# Fully Automated System for Monitoring Water Usage using SMS and Android Application

## Aniket Nikam[1], Nisha Warhade[2], Rohit Dhawale[3], Siddhant Prabhu[4], Ganesh Deshmukh[5]

*[1,2,3,4]Student, Dept. of Computer Engineering, PCCoE, Maharashtra, India*
*[5]Professor, Dept. of Computer Engineering, PCCoE, Maharashtra, India*

---------------------------------------------------------------------***---------------------------------------------------------------------

**Abstract -** *In summer, this unexpected shortage of water supply has become a common phenomenon. The situation is worsened as there is no fixed time allotted for releasing the water from Main Municipality Water Tank and people have to cancel all their plans in-order to store water for their household use whenever the water is released from Municipal Tanks. Apparently there is no early warning system to monitor the water level of tanks of housing societies when it has reached the critical level and to continuously give a graphical representation of water currently available in the tank of housing societies. The situation gets worsen when there is no personnel in-charge to do the maintenance of these tanks at the time when it is needed. This implemented project gives description of monitoring the water level with the help of ultrasonic sensor. The water level is monitored and the data is sent to Server with the help of ESP8266 Wi-Fi module. The Society Chairman is notified through SMS when the Motor-Pump starts and stops. Also the Water Usage of each and every flat in the Society is tracked and updated to server. In case of any leakage or the member is not at home and the tap is left open, the water flow can be cut-off with the help of solenoid valve operated from the Android application. Also, users would be able to see their water usage using the Android app.*

*Key Words*: *ESP8266 Wi-Fi Module, Arduino, SMS, Android, Solenoidal Valve, GSM Shield, Sensors.*

## 1. INTRODUCTION

The Internet of Things is a novel paradigm that has gained ground in recent past. The internet has changed the way we live, moving interactions between people at a virtual level from physical level [1]. The IoT has an extremely significant ability to impact the future of mankind. We are about to enter a world where everything has the potential to be connected. In fact, IDC estimates that by 2020, the installed base for the IoT will be as high as 212 billion, including 30 billion "connected things."[2]

There are a lot of appliances being developed in IoT domain.  Mankind has always been facing the issue of water scarcity and water wastage. We have developed a "Fully Automated System for Monitoring Water Usage using SMS and Android Application". This system will help address the issue of water scarcity and water management in large townships and also in small housing societies, we have developed a system that will help conserve water and keep a track of water and inform the residents in situations leading to misuse of water.
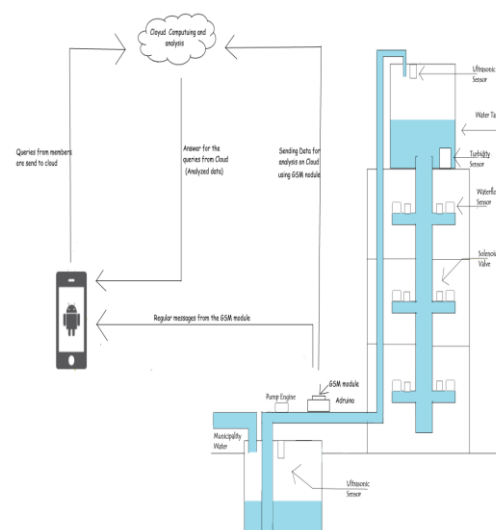
The Section II of this paper describes the System Architecture that has been implemented to solve the issue. The Section III of this paper discusses the Results obtained before and after the implementation of the System. The Section IV comments on the conclusions inferred from the results.

## 2. SYSTEM ARCHITECTURE

To overcome the issue of water wastage and water scarcity, we have implemented the following architecture for Water Monitoring using SMS and Android application. The System will comprise of two parts the hardware part and the software part.

The hardware part will include all the sensors. The software part will include all the API's i.e. Application Programming Interface and the protocols necessary for communication of different hardware components. The Software part also includes of Android and PHP files for User-Interface and communication.



**Fig-1.** System Architecture

---

The Architecture consists of following hardware components:

## 2.1 Arduino Mega:

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller [3].

## 2.2 GSM Module:

GSM is an international standard for mobile telephones. It is an acronym that stands for Global System for Mobile Communications GSM supports outgoing and incoming voice calls, Simple Message System (SMS or text messaging), and data communication (via GPRS).The Arduino GSM shield is a  GSM modem. From the mobile operator perspective, the Arduino GSM shield looks just like a mobile phone. From the Arduino perspective, the Arduino GSM shield looks just like a modem [4] [5].

## 2.3 Ultrasonic Sensor:

Ultrasonic sensors "are based on the measurement of the properties of acoustic waves with frequencies above the human audible range," often at roughly 40 kHz 1). They typically operate by generating a high-frequency pulse of sound, and then receiving and evaluating the properties of the echo pulse [6].

## 2.4 Water flow Sensor:

Water Flow Sensor is the process of measuring water use. It measures flow in cubic metre (m3) or litres (l) [7].

## 2.5 Solenoid Valve:

A solenoidal valve is an electromechanically operated valve. Solenoid valves are the most frequently used control elements in fluidics [8]. Their tasks are to shut off, release, dose, distribute or mix fluids.

## 2.6 Android Application:

The working of these hardware components of the system in synchronization with Android application is as described as follows:
1. Ultrasonic Sensor will detect the water level present in the tank;
2. Water Flow Sensor will calculate the amount of water used by flat/house.

This data then will be sent to Arduino.  Later the data collected on Arduino board will be sent to Cloud by Wireless Module using PHP files for analysis and for calculation of the data.

