Automatic Monitoring System Iot (Internet Of Things) Based Water Tanks

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Abstract.

Water tanks are widely used to store water in the community. However, the filling process still uses a manual method so it cannot monitor/monitor the water level in the tank, so when the water is full in the tank until it overflows it is then turned off. Water tanks are often placed at a height to take advantage of gravity so that water can flow optimally. The high position of the water tank is difficult for users to reach to determine the quality and volume of water. The performance of this tool has 2 conditions. The first condition will discuss the water level monitoring tool in the tank. Using the tool developed, the water pump can be turned on and off automatically which is controlled using a monitoring tool using a smartphone and the Blynk application with a water level indicator. , water flow, and watervolume and Notification of water conditions via Telegram. Technology for distributing and monitoring water in tanks is still limited to conventional means by turning on and opening the water tap. For this reason, a control system is needed that can monitor and control the water volume in several tanks through one application display on a smartphone such as Telegram. By using the NodeMCU ESP8266 as a microcontroller base, an ultrasonic sensor as a water volume measuring sensor, and a Mini Water Pump, the condition of the water volume and all changes can always be monitored via notifications on Telegram. Apart from that, the tool can also be controlled automatically or manually through the commands provided on Telegram. In this way, the concept of using Telegram as a water tank volume control and monitoring system can be the right alternative choice in designing a water tank control system. The research method used is a prototyping system. The expected result is the realization of automatic floodgates to make it easier for humans to carry out their tasks and make the system run more efficiently. Apart from being automatic, this tool has the advantage that it can be controlled remotely using the internet of things. The design of this automatic sluice gate uses an Arduino Uno microcontroller as a processing tool, and is equipped with an ultrasonic sensor, water level float switch sensor, servo motor.

Keywords: *Water Tank, NodeMCU ESP8266, Ultrasonic Sensor, Telegram, Arduino Uno*

I. INTRODUCTION

Water is a basic need for living creatures. Humans use water for various household purposes such as washing, bathing and cooking. Water is more valuable when viewed from its quantity and quality, this can be seen from the large number of house developments which are equipped with water tanks to accommodate water sourced from drilled wells. In general, water reservoirs are placed in high places so that water flows smoothly into the bathtub or faucet. Filling water from a water source to a tank takes a long time, so when filling water into a tank, the water often overflows because it is left for other activities. Therefore, a tool is needed that can work automatically to fill water and can also save water. One method used is to monitor water. Controlling water use to save water will be effective and efficient if it is based on monitoring daily water use [1]. When compared with the results of research by previous researchers, this research has advantages, including the use of the Telegram application[5]. Apart from that, in controlling water flow, this tool has two control modes, namely a remote manual method using the Telegram application and an automatic mode using a water level sensor. With the rapid development of technology, an innovation was carried out to overcome this problem by developing a system from this research, namely by utilizing water flow sensors and ultrasonic sensors.

[6] which is run with a microcontroller to become a tool that can detect flow rates and can also detect water levels in the lower and upper tanks, and by adding functions from IoT [3] to find out the volume of water in the tank and can be monitored mobilely. This research aims to design a tool that can detect water flow, water level automatically and can determine the volume of water in the upper tank using IoT for remote monitoring. The benefit of this research is to find out the water level in the tank and the condition of the pump, whether it works by flowing water or not, as well as knowing the volume of water in the upper

tank. This research was also carried out by developing several previous studies, namely research on securing water pumps with water flow sensors [2], and water usage monitoring systems with Arduino Uno [4].

II. METODS

Research methodology used in designing and building a Water Tank Monitoring and Control System. The design process for this tool uses the prototype model method. Tool design begins by collecting information through similar literature studies that have been made previously. The information obtained then becomes a reference for designing tool block diagrams and hardware design. After the hardware has been created and is in accordance with the initial design, the next step can be continued with software design, namely creating a tool program flowchart and selecting the application used to control the tool. After the hardware and software design has been made, the sensors and tool functions are then tested regarding conformity with the initial design. If there are deficiencies, it can be continued with revisions or improvements to the tool.

