The IoT can be described as a huge web of embedded objects designed with built-in wireless technologies such that they can be monitored, controlled and linked within the existing Internet infrastructure [6].

This system has the advantage of monitoring PDAM water quality which can be accessed anywhere and anytime as long as it has an internet connection. Monitoring can also be done in real-time and presented on a website through graphs and numbers.

2 Methods

2.1 Research Tools

The tools used in this study are as follows:

1. Hardware (Hardware)
    a. Laptops
    b. Arduino Uno
    c. Turbidity Sensors
    d. pH meter sensors
    e. LM35 sensors
    f. USB Cable / Data Cable
    g. Jumper Cable

2. Software (software)
    a. Arduino IDE
    b. Dbeaver
    c. Visual Studio Code

2.2 Design System

This section describes the general system design and displays all the equipment needed to create a PDAM water quality monitoring system in real-time as well as the workflow design of the sensors. This design is useful to make it easier to know how the system workflow is in outline. The general system design that discusses system workflow can be seen in Figure 1.

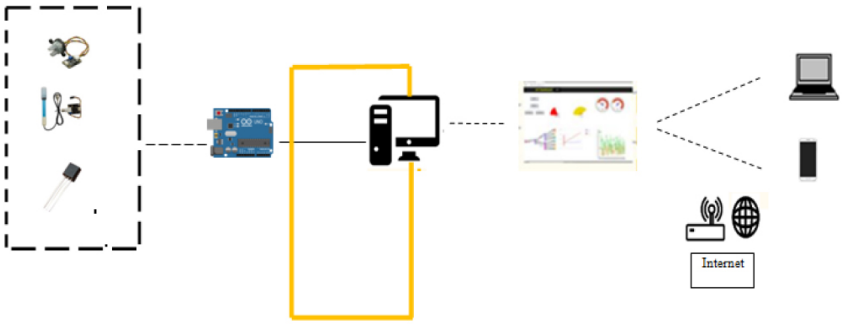

Fig. 1. Design System.

Based on Figure 1, this research designed a PDAM water quality monitoring system that uses turbidity, pH, and LM35 sensors to measure water conditions and temperature. All sensors are connected to Arduino Uno. On Arduino, program commands measure the level of turbidity, acidity and temperature of PDAM water. Arduino is connected to the laptop via a USB cable. The read data is sent to the server, and all sensor data from the server is stored in the database. Then the results of the PDAM water turbidity, acidity and temperature values are displayed on the website as graphs and numbers.

2.3 Interface Design

The interface functions as a liaison for PDAM water condition and water temperature values stored in a database so that the user can see them. It also provides information on turbidity, acidity and water temperature that has been measured according to the ideal limits of water conditions and water temperature. This PDAM water quality monitoring system displays the values of all the sensors used. The value shown on the website will be accompanied by the date and time. The display design of the turbidity, pH and LM35 sensor values can be seen in Figure 2.

