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A CONTROLLING MONITORING WATER DEPTH AND TURBIDITY BASED ON INTERNET THING

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Based on the results of the research conducted, there were problems found that when the process of checking the depth and turbidity of water quality was still using a manual system that involved the role of employees in carrying out the checking process using a opacimeter and level transmitter. Therefore, researchers provide input and suggestions for the process of checking the depth and turbidity of Water using sensors to get the results of checking and an Internet of Things based system to monitor the results of the sensors used.Then the results of the process can be monitored directly into the website platform. In this research, the writer uses fuzzy logic method to program the hardware and monitoring results use a website with codeigneter framework. Which aims to build a monitoring system for checking the depth and turbidity of water quality automatically using ultrasonic sensors and turbidity sensors.

1. INTRODUCTION

Before clean water is distributed to the community, the water quality is checked so that the water quality is suitable for consumption and is clean. However, there are shortcomings in the process of checking the depth and turbidity of water quality, employees still use the role of checking manually using a Turdibity meter to check water turbidity and a Level Transmitter to check water depth. Then the results of the check are written into the check results report book. As a result, in the system that is already running, using the role of employees can cause human error and lack of efficiency in terms of time and energy in the process of checking water depth and turbidity.

A monitoring system is a system that is very necessary in an application. The monitoring system here acts as a provider of data which will be processed further after the data is sent from a monitoring system . Water depth is the water level or water height in a place. Meanwhile, water turbidity is a condition where the transparency of a liquid is reduced due to the presence of other substances. The presence of the substances in question are dissolved in the liquid and makes it appear foggy or unclear.

The water quality depth and turbidity monitoring system that will be created will use a website and internet of things based system. Internet of Things or often called IoT is an idea where all objects in the real world can communicate with each other as part of one integrated system using the internet network as a link. The devices and sensors that will be used in this research are, firstly Wemos, Wemos D1 is a WiFi module device based on the ESP-8266 microcontroller, Wemos D1 has a function that is not much different from Arduino whose function is as an open source microcontroller, this device can be used in developing internet of things projects. Wemos D1 can be programmed using Arduino IDE software. The second Turbidity sensor, the Turbidity sensor, is a Turbidity sensor that can detect water turbidity by reading the optical properties of water due to light and as a comparison of the reflected light with the incoming light. The three ultrasonic sensors, ultrasonic sensors are 40 khz parallax sensors which are widely used for intelligent robot applications or contests.

The advantage of this sensor is that it only requires 1 signal (SIG) apart from the 5 V line and ground. The fourth LCD, LCD (Liquid Crystal Display) is a circuit whose job is to monitor information about connected sensor devices. Fifth, namely the buzzer, the buzzer is a component that functions to emit sound, its working principle is basically almost the same as a loudspeaker, so the buzzer also consists of a coil that is attached to a diaphragm and then the coil is electrified so that it becomes an electromagnet. This system is expected to simplify and help various jobs related to water

quality monitoring. There is a problem with the Waterindo Primatech company, namely that when checking the depth and turbidity of the water, it is still done manually using the role of employees who have to check the turbidity equipment and level transmitter.

Water can be classified into two types, namely clear water and cloudy water, both of which have their own characteristics. Clear water is one of the high-quality water resources that can be utilized by humans for daily activities, including sanitation. Water conservation is non-negotiable. The choices we make today determine what happens in the future, and we certainly don't want a shortage of water later on. One activity that requires a significant amount of water is bathing, which is typically done twice a day and uses an average of 50 litres of water per bath.Using that amount of water is not in line with water availability. In order to avoid wastage of water and prevent the spread of diseases during bathing, it is necessary to conduct research that can control the use of clean water to make it more efficient and hygienic.

In this prototype Upon the system that detects water turbidity using photodiode sensors and infrared light, which operates by measuring light intensity by measuring the voltage changes produced. Therefore, practically, the measurement of light intensity causing voltage changes produced by photodiode sensors and infrared light can be used to detect the level of water turbidity in a bathtub. On the automatic water filling system that uses an ultrasonic sensor with a transmitter (Tx) and receiver (Rx) and is utilized as a transmitter (Tx) that emits ultrasonic waves. Then, after the wave hits the water surface, it will be reflected and received by the receiver (Rx) so that the water level can be determined and the water pump can be turned off when the water condition in the reservoir tank is already full, and turn on the water pump again when the water in the tank is empty automatically. This prototype can be remotely monitored using a smartphone.