System Diagram

The following image is a block diagram of the design of an automatic water filling monitoring tool based on IoT, the image describes the relationship between input, process and output. Making this tool goes through 2 stages, namely the hardware design stage and the software design stage. Seen in Figure 1, the hardware uses Wemos D1 R2 components, ultrasonic sensors, relay modules, jumper cables, and Android smartphones. This software uses the Arduino IDE and Blynk applications.

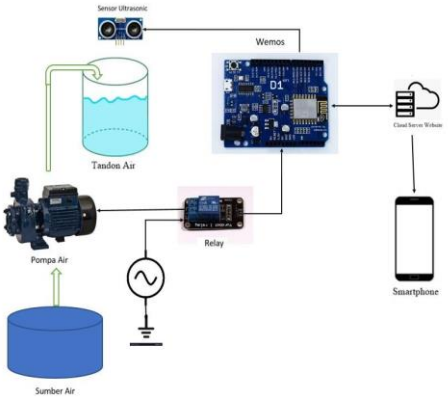

Fig 1. System Design

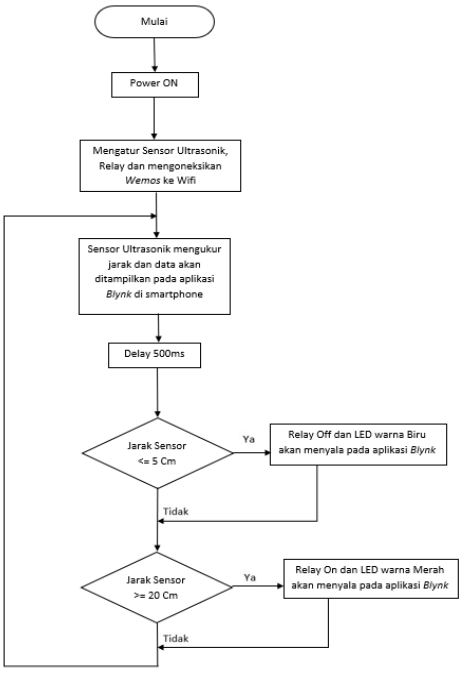

Fig 2. Work System Flowchart

The sub tools and sensors have two processes, namely "send data" and "receive commands." The flowchart explains the water level monitoring program process which starts from setting up the Ultrasonic Sensor to read the water level, then the user opens the application on an Android smartphone connected to the WiFi module on wemos D1R2, if successful then the data will be displayed on the Android smartphone. If the distance between the sensor and the water is more than 20cm, the relay will turn on and activate the water pump and if the distance between the sensor and the water is less than 5cm, the relay will turn off and also turn off the water pump. For applications on Android, use the blynk application. First log in to the Blynk website, then download the Blynk application on your Android smartphone, then start creating a layout by pressing the widget button to create the desired layout.

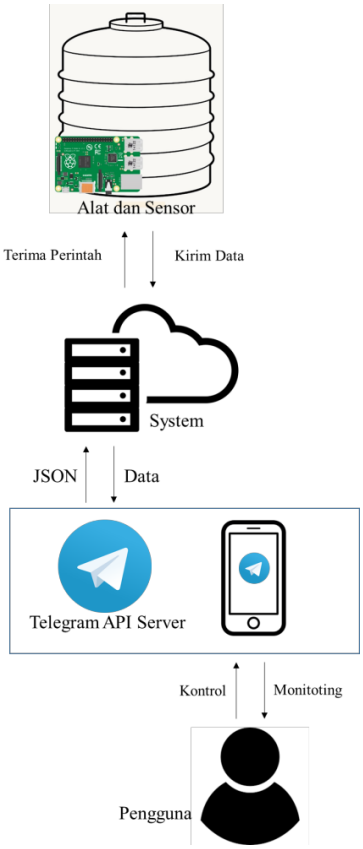

Fig 3. Overview of the Water Tank Monitoring and Control System via Telegram

The Telegram application has a process, namely sending and receiving messages from users via the Telegram Bot. The last sub is the user who has the "control" and "monitoring" processes. The monitoring process is where the user receives a report from the device in the form of the current condition of the water tank in the form of water volume levels. The user control process can receive commands to the device such as “Turn Pump On” and “Turn Pump Off”.

