Smart Water Tank: an IoT based Android Application

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Abstract -- Wastage of water in the current scenario, merely due to overflowing tanks, which is not affordable. Conventional water tanks can neither monitor nor control the water level in tank, leading to large amount of water wastage. Some other technologies had certain drawbacks in some or the other way. The need of removal of these short-comings and providing an efficient and economical solution has been the main focus of this project. Our project is for water level monitoring as well as controlling with IOT and android application. The IOT platform we are using is Arduino which is an open source. The water level in the water tank is divided into maximum, minimum and nominal levels indicated by different colours for each. An HC-SR04 ultrasonic sensor is placed on the surface of the tank to sense the water level and the distance from water level to the sensor is measured and sent to the android application through Arduino. We can monitor the tank manually using an on/off button provided in the android application. The android application has a user interface which displays the tank layout, a button for manual operation and an LED for indicating the motor status.

Index Terms: IoT, Node MCU, ultrasonic sensor, Arduino, Android Application.

I. INTRODUCTION

Water is always a crucial part of everyday life. Due to global environmental situation, water management and conservation is vital for human survival. In recent times, there were huge needs of consumer based humanitarian projects that could be rapidly developed using Internet of Things (IoT) technology. But our proposed system measures water level in real-time and helps the user to monitor the water tank remotely using android application.

II. BASIC CONCEPTS

A. Arduino UNO

It is an IoT platform which has an external Wi-Fi module that can connect to internet via hotspot using its SSID and Password. It can be programmed to implement logic statements as per requirement of the project.

The ultrasonic sensor reads the distance of water surface and returns it to Arduino UNO. The Arduino UNO, when connected to internet, uploads this value to the NodeMCU, which is an open source IoT platform. Also it retrieves some values from NodeMCU which are set by user in the android application. Accordingly, the functioning of motor depends upon the current water level and the maximum and minimum values.

B. NodeMCU (ESP 8266)

It is a Wi-Fi module which can connect to internet via hotspot by using its SSID and Password. It can be programmed to implement logic statements as per requirement of the project. In our project, we are using this to connect android application with Arduino. For our project, we are using this as an interface between android application and Arduino.

C. Blynk – Android Application

Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It is a digital dashboard where we can build a graphic interface for our project by simply dragging and dropping widgets.

D. Ultrasonic Sensor

Ultrasonic sensor is used to generate ultrasonic sound waves which are bombarded on the surface of water. This sensor consists of a speaker which emits an ultrasonic sound wave and a mic which detects that particular sound wave. As there is no contact of water with sensor, ensures long life of the sensor.

III. BASIC BLOCK DIAGRAM AND FLOW CHARTS

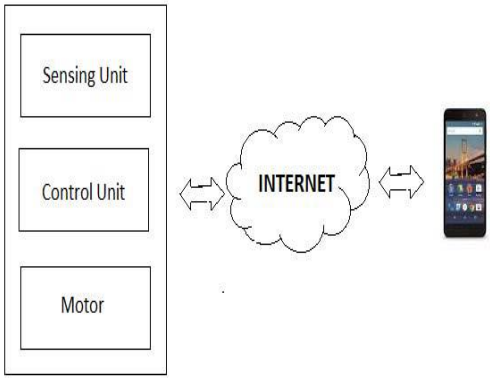

Fig1: Block Diagram

Android application and hardware and connected through NodeMCU via Wi-Fi hotspot or Internet.

Flow Chart (Over view):

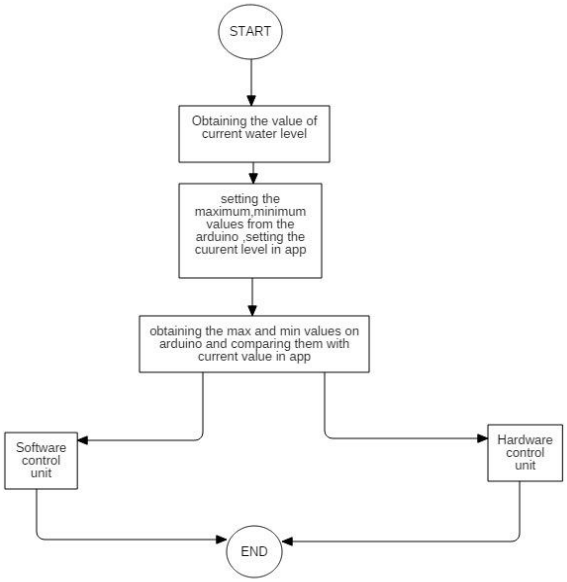

Fig2: Over all Flow Chart

Implementation in Arduino:

Flow Chart of working in Arduino UNO:

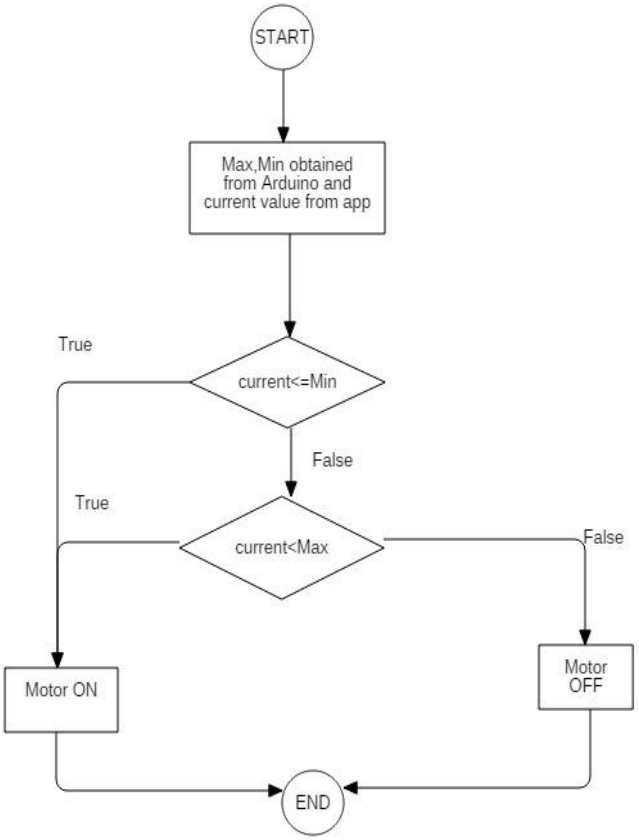

Fig3: Flow Chart of logic in Arduino UNO

IV. SYSTEM DESIGN AND IMPLEMENTATION

For this project, we have used Arduino UNO as microcontroller. The values of maximum and minimum levels are obtained by Arduino using ESP. These values are set in the code written for Arduino UNO. The current level of water is obtained from the ultrasonic sensor. Depending upon these values, the motor is turned ON / OFF.

Proposed working of water tank and motor:

Table1: Proposed Working

Sl. No.	Conditions of Water Level	Motor Status
1	Water level below minimum level	ON
2	Water level equal to or greater than maximum level	OFF
3	Water level in between minimum and maximum levels	Status can be controlled by the user

Depending on the water levels, as described above, the status of motor will be automatically controlled. If water level is in between both the levels, then the user can exercise control by toggling the status of motor from the android application. Buttons – ON and OFF have been provided for the same.

The application is designed in such a way that it will show the instantaneous value of current status of water in percentage.

The height of tank is to be set once in Arduino. This height shall be used to determine the percentage of water. Calculations of the current water level will be done with this. Making decisions with percentage proves to be easier to implement the logic in programming.

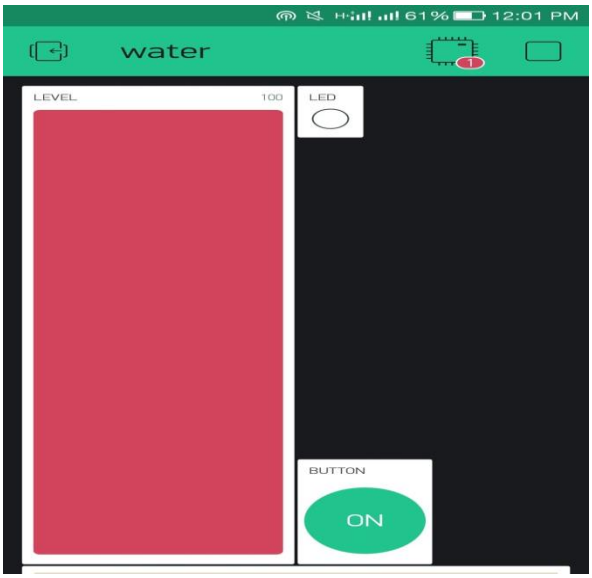

Fig4: Screenshot of water tank when it is full

V. CONCLUSION

Water is one of the most important basic needs for all living beings. According to Wikipedia, 97% water is present in Seas and Oceans. That means only 3% of available water is present as fresh water. Out of this 3%, only 1% of water is available for consumption. But unfortunately a huge amount of water is being wasted because of uncontrolled use and exploitation of water resource. Some other automated water level monitoring systems are also present, but so far most of the methods have some shortcomings in practice. We tried to overcome these problems and implemented an efficient automated water level monitoring and controlling system. Our intension of this research work was to establish a flexible, economical, easy configurable and most importantly, a portable system which can solve our water wastage problem. We have used ESP and Ultrasonic sensor which reduces cost effectively and makes this project economical. Also, this project doesn't require special different tank for it, existing water tanks can be used. We have successfully implemented this project.

VI. FUTURE SCOPE

This project has enormous applications. It can be installed in the following areas:

1. Private houses or bungalows
2. Housing societies
3. Apartments
4. Institutions like schools and colleges, hostels
5. Hospitals
6. Offices
7. Municipal overhead tanks (with slight changes in hardware)

This project can be implemented for a wide range of different sizes of water tanks making it a completely reliable solution.

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