Literature Review

Water

Quality and quantity of clean water Water is one of the carriers of disease originating from humans. When water is consumed as a drink or food and does not carry disease-causing agents, good water treatment is required. Water from a network transmission or distribution source is absolutely necessary to prevent contact between waste as a source of disease and much-needed water. Therefore, it is necessary to have a water source that can provide good quality and quantity of water. Improving the quality of drinking water by treating the water that will be used as drinking water is essential, especially if the water comes from surface water.

Water Turbidity Turbidity is an optical property that occurs due to the scattering of light by particles that are dispersed in a colloid, which is a liquid that has particles that are scattered (floating) and finely dispersed in a dispersing medium. These scattered particles can be organic matter that is finely decomposed, microorganisms, mud, clay, and colloidal substances that are similar or floating objects that do not settle immediately (Moechtar., 1989).

Arduino Arduino board is an Arduino sensor that senses the environment through input from many sensors, and controls its surroundings such as controlling light, motors, and other actuators. The input quantity in most control systems is not electrical quantity, such as physical, chemical, mechanical and so on. Arduino software is where you can instruct Arduino on what to do by writing code in the Arduino programming language and utilizing the Arduino community's developments. The Arduino programming language is a fork of the wiring platform language and the processing language. (Istiyanto, 2014).

Sensors and transducers are equipment or components that play an essential role in an automatic control system. Accuracy and appropriateness in choosing a sensor will significantly determine the performance of an automated control system (Soeprijanto, 2011). To apply electric quantities to a measuring system, manipulation system, or control system, usually the non-electric quantity is first converted into an electric signal through a device called a transducer (Soeprijanto, 2011).

Sensor

The purpose of a sensor is to respond to various types of physical input attributes (stimuli) and convert them into electrical signals that are compatible with electronic circuits. We might say that a sensor is a translator of generally non-electrical values into electrical values. When we say "electrical," we mean a signal that can be channelled, amplified, and modified by electronic devices. Sensor output signal may be in the form of voltage, charge, or may be further explained in terms of amplitude, frequency, phase, or digital code. Therefore, a sensor has input properties (in any form) and electrical output properties. These characteristics are called signal output format.

D. Sharon, dkk (1982), menjelaskan bahwasanya sensor adalah suatu peralatan yang berfungsi untuk mendeteksi gejala atau sinyal yang berasal dari perubahan energi seperti energi listrik, energi fisik, energi kimia, energi biologi, energi mekanik dan lainnya. Sebagai contoh: kamera sebagai sensor penglihatan, telinga sebagai sensor pendengaran, kulit sebagai sensor peraba, LDR (light dependent resistance) sebagai sensor cahaya dan sebagainya (D. Sharon, 1982).

William D.C. (1993) stated that a transducer is a device that, when activated by energy within a transmission system, will deliver the same or different form of energy to the next transmission system. This energy transmission can be in the form of electricity, mechanics, chemistry, optics (radiation), or thermal (heat). Contoh generator is a transducer that converts mechanical energy into electrical energy, a motor is a transducer that converts electrical energy into mechanical energy, and so on (William D.C, 1993).

Potodiode

A potodiode is a photovoltage semiconductor/photoconductive semiconductor operated at a negative reverse bias voltage. A photovoltage detector is an active detector that generates its own voltage when illuminated when irradiated. This tool then converts the incident radiation energy into electrical energy (Sugiharto, 2002).

Photodiodes are similar to diodes in general. the main difference in photodiodes is the installation of a PN meeting lens. The conductivity of the diode is determined directly by the light that falls on it. The energy of the light beam falling on the PN meeting causes it to move out of the valence band leaving the hole thus generating a pair of free electrons and holes. The basic circuit of a photodiode is connected in series with a light falling on the PN confluence of the photodiode no light falls on it. The current flowing in dark conditions is called dark current while the resistance is determined by Ohm's law (Sugiharto**, 2002). The photodiode circuit can be seen in the figure.**

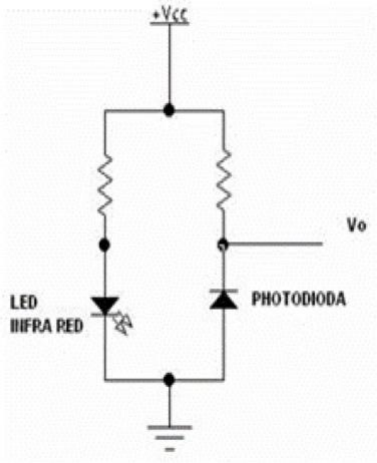


Figure 1. Photodiode Sensor Circuit

Photodiodes are made of semiconductor materials. Usually used is silicon (Si) or gallium arsenide (GaAs), and others including Indium antimonide (InSb), Indium arsenide (InAs), Lead Selenide (PbSe), and tin Sulfide (PBS). These materials absorb light through a characteristic range of

wavelengths, for example 250 nm to 1100 nm for Silicon, and 800 nm to 2.0 µm for GaAs (Setiawan I., 2009).

