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Water Level Control Monitoring Based On Arduino Uno R3 ATMega 238p Using Lm016l LCD at STMIK Hang Tuah Pekanbaru

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***Abstract*—Water plays an important role in the survival of living creatures on earth. The advancement of computerized technology encourages people to make appropriate equipment that can be utilized in various aspects of life, such as ease in controlling the performance of water pumps in the shelter. STMIK Hang TuahPekanbaru uses system level switch but there are some weaknesses also in this system level switch that pump will live more than 1 time a day if there is damage to the buoy. In this study will be made a tool that can do the monitoring water height automatically. "Monitoring Water Level Control Arduino Uno using LCD Lm016l" which is able to monitor and control the water level in the Tandon using ultrasonic sensors. The working principle of the appliance is that if the water reservoir is empty or reaches the 20% level, the ultrasonic HC-SR04 sensor will detect the water level and give signal to arduino uno to switch the water tank filler pump and send the water level data to the LCD. If the water reservoir is in full condition or reaches the 100% level, the ultrasonic HC-SR04 sensor will detect the water level and give signal to arduino uno to automatically turn off the automatic water supply pump and transmit the water level data on the LCD, making it easier to control the inventory water.**

Keywords: Monitoring, Control, Arduino Uno, LCD LM016L

I. INTRODUCTION

Water has an important role in the survival of living things on earth. Water will be very beneficial for life on earth in proportion. Humans use water for various needs, for example in households for consumption, bathing, washing and so on. This water is becoming increasingly valuable in terms of quantity and quality.

Advances in computerized technology encourage humans to make appropriate equipment that can be used in various aspects of life, for example the ease of water level control in a reservoir. Water Level Control is a tool that can make it easier to identify the water level in the water reservoir. The main function of this Water Level Control is to control the pump performance.

Water management in reservoirs or water reservoirs has been developed previously with a float system and a system level switch. The buoy system is usually in the form of a float ball, a ball that will adjust the opening and closing of the water according to the water level in the reservoir. This buoy system is purely mechanical, when the water level in the toren drops to the lowest level of the float ball, it will mechanically open the water flow for filling. When the water level has reached the height level of the float ball, the water flow will be closed mechanically as well. So it works is a tap that opens and closes automatically. There are several drawbacks to this system, namely that it easily leaks in the faucet, because the faucet also has to withstand the water pressure in the pipe that comes out of the water pump engine.

Meanwhile, STMIK Hang Tuah Pekanbaru uses a system level switch with electrical relay contacts. Almost similar to the buoy system, except that the buoy ball is replaced with 2 weights that are suspended in one rope. Then the control system uses relay contacts which is connected to the water pump machine via an electric cable. When the water level in the reservoir is low, the water engine will start and then stop when the level is high, according to the position settings of the two ballast.

The level switch system is more reliable in avoiding leaks such as the float system, because the water pump engine is turned off directly. But there are also some weaknesses in this system level switch, namely the pump will turn on more than once a day if there is damage to the buoy, the water in the reservoir has not yet reached half the pump has come back to life and so on, how much increased electricity pay is, there is no sign when the water is full.

This study discusses a system that is integrated with sensors for measuring water level [1]. This research discusses the measurement and control of water suitable for large-scale Solar Water Heater Engineering projects based on PLCs, industrial touch screens, and Variable frequency drives by XiaomingCui [2]. This research uses the Internet of Things which can solve these problems. This study uses an ESP8266 controller which can monitor the level of the water container by Steven Sachio [3].

This research discusses about the remote monitoring of Changjiang by Xiaohong Yan river water [4]. This research

discusses the monitoring and collection of household water supplies by Tanvir Rahman [5]. This research discusses the construction of standardized railway water supply technology and drainage control systems by Muren Qi [6].

This research is the development of a Smart Water Level Control System [WLCS] based on IoT and Mobile by Siddartha Shankar [7]. The following research discusses the steam generator control system is the most difficult control system in nuclear power plants. [8]. The research conducted by Suppachai Howimanporn and friends is the design of the scheduling PID controller based on swarm optimization to monitor water levels [9].

