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Automatic Water Level Monitoring System

Deepali Gupta, Dimpal Singh, Anshu Kumar, Aaditya Raj, Associate Professor Arun Patel
Electronics and Communication Engineering),
Lakshmi Narain College of Technology, Bhopal, India

Abstract- Generally most of the houses depends upon the overhead tanks as the main source of water. People generally switch on the motor when their taps go dry and switch off the motor when the tank starts overflowing. This results in unnecessary wastage of water and sometimes non-availability of water in emergency. This phenomenon is commonly seen in both Urban and rural areas and this needs to controlled by monitoring water level in the tank, here we need a mechanism capable of switching on the motor when the water level in the tank goes low and switching it off as soon as the water level reaches a maximum level. Automatic water level control can be achieved by monitoring and keeping track of water level with the help of electronic sensors and controllers. Ultrasonic sensor is used to monitor the water level by calculating round trip time of echo from transmitter to water surface. Water level obtained from ultrasonic sensor is given to Arduino, where all the calculations and decisions are made. Arduino generate a signal to turn on/off the motor based on water level. This on/off signal and the water level should be communicated to the motor by using RF module where radio waves are used as the means of communication. The motor will be controlled automatically based on the water level in the tank.

Keywords- Water level, sensor, IoT

I. INTRODUCTION

Recently, information technologies are widely used in industry, that is, applications based on simple and complex automation [1]. Water resource storage devices such as water reservoirs and water tanks are used to store water resources in farms and industrial enterprises. Of course, the water level should be monitored in these objects to prevent any negative consequences and to collect the necessary information on the water level. When monitoring water resources in the facility, remote monitoring and data collection systems are needed to collect data based on predetermined values and deliver processed information to the user when necessary or to make decisions in complex situations. The trend of information technology has revealed research directions, including the study of systematic assessment of water properties by using a sensor that converts mechanical quantities into electrical quantities and its tools, classification of water quality for human use, which helps human health and the ecosystem [3, 4, 5, 6, 7]. Currently, every industry professional has very little time, and they try to use their working time effectively. Therefore, they will not have time to constantly monitor the water level. Water is a necessary resource every hour of our life [8].

The main goal of the article is to develop a device that measures the water level in the tank and notifies the user about the water level through SMS alerts. Currently used water level measurement and control tools have several shortcomings. For example, if we take the water level monitoring gauges, it must be constantly monitored by a

person, the level of accuracy is very low, and automation is difficult. We can give many such examples. Such water level measuring devices do not meet the requirements of today's era. In this article, the water level was measured using an ultrasonic sensor. The waves produced by the ultrasonic sensor are sent to the water tank, their time of propagation and return is recorded, and after several measurements, we get accurate information about the water level in the tank. The water pump motor automatically turns on when the water level drops and turns off when the tank is full.

II. LITERATURE SURVEY

There are many proposed methods for the water level controlling system in literature. Automatic water level controller we can use in Hotels, Factories, Homes Apartments, Commercial Complexes, Drainage, etc.

Automatic water level controller will automatically "START ON" the pump set as soon as the water level falls below the predetermined level and shall "SWITCH OFF" the pump set as soon as tank is full. It can be used to sense water level indicator in the huge containers in the companies. Fuel level indicator in vehicles.[1]

Detector is a device that responds to a physical stimulus (as temperature, sound, pressure, magnetism, or a particular motion) and transmits a resulting impulse (as for measurement or operating a control). Sensor is essential for taking input from the environment to the microcontroller. The particular input could be light, temperature, motion, moisture, pressure, or any one of a great number of other environmental phenomena.

The output is generally a signal that is converted to readable display at the sensor/detector at a position or transmitted electronically over a network for reading or further processing. In our project, we have used 'Reed switch' as a sensor.[2] A switch acts as drawbridge in an electric circuit. When the switch is closed, the "bridge" is up and no current flows. So the purpose of a switch is to ON or OFF a circuit at a time of our choosing [3].

III. PROPOSED SYSTEM

In automatic water level controller system there are two modes operation Manual mode: in this mode the operation of the circuit is working as a non-automatic system. That means the operation of pump is controlling by manually by using start and stop switch The pump is start by pushing start switch, and then pump are start to filling the water in the water tank. And when stop switch are in operating condition, then pump are turn off. Auto mode: in this mode the operation of the circuit is working as an automatic system. That means the operation of the pump is control by the circuit. When the level of the water is at lowest level of the tank. Then sensor is identifying this condition, and then the pumps are automatically turned on. And then water is filling into the water tank. When the level of the water is at the highest level of the water tank. Then sensor is identifying this condition and then the pump is automatically turned off.