Infrared

Infrared radiation is an electromagnetic wave that cannot be seen by the naked eye, as it has a wavelength ranging from the lower limit of ultraviolet radiation at 5 nm to the upper limit of the infrared region at 1000 nm, with a frequency ranging from 300 GHz to 3000 GHz. ultrasonic wave transmission. The ultrasonic sensor consists of an ultrasonic transmitter circuit and an ultrasonic receiver circuit. This sensor can measure distances between 2 cm and 400 cm, and the sensor output is in the form of a pulse whose width represents the distance. The pulse width varies from 115 µs to 18.5 ms. The ultrasonic speaker converts the 40 KHz signal into sound while the microphone detects the sound reflections.

2. METHOD

The Waterfall method is often also called the linear sequential model or classic life cycle. The waterfall model provides a sequential or ordered software life flow approach starting from analysis, design, coding, testing and support stages.

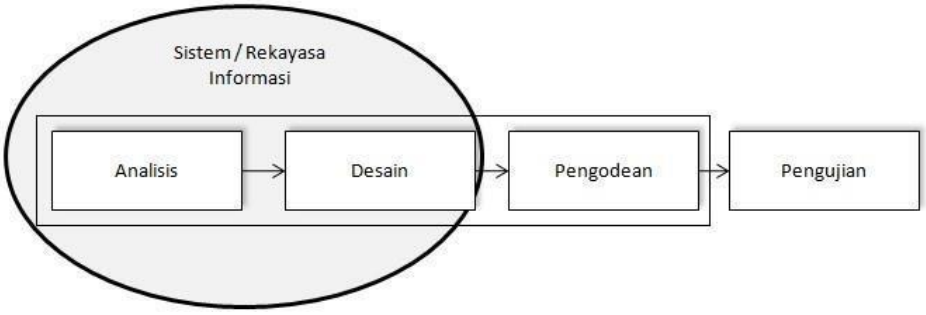


Figure 2. Modle WaterFall

The following are the stages in the method:

1. Analysis, based on analysis of the hardware system that is already running at PT Waterindo Primatech in carrying out the process of checking water depth using a Level Transmitter and checking water turbidity using a Turbidity meter.
2. Design, after carrying out the analysis process in this second stage, the design process is carried out. Where the results of the analysis create software and hardware designs.
3. Coding, after carrying out the design process, at this stage the design results will be translated into coding which uses fuzzy logic which is applied to the Arduino software and PHP coding to create a website and the coding results and tools are tested until they are achieved in accordance with fuzzy logic regulations. After that, the coding results will be tested using the black-box method to determine the functions, input and output of the hardware and software. 4). Testing, after coding on the hardware, at this stage testing is carried out on the hardware and system flow that has been designed in the coding using Arduino.

   By filling the first reservoir with turbid water and the second reservoir, start checking the depth and turbidity based on the system flow created. After that, the sensor data will appear on the website and the testing method used uses the black-box method, where the test is aimed at finding out the functions when displaying data, storing data, changing data, deleting data and validating data according to the data results obtained. sensors.

3. RESULTS AND DISCUSSION

Analysed Design

System design contains plans that will make a system work as expected. Block Diagram Design to explain the system design carried out in realizing a water depth and turbidity monitoring system using Wemos D1 R1 - Website with output in the form of a system that can monitor the results of water depth and turbidity sensors at PT Waterindo Primatech Bekasi, first in general it is depicted by a block diagram of the working system shown.