The water crisis is one of the biggest problems in the whole world and the water crisis is reaching a very alarming level day by day [10]. Detecting Heart Rate Using Pulse Sensor as Alternative Knowing Heart [11]. This study aims to design a water clarity control system in the aquarium using the Arduino Uno Microcontroller as the control center, and LDR (Light Dependent Resistor) as a sensor [15].

In the water quality monitoring system, the characteristic parameters collected are pH, temperature, and water turbidity. With this system, farmers can monitor where the PH level, temperature and water turbidity are in accordance with the plants to be planted [16]. Subsequent research discusses the control of hydroponic plants where the result of this research tie is that the system can help farmers to increase the effectiveness and efficiency of controlling and controlling NFT Hydroponic Farm [17].

In this study is to monitor and control the pumping of water against fires carried out by robots [18]. Subsequent research discusses the control system, monitoring and control of incubators for infants [19]. Subsequent research also discusses monitoring and controlling the water level where the results show the system has high stability, reliability and flexibility. this system is very good for monitoring the current water level based on the water level [20].

Subsequent research discusses about Solar Water Heater techniques cannot meet the needs of large-scale projects in human-machine interaction, intelligent control, remote monitoring, reliability and scalability, etc. This study presents water level measurement and control schemes suitable for large-scale Solar Water Heater Engineering projects based on PLCs, industrial touch screens, and variable frequency drives [21]. Subsequent research also discusses controlling the water level so that overflows and waste do not occur, this system uses the concept of the Internet of Things [22].

The following research examines the Control and Remote Control of Water Intakes of the Changjiang Water Resources Commission [23]. In this research, a long distance water resources data transmission system is designed. Wireless GPRS system is adopted [24]. This research conducts the development of an IoT and Mobile-based Smart Water Level Control System [WLCS]. which the results of this study can address water wastage effectively by monitoring the water level in the upper tank and prompting the user to control the on and off of the water machine via mobile [25].

This research discusses a PID controller design based on swarm optimization to monitor water levels [26]. This research discusses the water level control system on the top and the Arduino water pump will control the pump by controlling the pump not to dry and an alarm will be installed to control it so that the water does not come into crisis [27]. This study aims to provide a water level control system to anticipate flooding for the community on Jalan Kahilom Pandacan, Manila. client's requirements [28].

Further research aims to monitor flood water levels independently for the community on Jalan Kahilom Pandacan, Manila. This system uses Arduino Uno, GSM protector and sensors which will be supported by a solar panel with a generator [29]. This research discusses the monitoring of pollution levels; water monitoring is important. Manual water quality monitoring methods in India dramatically exacerbate water quality degradation [30].

In this research, a tool that can monitor water levels will be made automatically. Arduino Uno Based "Water Level Control Monitoring Using Lm016l LCD" Ardunio Uno is a circuit board with Atmega-328 type processor with 28 pins, on the circuit board there are 14 digital inputs / outputs (6 outputs for PWM), 6 analog inputs, crystal resonators ceramic 16 MHz, USB connection, adapter socket, ICS pin header, while the LCD displays the final result of the measurement in the water reservoir.

II. METHODS

In this stage the researcher uses the Waterfall method, because this method is a method that is widely used by software developers. The essence of this method is that the work of a system is carried out sequentially or linearly.

A. Needs analysis (requirement definition)

The system requirements needed to build this Water Level Control Monitoring use an Arduino Uno microcontroller as the main processor, an Arduino Uno microcontroller as a water level measurement processor and to display to the LCD, an ultrasonic sensor as a win the data compulsory direct visits to the research site using the observation method [12]. water level meter, Relay functions to regulate the water pump voltage, and LCD which is used as the water level information display. In making the program using Arduino IDE software that uses the C programming language.

