

# Implementation of Smart Water Level Monitoring System for Residential Apartments using IOT

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**Abstract-** IOT based Water Level Monitoring system is an innovative system which will inform the users about the level of liquid and will prevent it from overflowing. To demonstrate this the system makes use of containers, where the ultrasonic sensors placed over the containers to detect the liquid level and compare it with the container's depth. The system makes use of AVR family microcontroller, Raspberry Pi, LCD screen, Wi-Fi modem for sending data and a buzzer. A 12 V transformer is used for power supply in this system. The LCD screen is used to display the status of the level of liquid in the containers. The liquid level is highlighted as colored to show the level of liquid present in the container with the help of a web page to the user. The buzzer starts ringing when the set limit of the liquid is crossed. Thus this system helps to prevent the wastage of water by informing about the liquid levels of the containers.

**Index terms-** Water Level, IoT, Embedded System, Monitoring System

## I.INTRODUCTION

Thus the Internet of Things (IoT) has a major role to play in Smart Village in India. In IoT enabled Smart Village every physical object, a thing, will be connected to the Internet and enable users to keep track of its status and to control it remotely. This will help users to access to services provided by such objects as and when required. IoT can be used in smart village to develop Smart Agriculture, Smart Dairy, Smart Schools, Smart Healthcare and Smart Grid solutions. IoT in agriculture can be used for better management of resources used in crop production. Water is one of the important substances

used in crop production. It must be saved to avoid water shortage in future.

One such way to save water is to monitor and study its usage and accordingly its utilization should be managed. Monitoring water level of a water source, such as water tank or bore well etc., plays a key role in water management. Keeping track of water level in a water source can be used to preserve water and to study the water usage. Thus monitoring water level is an important task in agricultural. Water Level Monitoring can be found in many areas since before. Various types of Water Level monitoring system based on the control.

1. Individual systems: This is a very popular type of systems. Here the whole model is implemented on a targeted single source system.
2. Large control systems: Here the water level is implemented on a very large scale basis and huge amounts of sensors are used.
3. Central Control systems: Computerized systems programmed to handle all the functions of multiple utilities like air conditioning system.
4. Home entertainment systems, refrigerators all at the same instant regardless of your presence. Control system can be accessed through telephone or internet from any corner of the world.

This project operates in a condition of low water level. Water detector detects the water level and then sends signal to microcontroller unit. The microcontroller circuit sends signal to GSM modem and then GSM modem sends SMS to the person in-charge mobile phone. The mobile number of the user

has been set in AT command of PIC16F877A and sends alert.

### II. BLOCK DIAGRAM

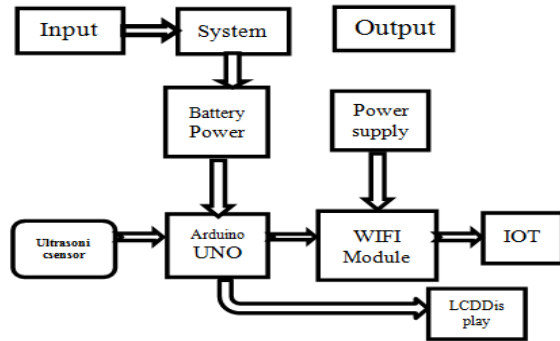


Figure 1. Block Diagram

### III. SYSTEM FUNCTIONALITY

The proposed system is simulated by using Proteus and design suit software. Wires are used as a sensor for simple yet ameliorated understanding. Five sensors are placed at equal intervals in the storage system. These five sensors provide input to the Arduino Uno pins (A1 to A5). When water level reaches the sensor level, that respective branch is connected to the 5-volt DC supply using the probs. Arduino reads the analog input from the sensors as per the requirement. Arduino then produces the needed (high or low) output on the motor pin. The output to the motor pin is then given to the motor driver, as shown in fig 2. Here, L293D (6 pin motor driver) is used to control the DC motor. The Arduino is interfaced with the LCD. The Arduino is programmed such that depending on the input from the analog pins, percentage of water in the storage system and the status of the motor are displayed on the screen.

#### A. Water Tank

The water level detector is triggered when it touches the water level at specified level illustrates the three low levels of the water in the tank that to be alerted. The three levels are called as low level, L1, very low level, L2 and critical level L3. A signal is sent to each detector circuit and sent notification to microcontroller when it does not detect any water. From the microcontroller, the signal is sent to GSM and to person in-charge in a form of SMS. There are three sequences of SMS sent to the person in-charge to alert the level of the water tank.

