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Smart Water Management System

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Abstract

The main concept of the project is to save water, and to provide the good quality of water to the consumers, that are being provided by the government in their locality. Arduino (ATmega 328) microcontroller is used to control all the other sensors that are being included in the project. Microcontroller gets the power using external power supply. Infrared sensor is used to find the presence of vessel and Ultrasonic sensor is used to find height of the vessel. Quality of the water is checked using pH sensor. The flow of water is controlled by an AC Motor. Once the water is filled in the respective container, AC Motor stops the water flow and the respective message will be displayed. The LCD display is used to show the pH values and display whether it is safe for drinking or not. LED variant is connected to show the required output.

Key Words: *Arduino NANO, Ultrasonic Sensor, Infrared Sensor, pH sensor*

I. INTRODUCTION

Every human being in the world needs water to survive. We cannot lead our life without consuming water. On an average, human body approximately consists of 60% of water. The human body uses water in all the cells and organs of the body. A man should consume 8 liters of pure water per day, for maintaining good health conditions. All around the world water consumption has been increasing day by day. This increase in consumption is due to improvement in living standards with rise in the population. Many human activities use water for many purposes which are listed above as uses of water.

Consumption of water is an important factor, because we need to take pure and clean water to survive. Water conservation means using the water wisely and not wasting the water. Because every human being in the world needs water and depends in it, humans need to learn how to drink water and keep our limited water supply clean and free from contamination. Consumers must know the availability of fresh water for future generation where the withdrawal of freshwater from the ground surface does not exceed its natural replacement rate, so that water is made available to all people consuming water through this.

In the existing model, Water ATM method is used in which coin will be inserted at first; the required amount of water will be flown through the container at a particular amount of time. Once if the required amount of water will be flown the system will get off and the flow of water will be stopped completely.

II. EXISTING SYSTEM AND DISADVANTAGES

In the existing method, the system will start when a 5 rupee coin is inserted. After the machine recognizes the presence of the coin in its particular slot, 20 liters of water will begin flowing into the container. The process will be terminated once the container has been filled with 20 liters. Again, once another coin has been inserted, this process will repeat.

The main drawback of existing system was, the system will accept only the new 5 rupee coin and after confirming the presence of coin in its slot, 20 liters of water will flow without any particular interval. If consumers want to change the container, they could not able to stop the water flow. Another major disadvantage was there are chances for using duplicate coins instead of original coins to fill water.

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Figure 1.1: Water ATM

III. PROPOSED SYSTEM

The system can be developed with the Arduino Atmega 328-P based console, which can be programmed using C Programming language. The functionalities in the proposed system include the pH value checking and automatic control of water flow when the vessel is filled in the real time.

Proposed system can be kept in various public places to provide a good quality of water for the peoples. The output provides a clear idea about the complete process about the system. Water is an important thing for all the living beings in the earth. In the process, we are using an IR sensor to find the presence of the vessel and the Ultrasonic sensor is used to find the height of the vessel and to check the quantity of water to be filled to the vessel. By this way we are preventing the overflow of water. Once the vessel is filled it will be intimated on the LCD display. Due to some emergency situations, when consumers remove the vessel suddenly, the flow of water will be stopped and displayed on the LCD display.

Figure 1.2: Proposed Model

BLOCK DIAGRAM FOR PROPOSED MODEL

The block diagram for the Smart Water Management System is picturized. The block diagram gives the complete working of a design of the working process.

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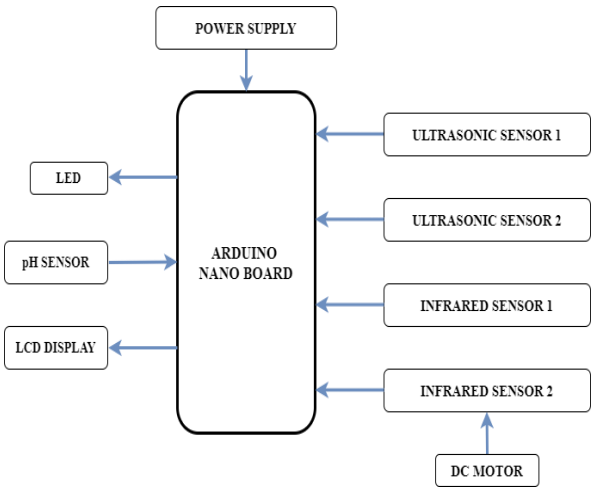