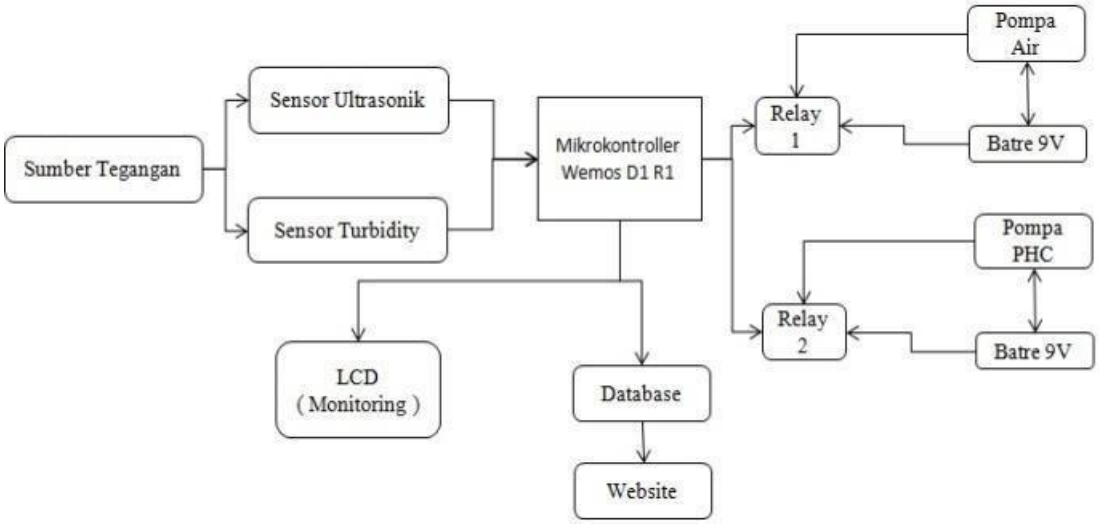


Figure 3. Block Diagram Design

In Figure 2, the power source used by Wemos D1 is 5 volts from a power bank. The Wemos D1 itself functions as a microcontroller which can control the two sensors used, namely the turbidity sensor used to detect turbidity and ultrasonics used to detect water depth/level. Data from sensor readings can be seen on the 20x4 LCD and on the website to monitor water depth and turbidity. Design

Hardware

The hardware design used in this research is shown in Figure 4 as follows.

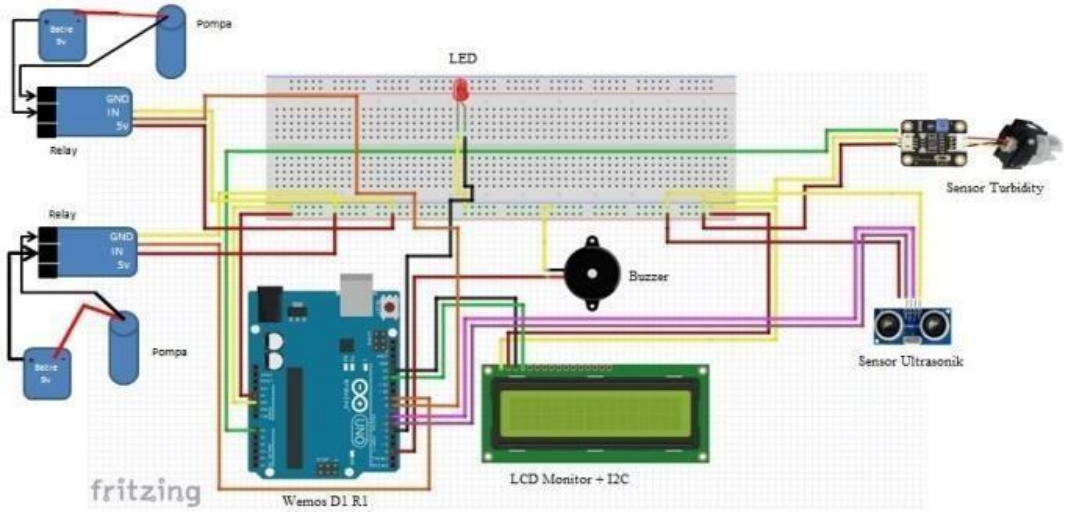
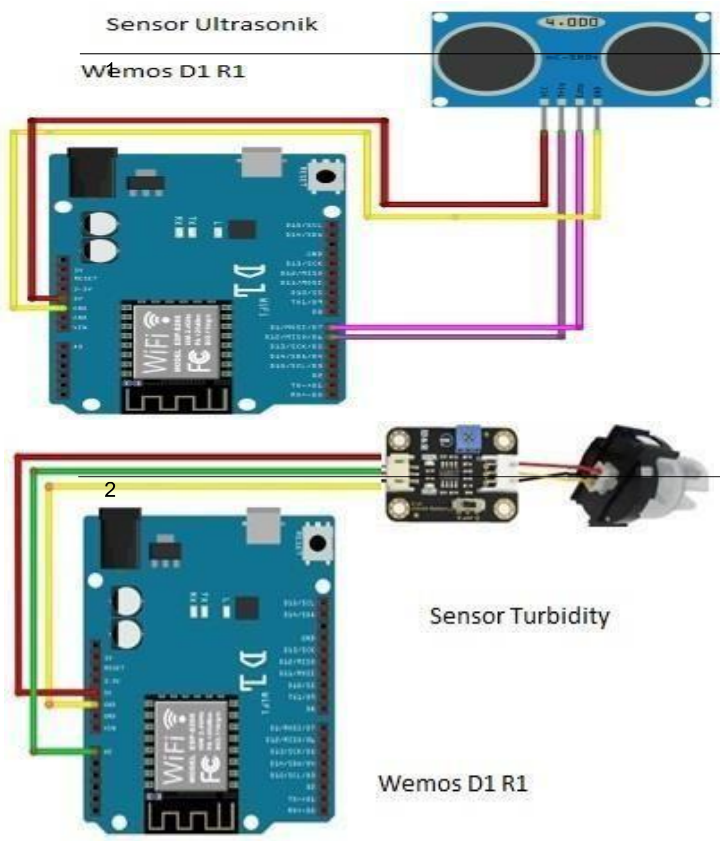


