Automatic Water Level and Quality Monitoring System Using Narrow-Band IoT

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Abstract - *In this world of Internet, it is important to provide innovative solutions to make life easier for the people as well as contribute to nature. Internet is a worldwide phenomenon used by almost everybody today. Internet of Things (IOT) is also one of the developing fields in the area of computer science. Water, now becoming a scarce commodity especially in a country like India needs to be saved in every possible way. The Automatic water level and quality monitoring system will constantly monitor the water level and its quality in the tank it is being stored. The quality of water is monitored before filling the tank with water from the sump and the tank filled only up to a point where it doesn't overflow Outcome is expected to reduce the water wastage caused during pumping of water from sump to tank.*

Key Words: Internet, Internet of things, water level, sump, tank.

1. INTRODUCTION

Water is an important element which at once was available in plenty. Today, in a country like India especially in lower states face acute water shortage during summers and are unable to effectively store water during monsoons. There are multiple ways in which large amount of water is wasted every day. One such is pumping water from sump to tank which is done in almost every household and school. Even if the wastage is 2 litre per pump and once a day, considering the fact that there are around 25000 houses in just within a few mile radius, the overall wastage is 50000 litres per day. Wastage can happen as a result of quality when it fails to satisfy certain levels of standard. These wastages can be efficiently reduced by implementing the concept of IoT [1].

Fig.1: Internet of Things (IOT)

2. COMPONENTS OF THE SYSTEM

The components include Arduino nano that acts as a microcontroller, an ultrasonic sensor that is used to measure the distance of the tank and the water level inside it, a pH sensor to determine the pH of the water in the sump, internal and external relays that act as a switch to pump the water, a pump to transfer water from sump to tank, a LCD display to show the water level in the tank, a push button to calculate the distance or the existing water level in the tank, a buzzer to notify when the sump is empty[2].

3. WORKING OF THE SYSTEM

The push button is used to trigger ultrasonic sensors, which is used to identify the distance of the tank or the existing water level in it. Once the distance is calculated, the water is pumped from the sump to the tank based on two conditions. In the bottom of the sump is a pH sensor which is responsible for the quality check. pH sensor checks for the pH of the water in the sump before filling the tank. Once the quality check is complete, the internal relay automatically switches on the pump. The maximum and minimum water level is pre-defined in the code. Based on this, the tank is filled up to a safe limit and stopped automatically after reaching the maximum distance. When the water is in use from the tank during pumping, the pump keeps on pumping till the tank is filled or till the water in the sump is completely pumped into the tank raising an alarm indicating that the sump is empty. All the activities that are taking place are displaced in an LCD for better understanding. In case of negative scenarios where the quality of water is not up to the expectation, the motor is turned off and the pumping mechanism is automatically stopped to avoid contamination of tank water.

4. IMPLEMENTATION

The quality of water is determined by its pH value. Water is considered to be useful for human activity when it's within a range. Ideal pH for water is 7 and the value less than it considered as acidic and the value greater than is considered basic. Water that is used for all activity must be within the range of 6.5 to 8 which is from mildly acidic to mildly basic. Every household has a tank and sump where water is stored for multi-purpose usage. If the water is acidic then it corrodes the pipe and if it is alkaline salt deposition will be high. Hence pH is an important factor to be considered when monitoring water in households and schools. The pH of the water determined by the pH sensor is verified if it is within the predefined range set in the code. This verification is done in Arduino. The pH sensor is associated with sump to increase the efficiency of saving water. The pump requires two conditions to be satisfied. One of which is the pH of the water in the sump. If there is any anomaly in the pH, the pump is not started, instead the LCD displays the pH obtained along with its potential mineral contents. Once, pH criteria is satisfied, then the second condition is checked. When the water level in the tank is not full, the pump is switched on. When there is change in the height of the tank, the push button is pressed and the water level in the tank is calculated. If the water level is already in the maximum limit, the pump is not activated to fill the tank. If the tank is empty or half filled, both the conditions are satisfied and the pump is activated. This ensures the reduction in water wastage before and during pumping. The automatic on / off of the pump is done by relay. The LCD display displays the water level of the tank as a bar graph while also displaying the pH and its current mineral contents. The final scenario where sump is empty with no water will be indicated by an alarm raised by a buzzer.
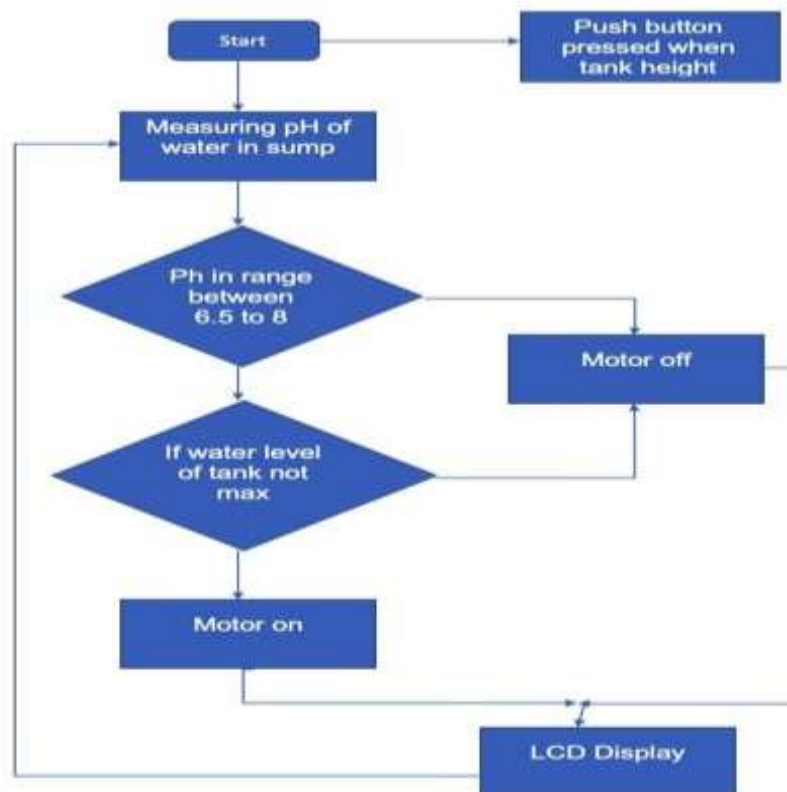

Fig.2: Data flow diagram

5. ADVANTAGES

1. Requires less space.

2. It ensures water quality.

3. No unnecessary wastage of water.

4. It is cheap and innovative.

6. RESULT

Technological solution for saving water wastage and simultaneously checking for its quality.

7. CONCLUSION

Water is important and it is our responsibility to save it. It is also essential to ensure the quality of water during monsoon times as a definite pre-caution. Technology used to attain environmental peace is as important as its growth.

8. REFERENCES

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