Figure 1.3: Block Diagram of the proposed model

COMPONENTS USED

a) LCD DISPLAY

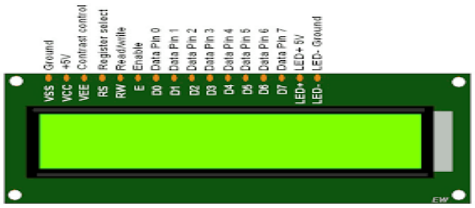

Figure 1.4: LCD Display

LCD Modules are available in various dimensions. The most used LCD Display is the 16 x 2 LCD Display. It has 32 characters in total. LCD is the 2 Dimension model which is shown in figure 1.4 the total number of pixels are 1280. These displays are preferred over the 7 segment display, the reason behind LED's are economical, easily programmable.

b) RELAY

Figure 1.5: Relay

Relay is used to control the high power and high voltage circuits which is connected to Arduino board. The diagram for 5V relay is shown in the below figure. A relay is aswitch operated electrically, which is operated by an electromagnet. Inside the relay, there is no electrical connection. It operates at 5 V. Maximum current is 20 mA.

c) DC MOTOR

Figure 1.6: DC Motor

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Speed of a DC Motor can be controlled by a variable power supply or by changing the current strength in the filed windings. DC Motors with less torque can be used in toys and other applications. DC Motors can be used in electric vehicle propulsion, elevators, and some of the steel rolling mills. The current running through a coil generates the magnetic field aligned in the center of the coil. The magnitude and direction of the produced magnetic field may be altered with the magnitude and direction of the current flowing through it. DC Motors which is used for big applications can be cooled using a forced air. The speed of any DC Motor can be controlled by adjusting the voltage applied by the armature. Modern DC Engines can be controlled with power electronics. DC Motors can operate directly from the rechargeable batteries. Today DC Motors of smaller size can be used in the toys and other small applications and of larger size is used in rolling mills. DC Motors are available in different RPM's and different operating voltages.

d) DISTANCE FINDING SENSOR

Figure 1.7: Distance Finding Sensor

Distance finding sensor consists of 4 pins VCC, Trig, Echo and Gnd pins. In which VCC pin is used for power supply and Gnd pin is used for device grounding. Trigger pin is an input pin that transmits ultrasonic wave. Echo pin is an output pin which is reflected from any materials or objects. The speed of Ultrasonic sensor in the room temperature is 330 m/s. The formula which is used is Distance = Speed * Time.

e) IR SENSOR

Figure 1.8: IR Sensor

IR sensor measures only the radiation in infrared; all objects radiate in the form of thermal radiations. It has the capable to measure the heat that an object emits. It ranges up to 850nm. It has some disadvantages like it could not work accurately on sunlight because sun itself can emit the IR waves. There are various types of IR sensor in which Passive IR sensor is used to detect the presence of human, only if the human is in motion. It can detect the presence of human by observing the infrared radiation which is emitted. The detection range of IR sensor may vary with the brightness of LED. It can sense up to 10 to 15 cm. It has 3 pins VCC, GND and Output pins. It can work on 3 – 5V power supply

f) SPDT Switch

A Single Pole Double Throw (SPDT) switch has two ON positions. It has 3 pins in which it has one common pin and another 2 toggle ON pins.

Figure 1.9: SPDT Switch

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IV. OUTPUT

STEP 1:

The identification of the vessel and the height of the vessel is identified and displayed on LCD Display.

Figure 1.10: Object height measurement

STEP 2:

Once the presence of the vessel,and the height of the vessel,will be displayed, along it will display wheather it is good or bad.

Figure 1.11: Identification of pH values

The LCD will display the pH value of the water and it is good for drinking along with the Green colour LED will be glow.

Figure 1.12: Identification of pH values

The LCD displays the pH value of the water and shows which is bad for drinking purpose along with the Red colour LED will be glow.

STEP3:

When the vessel has been filled, the control valve will stop the water flow and it will intimate to remove the object on the LCD display.

Figure 1.13: Process completed

When the consumer has removed the object suddenly due to some emergency or if the vessel is not placed properly the LCD will display as shown in the figure 1.12

Figure 1.14: When the object has been removed

STEP 4:

Once the process has been completed, it will take up to 5 seconds to initiate the next process, the delay was given as 5 seconds to increase the efficiency of the machine.

Figure 1.15: Waiting for Reinitialization

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V. CONCLUSION

Thus the developed system greatly prevents the overflow of water. The pH sensor placed in the system greatly provides the value which is safe for drinking purpose or not. It allows the user to understand about the health. The 16 x 2 LCD display is used to show the pH values to the consumers. LED light will be glow when the pH of the water is acidic or basic, and the water flow is stopped. The proposed model also allows the consumers to create awareness like not to waste the water and save water for the future use.

The low price and small setup are the major advantages of the system. The proposed system opens up several new awareness (wasting of water) for the consumers who fetch water. Both Arduino Nano and Arduino Uno have same 16MHz clock speed, in this model Arduino Nano is used, so that the size of the project is reduced.

VI. REFERENCES

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