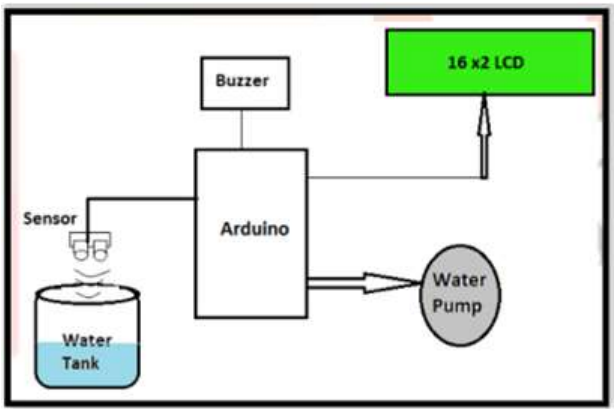

Figure 1: Block diagram of proposed system

1. Hardware Requirements

The Arduino UNO which is capable of interfacing two more sensors and processing power which suffice two electronic chips. Arduino acts as a microcontroller which controls every sensor and chip. Currently we are using Arduino with an ATMega328p processor with a flash memory of 32KB, SRAM 2KB and EEPROM 1KB. This Arduino works on clk speed of 16 Mhz. Ultrasonic sensor is used to measure the water level and we are using a sensor capable of measuring a distance of 300 cm.NRF24L01 is a Radio frequency module which is used to maintain the communication in between

both the sender and receiver sections. This RF module is capable of communicating at a distance of over one kilometer in line of sight and 300 to 600 with the obstacles presence. Power adapter of 5v is used to power the Arduino UNO which converts AC power to DC power supply. The circuit is designed to indicate three levels of water stored in the tank: low but not empty, half and full but not overflowing. When there is no water in the tank, all the LEDs are off as an indication that the tank is completely empty. When water level increases and touches the sensor, the Red LED will glow indicating that there is water within the tank. As the water level continues to rise and reaches half the tank, Yellow LED will glow. When the water in the tank rises to full an alarm is made by the buzzer as an indication that the tank is full. The setup at the water tank consists of Arduino, Ultrasonic and RF module. And the setup at the receiver section consists of Arduino, RF module and Relay. The Schematic diagram for the receiver section is given below. Both of these circuits are fabricated into single units. So that the sensors and microcontroller are not exposed to the outer environment.

2. Software Requirements

Arduino Embedded C

The open-source Arduino Software (IDE) simplifies the process of writing and uploading code to an Arduino board. It is compatible with Windows, Mac OS X, and Linux, and is developed in Java, based on Processing and other open-source software. The Arduino IDE features a text editor for coding, a message area, a text console, a toolbar with buttons for common functions, and various menus. It interfaces with Arduino hardware to upload programs and facilitate communication. Many projects utilize the Arduino IDE due to its user-friendly nature, making it a convenient option for running programs on the board. The IDE employs a subset of the C language, offering easy access to numerous software libraries and on-board functions such as timers and I/O ports. This simplicity, however, comes at the cost of some efficiency compared to full-scale embedded C, and it abstracts certain useful details of the microprocessor from the user.

IV. RESULT

The experimental setup is done as shown in figure and the app designed to handle the pump when tank is empty is shown in Figure. And application helps user to monitor all the activities that happen between the tank and the pump. Features of the proposed solution are:

- The automatic turning ON/OFF of the pump using Raspberry Pi.
- Proper management of usage of water and control of wastage of water.

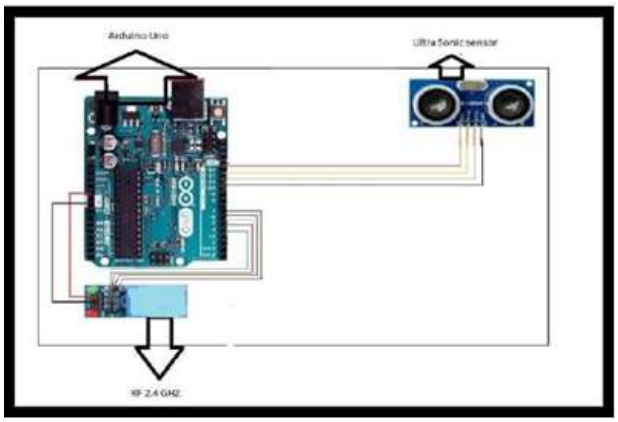

Figure 2: Schematic Diagram of water tank

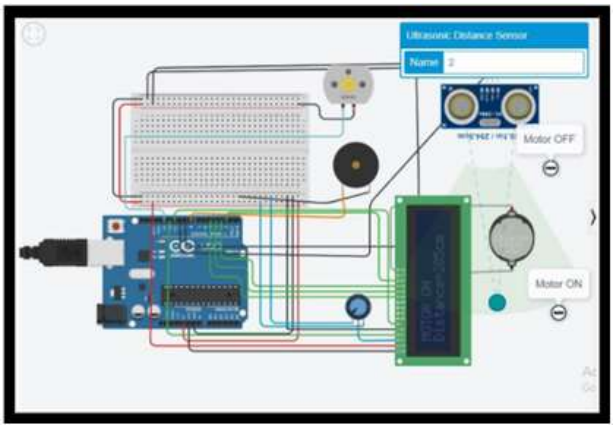

Figure 3: Circuit Diagram of the system

V. CONCLUSION

Effective Water and power management in houses. And we don't have to look after the motor anymore. There are certain limitations to this model. Some of them are addressed below: The

maximum and minimum threshold limits of the tank are variable for tank to tank.

The power supply for the model needs AC supply at the tank client should deploy one if it is not avail at present. The obstructions decrease the communication distance so that the better frequency ranges should be deployed. The future work of this project include adding The GSM board to send the real time notifications to the client. Automatic detection of tank depth while installation. Optimizing the power usage and noise decreasing in wireless communication. This module can be adapted to connect to the internet by giving a GPRS connection with 2G network. This system can be altered with high processing Microcontrollers like raspberry pi to take this model to a whole new level of IoT. By adding IoT the data analytics on water usage can be made possible so that the clear picture of water wastage with respect to different analysis can be achieved.

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