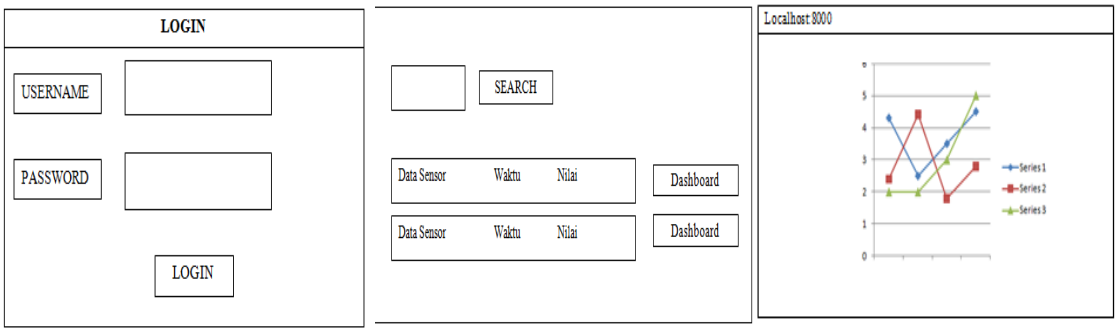

Fig. 2. Interface Design

3. Result and Discussion

This research resulted in a real-time PDAM water quality monitoring system to determine the water's condition and temperature. This system provides information on water turbidity level, acidity and water temperature measured using turbidity, pH and LM35 sensors which can be accessed through the website. PDAM water condition and temperature data measured by these sensors are stored in a database and displayed on the website that has been created. The information displayed is in the form of sensors' values and real-time temperature information.
The general results are in the form of a PDAM water quality monitoring system through a created website, which is stated in Figure 3 and Figure 4. The monitoring website is a website that acts as a viewer for turbidity, pH and LM35 sensor data taken from the SQLite database.

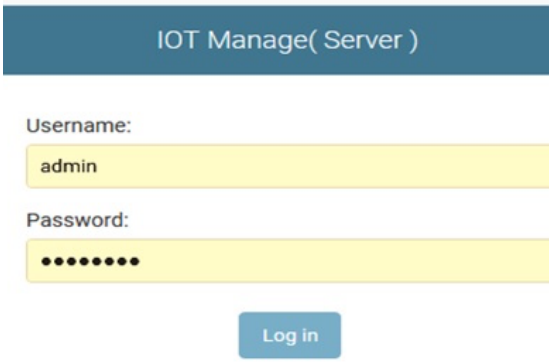

Fig. 3. Login View

Figure 3 is the website's initial page to see the sensor data display. Users must log in first to view sensor data through graphs and numbers.

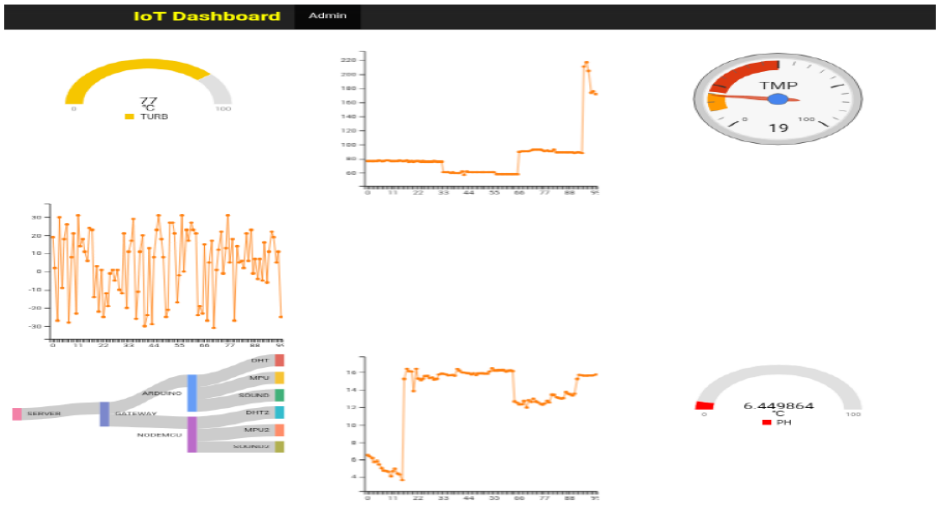

Fig. 4. Sensor data graph display

Figure 4 displays all sensor data installed on Arduino. The displayed sensor data is in the form of graphs and numbers. Sensor data showed turbidity sensor data, pH sensor data and LM35 sensor data.

Table 1. Test Result.

No	Sensor Typer	Test Results Display Data
1	turbidity	Succeed
2	pH	Succeed
3	LM35	Succeed

4. Conclusion

Based on the results of testing the PDAM water quality monitoring system, it can be concluded that it can display real-time data based on a microcontroller, which can be displayed in graphical and numerical form. The turbidity, pH, and LM35 sensor successfully display data on the website. The data shown are water turbidity level data, water acidity data, and water temperature data. After testing the system using a web browser, it was found that the website worked well and displayed a responsive display. Data for each sensor managed to appear well in the form of graphs and numbers.

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