Water Level Monitoring using an Ultrasonic Sensor

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Introduction

Water level monitoring is a technique that is used in maintaining and preserving the available water by making sure that none of it goes to waste, this is made possible by informing the user about the level of water present in an overhead tank, reservoir or any container for water storage.

This project integrates the concept of WAVES from our Physics classes and Programing knowledge from Extra Curricular classes by combining the two to form a system of electrical circuits that contains various components that send ultrasonic waves, receives them, calculates the distance and volume, and displays the output to the user.

This project is of great interest to us because of where we live, we live in a dry area with little supply of water and therefore the people here really have a WATER PROBLEM hence we have developed this project so as to help our surrounding environment and the whole society in general.

We believe that this project will become famous and help the people of Tanzania and the rest of the globe once finished.

Method

In this project the method(s) used to Monitor and indicate the level of water present in a reservoir, overhead tank or any other water container.

I.   CONSTRUCTION OF THE ELECTRONIC CIRCUIT:

The following are its components;

Arduino UNO, SparkFun Ultrasonic Sensor HC-SRO4; ALPHANUMERIC LCD,20*4.; BUZZER (optional); 6 L.E.DS (2-red,2-yellow,2-green) and Medium sized Jumper wires.

The connection above shows that in the Transmitter circuit an Ultrasonic sensor is connected to pin D9 and D10 pin of Arduino. Ultrasonic sensor is powered by Vcc and GND pin, these pins are connected to Vcc and GND pin of the Arduino. The measured data is transmitted by RF transmitter. RF transmitter's data pin is connected to D4 pin of Arduino Nano. RF transmitter's Vcc and GND pins are connected to Vcc and GND pins of the Arduino. In this transmitter circuit an Antenna is used which is connected to ANT pin of RF transmitter, whole circuit is powered by 9 volts battery
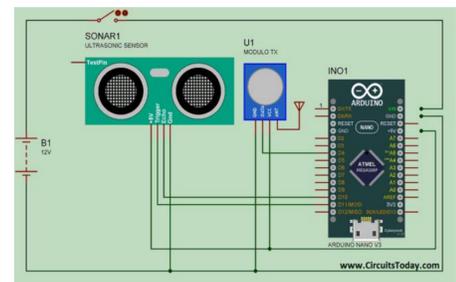
Results

In the receiver Circuit, RF Receiver is used for receiving data from the transmitter. Data pin of RF Receiver is connected to D4 pin of Arduino. Water level is shown on LCD and LCD is connected to Arduino from pin D4 to D9. LCD is powered by Vcc and GND pin using the Arduino, the contrast of LCD is changed by moving the preset, which is connected to pin 3 of LCD. Receiver circuit is powered by a 9 Volt battery through a switch, which is connected between Vcc and GND pin of the Arduino.

II.   ATTACHMENT OF THE CIRCUITBOARD ONTO THE UNDERSIDE OF A RESEVOIR'S LID;

After the Circuit board is complete then the whole structure is shelled within a protective containment unit such as a mobile and portable box made of metal etc. then the whole structure is attached to (for example since most people have and use overhead tanks then this example is completely based on the tank) the underside of the tank's lid.

III.   CALCULATION OF THE DISTANCE OF THE WATER FROM THE SENSOR HENCE THE VOLUME OF WATER PRESENT:

The Arduino UNO contains a microcontroller that is capable of calculating the distance of the water level from the sensor .
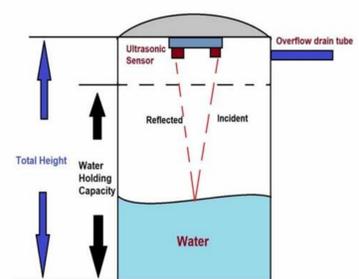
IV.   INDICATION OF VARIOUS WATER LEVELS BY USING THE LCD SCREEN CONNECTED.

The LCD screen connected is a simple one with only a maximum of 16 characters and 2 rows for displaying data accordingly. This screen displays what it is commanded by the Arduino UNO hardware which contains different codes that command all the peripheral devices that are connected to it including the display on the LCD screen.

A DIAGRAMATIC REPRESENTATION OF THE ATTACHMENT OF THE WHOLE CIRCUITBOARD.

Conclusions

In a nutshell, the project was a success and the findings and all observations of the users of the Automated water level indicating system have less water lost per day in comparison with those who aren't using the system, this shows that the experiment is a success and very reassuring plus it is a safer method since the sensor(in this case ultrasonic sensor) is not in-contact with water therefore it cannot get corroded by the water unlike the former experiment which used a water sensor that had to be in contact with the water   and got corroded very early but this system is more complex but very efficient, accurate and safe..

A TABLE SHOWING THE DATA WE WERE ABLE TO COLLECT ON THE 20th OF APRIL 2021:

METHODS/PARAMETERS	DATA COLLECTED		
	DIAMETER OF TANK	HEIGHT(DEPTH) OF TANK	VOLUME
BY SURVEY	22 METERS	5 METERS	1,900.663.56 Liters
BY FIELD STUDY	22 METERS	5.38 METERS	2,045,113.99 Liters