B. System design (system and software design)

After the existing system is analyzed and in accordance with the research needs, the logic design is made using flow charts as a tool to build the system [13]. In this stage the researcher describes the design of the system to be built in accordance with the data analysis carried out in the previous stage. In modeling the system, researchers use procedural concepts.

C. Encoding (implementation)

The program design in the previous stage is translated in the form of codes using a programming language. In this system, the programming language used is C ++.

D. Testing (system testing)

The system testing process is to prove the system runs as expected [14]. At the testing stage using the blackbox method to find incorrect or missing function errors, to work errors of a device being designed.

E. Maintenance (maintenance)

This is the last stage in the waterfall model. The system that has been run must be maintained. Maintenance also includes fixing errors that could not be found in the previous stage.

III. IMPLEMENTATION

The shape of the tool can be seen in Figure 1 with a size of 10 x 20 cm and a weight of 200 grams

Fig. 1. Implementation of the Water Level Control Monitoring tool

The Arduino Uno circuit with the 1 channel Relay Module is used to connect or disconnect the electric current to the connected water pump. This circuit is designed according to the Arduino microcontroller program, where there is a control signal from the Arduino microcontroller.

A. System Testing

The testing stage is the final stage when all processes are passed in order to find out whether the tool designed is in accordance with the expected results. Testing the system from Arduino Uno on the Water Level Control Monitoring system at STMIK Hang Tuah Pekanbaru can be done with the following steps:

1. Connect the utility power source to the water level control hardware circuit.
2. After that the water level control monitoring system will turn on like the supporting devices, namely Arduino Uno, LCD LM016L, HC-SR04, and Relay Module.

Fig. 2 System Device Turns On

3. After the water level control monitoring system turns on, the HC-SR04 ultrasonic sensor will detect the contents of the water in the reservoir.
4. When the sensor detects that the reservoir is 20% or empty, the pump will start automatically.

Fig. 3. pump starts automatically

This ultrasonic functions as a water level controller. The signal that is emitted into the water will then propagate as a signal. The signal will then be reflected and will be received back by the Ultrasonic receiver. After the signal reaches the ultrasonic receiver, the signal will then be processed to calculate the distance to the water level in the reservoir.

5. After the reservoir is fully filled, the pump will automatically shut down.

Fig. 4. the pump shuts down automatically

This LCD functions to display the water level, where the LCD will display the water level with different distances. The program starts with start, which means the circuit is turned on, the program initializes the connected to the ultrasonic sensor circuit. After that the ultrasonic sensor is used to measure the water level. When the water reservoir is empty, the pump will start and fill the reservoir. If the water level reaches 100%, the pump will stop and the results of the water level in the water reservoir will be displayed on the LCD. Then the ultrasonic sensor will continue to work and when the water level is 20%, the pump will start and the results of the water level in the water reservoir will be displayed on the LCD. So, the water reservoir that we use will not automatically be empty because before the reservoir

is at a level below 20%, the water pump will start automatically.

B. Home Testing Results

This test uses the BlackBox Testing method, where this test focuses on the functional requirements of the device with the aim of trying to find errors, the error in question is a malfunction, data structure error, or performance error.

TABLE I. TEST RESULT

No	procedure	expected results	validation
1	water in the reservoir contains 20%	pump starts automatically and displays on the LCD	Valid
2	water in a full reservoir	the pump stops automatically and displays on the LCD	Valid
3	water in the reservoir contains 80%	the pump is off	Valid
4	water in the reservoir contains 60%	the pump is off	Valid
5	water in the reservoir contains 40%	the pump is off	Valid
6	the water fills the reservoir gradually	The ultrasonic sensor can measure the water level and display it on the LCD display	Valid

IV. CONCLUSION

Based on the results of the analysis, design and implementation that has been done. Then several conclusions can be drawn including the following:

1. The design of the water level control monitoring system can monitor the water supply in the reservoir, display the water level status via the LCD and can also fill the water according to the water level configuration desired by the user.

2. The design of the water level control monitoring system can help control the process of filling water in the reservoir, because this tool can work automatically in turning on and off the water pump so that it can reduce electricity waste.

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