III. RESULT AND DISCUSSION

1. System Testing

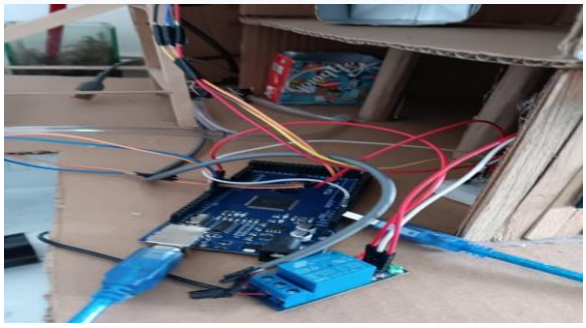

Fig 4. Tool Hardware

Figure 4 shows Wemos D1 R2 and the relay in the box, ultrasonic sensor, and water pump. First connect the device to the internet/wifi. Then the user opens the blynk application on the smartphone. If successful, the smartphone screen will show the results of the water level reading from the ultrasonic sensor. When the distance between the ultrasonic sensor and the water surface is less than 5cm, the relay will be off by turning on the green LED in the Blynk application, and when the distance between the sensor and the water surface is more than 20cm, the relay will be on by turning on the red LED in the Blynk application. .

2. Software Testing

This test was carried out to see whether the display on the Blynk application shows the water level in the water tank, with the aim of seeing whether the water in the tank has run out or not. The tank ultrasonic sensor was tested 5 times and the average value from the test was taken as the test data value. The following is the display in the Blynk application when the ultrasonic sensor detects the water level. The bottom water level indicator can be seen in Figure 5.

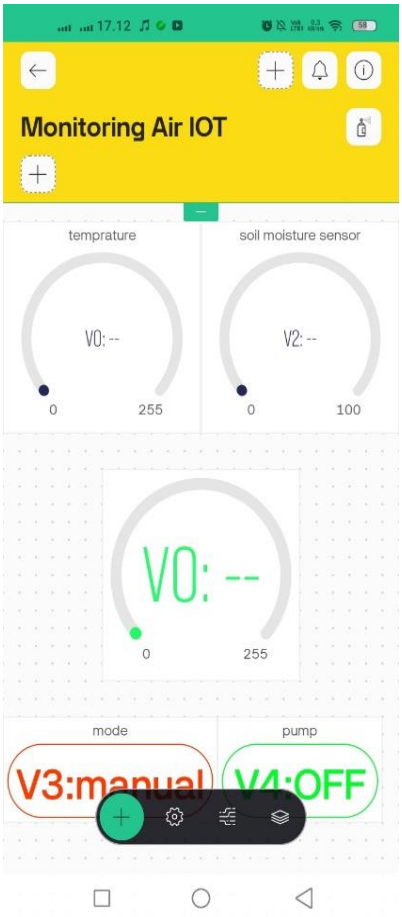

Fig 5. Installation view of tools for monitoring and controlling Blynk water

3. Water Filling System Test Results

Testing of the water filling system in the storage tube can be seen in Table 1, this table shows the results of the sensor distance and water height, namely when the sensor distance is 5 cm and the water height is 15 cm, the water pump will turn off, and when the sensor distance is 15 cm and the water height If the water in the container is 5 cm then the pump will turn on.

Tabel 1. Water Filling System Testing

No	Container Height (Cm)	Sensor Distance (Cm)	Water Height (Cm)	Water Pump Condition (ON/OFF)
1	**20**	5	15	0ff
2	20	7	16	on/off
3	20	15	5	on
4	20	20	2	on
5	20	10	10	on/off

4. Monitoring and control testing via Telegram

A. System Trial

System testing was carried out by interacting between the tool block and the system block via the Telegram instant messaging application. The Telegram application used for testing on the iOS platform.