#### B. Water Level Sensor

The water level Indicator employs a simple mechanism to detect and indicate the water level in an overhead tank. This is a five levels indicator. The sensing is done by transmitter and will start sending radio signal that will receive by the receiver. The receiver updates different level LED depends upon the water level signal transmitted by transmitter. (Five level). A buzzer is also added which will automatically start as the water level becomes full. The user has to press the only button on receiver to stop the buzzer. The water level Indicator will be work efficiently up to 5 floor building. Installation of the receiver in open will increase its efficiency.

#### C. Circuit Diagram

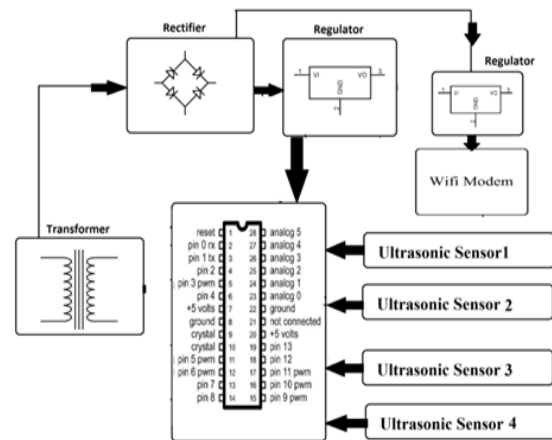


Figure 2. Circuit Diagram

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The UNO is the best board to get started with electronics and coding. The UNO is the most used and documented board of the whole Arduino family. Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

#### D. Power Supply for Circuit

Adding an emitter follower stage to the simple zener regulator forms a simple series voltage regulator and substantially improves the regulation of the circuit. Here, the load current  $I_{R2}$  is supplied by the transistor whose base is now connected to the zener diode. Thus the transistor's base current ( $I_B$ ) forms the load current for the zener diode and is much smaller than the current through  $R_2$ . This regulator is classified as "series" because the regulating element, viz., the transistor, appears in series with the load.  $R_1$  sets the zener current ( $I_Z$ ) and is determined.

#### E. LCD

LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. There are a lot of combinations available like,  $8 \times 1$ ,  $8 \times 2$ ,  $10 \times 2$ ,  $16 \times 1$ , etc. but the most used one is the  $16 \times 2$  LCD.  $16 \times 2$  LCD is named so because; it has 16 Columns and 2 Rows. It will have ( $16 \times 2 = 32$ ) 32 characters in total and each character will be made of  $5 \times 8$  Pixel Dots. Each character has ( $5 \times 8 = 40$ ) 40 Pixels and for 32 characters we will have ( $32 \times 40$ ) 1280 Pixels. Further, the LCD should also be instructed about the Position of the Pixels. Hence it will be a hectic task to handle everything with the help of MCU; hence an Interface IC like HD44780 is used, which is mounted on the backside of the LCD Module itself. The function of this IC is to get the Commands and Data from the MCU and process them to display meaningful information onto our LCD Screen.

#### F. Water Level Detector Circuit

The signal is sent to microcontroller circuit when switch is open. The relay energized when bare wire detect water and closed the relay switch and otherwise. There are three stages of the water level connected to the input Port A of the microcontroller. The circuit used 9V DC as the power supply.

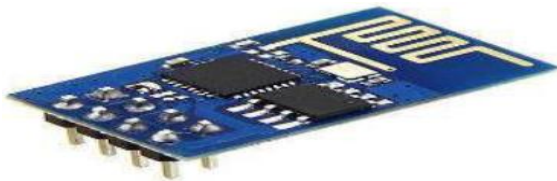


Figure 3. Level Detector Unit

The system consists of three different circuit boards namely the detector relay and circuit boards and

microcontroller circuit boards. The three were assembled and connected to the GSM modem.

#### G. Software Requirements

Software requirements definition is an abstract description of the services, that the system should provide, and constraints under which the system must operate. Only the superficial behavior of the system should be specified and is not concerned with system design characteristics.

1. Reliability: The overall consistency of a measure. A measure is said to have a high reliability if it produces similar results under consistent conditions.
2. Availability: The degree to which a system, subsystem or equipment is in a specified operable and committable state at the start of a mission, when the mission is called for at an unknown.
3. Security: Degree of resistance to any harm.
4. Portability: Using the same software in different environments.
5. Maintainability: Measures the ease and speed with which a system can be restored to operational status after a failure occurs.

#### IV. CONCLUSION

The Internet has changed the dimensions of life involving virtual interaction. IOT has the potential to add new dimensions enabling smarter objects communications. This project proposes a simple water level monitoring system with different levels indicated. It also signifies when the water level is below and above then the requirement. System design and architecture is as discussed, thus being a cost effective and simple strategy to monitor the water level system.

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