Figure 4. Hardware Design

Figure 3 shows the design of the hardware that has been installed with cables and is ready to run with the Arduino Ide program. For more detailed designs, see table 1.

Table 1. Hardware Design Details

No	Design Information
1	 Ultrasonic Sensor Circuit, this circuit has 2 main component. one is an ultrasonic transmitterWhich ownfunctionemits ultrasonic waves with a frequency40 KHz (kilohertz) and ultrasonicreceiver ownfunction capture the results of reflected ultrasonic wavesWhichabout an object
2	Turbidity Sensor Circuit, this circuit functions to measure water quality withhow to detect the level of turbidity. This sensor detects particlessuspendedin water by measuring transmittanceAndlight scattering.

Hardware Implementation, at this stage is the result of the overall hardware design of the water depth and turbidity monitoring system at PT Waterindo Primatech Bekasi. Based on Figure 3 which has been presented, you can see the physical form of a series of water depth and turbidity monitoring systems consisting of Wemos D1 R1 in the box, Project Board in the box, Ultrasonic Sensor on the surface of the clean water reservoir, Turbidity Sensor in the clean water reservoir. to check the level of water turbidity, Relay to turn on and turn off the pump, Pump to push water from the water reservoir that has been provided, Buzzer to indicate if the water has reached the specified limit, LED will light up if the water has reached the limit and LCD A monitor with an I2C LCD module will display the results of the sensor data that has been obtained.

Figure 5 Results of Water Depth and Turbidity Monitoring System Design

Device ImplementationSoft, at this stage is the result of software design in the form of a website-based water depth and turbidity monitoring system application. Table 2 explains the appearance of the website. System Testing: The system testing used in this research is Black Box Testing. Testing is intended to find out whether all functions can run as expected without testing the design and program code. The following are the results of black box testing on the admin and operator login pages: Following table 2 are some test rules carried out based on sensors *ultrasonic*and turbidity sensor on WEMOS D1 R1 with pump control:

Table 2. Automatic Pump Control Test Results in Monitoring System Applications

NO	Scenario Test Case	Turbidity Sensor	The results	n	Conclusion
		Ultrasonic	**expected**	**Testing**	Valid
1	Read Sensors	Cloudy & Empty	Pump ON	In accordance Hanap	
			Pump a Little	In accordance	Valid
2	Read Sensors	Normal & Blank		Hanap	
3	Read Sensors	Clear & Empty	Pump ON	In accordance Hanap	Valid
4	Read Sensors	Cloudy & Normal	Pump OFF	In accordance Hanap	Valid
5	Read Sensors	Normal & Normal	Pump a Little	In accordance Hanap	Valid
6	Read Sensors	Clear & Normal	Pump a Little	In accordance Hanap	Valid
7	Read Sensors	Cloudy & Full	Pump OFF	In accordance Hanap	Valid
8	Read Sensors	Normal & Full	Pump OFF	In accordance Hanap	Valid
9	Read Sensors	Clear & Full	Pump OFF	In accordance Hanap	Valid

Based on the tests presented, it can be concluded that monitoring water depth and turbidity with WEMOS D1 R1 hardware is capable of automatically controlling the pump with depth limits and water quality limits based on predetermined sensors and rules. After testing the application of the water depth and turbidity monitoring system to control the pump automatically, it was found that every component of the monitoring system device could work well without problems. WEMOS D1 R1 as a microcontroller and website as monitoring sensor data results. So that the monitoring system can run as expected.

4. CONCLUSION

Several conclusions based on this research, the proposed system created by researchers can help in the process of checking depth using an ultrasonic sensor and water turbidity using a turbidity sensor which is in accordance with the logic that has been applied based on the research results. The proposed system created by researchers can store data from incoming sensors into a MySQL database. if the sensor reading data is in accordance with the logic that has been applied. The proposed system created by researchers is a water depth and turbidity monitoring system that is integrated with an automatic pump and stores sensor data results directly into a database in real time according to adjusted logic.

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