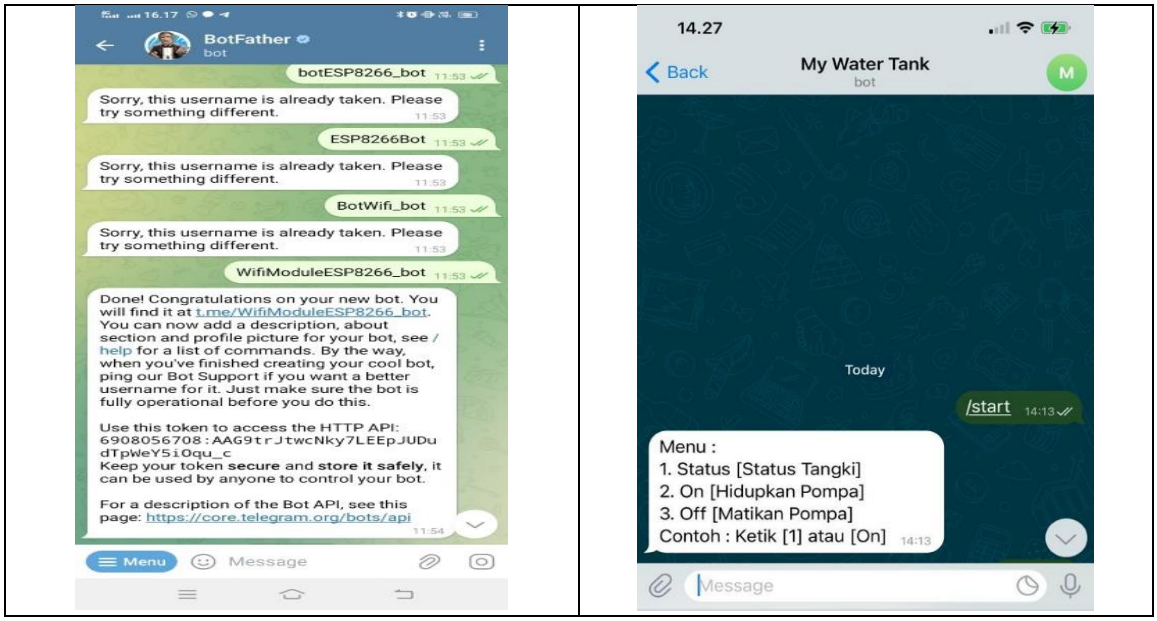

Fig 6. Telegram application used for testing on the iOS platform

Testing of the water monitoring and control system is carried out by giving remote commands using the Telegram application on the smartphone. Following are some experimental results which can be seen in Table 2.

Tabel 2. Test control via the Telegram application

No	Tool measurements	Orders in telegram	Solenoid status	Successful sending to telegram
1	9 mm	open	open	Sucses
2	26 mm	close	close	Sucses
3	48 mm	open	open	Sucses
4	55 mm	open	open	Sucses
5	1 Liter	close	close	Sucses

5. Prototype Result

The prototype presented in Figure 7 is a prototype of the overall system. The prototype is used to test the system in monitoring water turbidity, water volume, sending information, and controlling the process of starting and stopping the water pump.

Fig 7. Whole System Prototype

IV. CONCLUSION

From the testing process of the internet of things automatic sluice system, it can be understood the results of the implementation of each component of the tool. A water tank monitoring and control system using a Smartphone based on the Telegram bot has been successfully created in this research. The system succeeded in detecting turbidity and water volume in the water tank and controlling the water volume by turning the pump off and on. The implementation of the Telegram bot can carry out the interaction process with users in sending control messages and receiving system response messages in the form of monitoring results. The system has speed.

The use of Telegram bots as an interface is an advantage of this research, where Telegram bots are provided free of charge by the Telegram instant messaging application, thereby reducing costs in system development. Another advantage of this research is the application of the internet of things using a microcontroller so that future research can add other features such as turbid water treatment features in the form of water purification using coagulation, filteration or other methods. The shortcomings of this research can be used as developments in further research such as adding bots from other instant messaging applications so that if one application has a problem or the server is down, you can use bots from other applications as an interface to interact between users and the system and pay attention to quality.

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