The data analyzed on Cloud is given to users depending upon the queries which will be given by users with help of android app interfaced with the help of GSM Module and Wi-Fi module. Regular update of water tank will be given to the members on their registered cellphones with the help of GSM module. Solenoid Valve will be used for closing the water supply depending upon users choice or depending upon more water consumption. The water supply to a flat in housing society will be cutoff if the water consumption of the flat has exceeded the threshold or if there is abnormality in water consumption of the flat, however the flat owner will be allowed to again restart the water supply to his flat by simply sending the request from his Android Application to Arduino controller in genuine cases.

As soon as there is contamination in water, the message will be sent to the authorized personnel (chairman or secretary). The authorized personnel has the rights to control one's Solenoidal valve and to see the water level in the tank as well as to view the water consumed by each flat.

## 3. RESULTS OBTAINED

Our system helps to monitor the water usage in a housing society. Various sensors are used to keep a track of water usage. The sensors can be controlled and monitored using Android Application. The Chairman has to register first using the Android App, where he will be sent an OTP (one-time-password) using which his registration will be confirmed. Once the Chairman is registered other Members will register as well. The systems functions are as follows:

## 3.1. Check Water Level (using LED indication):

Ultrasonic sensor is used to detect the water level in the tank with the help of Arduino and the distance sensed is sent to Cloud and appropriate LED glows.

There are three LED's used red, yellow and green respectively. The red LED glows when the water level in upper water tank is critically low. The yellow LED glows when the water level in the upper water tank is moderate. The green LED glows when the tank is completely filled. As soon as red LED glows the water-pump is automatically started and the SMS is sent to the members stating "Water in Upper water tank is critically low use water efficiently, Water-Pump is now started." When the green LED glows water-pump is automatically turned OFF and SMS is sent to the members stating "Water-tank is completely filled, Water-Pump is switched OFF."

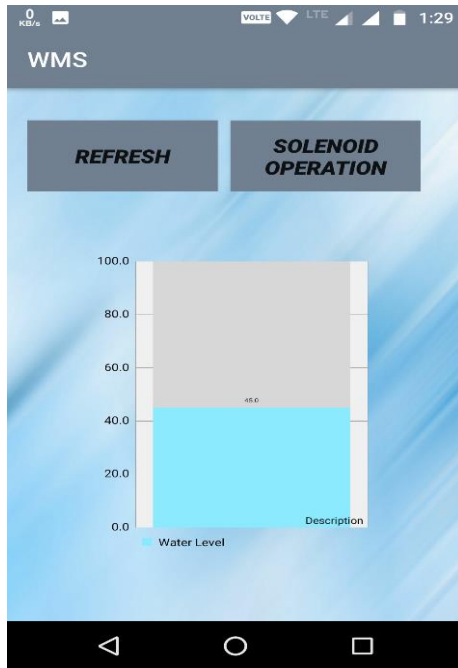## 3.2. Check Water Level (using Android Application):



**Fig-2.** Screenshot of Android Application to view Water Level in the tank

With the help of Ultra-Sonic sensor the flat member is able to check the water level in the tank anytime and from anywhere he want. The member must be connected to the Internet/Wi-Fi to check the water level. The members are notified via SMS whenever the water pump is automatically turned ON based on water level in the upper tank. The members are also notified when the Water Pump is automatically turned OFF when the tank is completely filled.

## 3.3. Check Water Usage (using Android Application):

With the help of Water Flow Sensor the water consumed by the flat owner is sent to the Arduino and from Arduino it is updated to the database using Wi-Fi module. The Member is then able to check his/her flat water usage on daily basis or on monthly basis. He can then use water efficiently.

The Chairman or Secretary can view who are the people who have used more water and can encourage those people to use less water.



**Fig-3.** Screenshot of Android Application to view Water Usage of a particular flat

## 3.4. Cut-Off Water Supply (using Android Application):

With the help of Solenoidal Valve the flat owner can cut-off the water supply at times when he is not at home and water taps are left open. Admin also has special rights to cut the water supply in case the owner is unable to do so. The water supply is automatically cut-off by solenoidal valve once the threshold value for water-usage is exceeded by that flat.

Thus this system helps to reduce water scarcity and thus helps the members to use water in an efficient way.
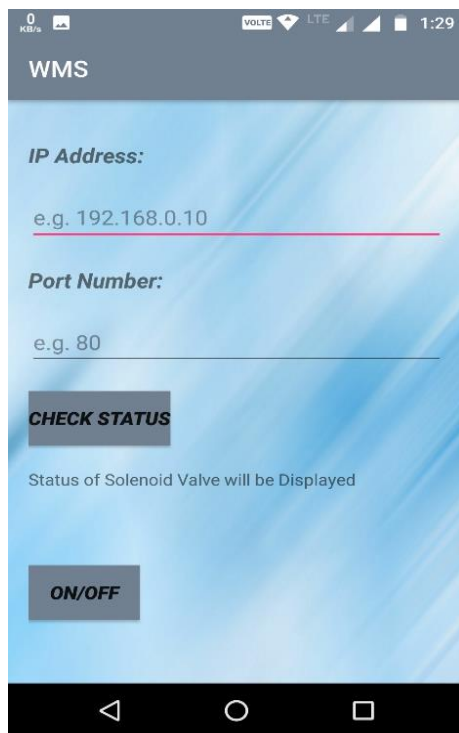
**Fig-4.** Screenshot of Android Application to control the Solenoidal Valve

## 3.5. SMS to Notify Flat Members:

This system notifies the flat member that "PUMP IS TURNED ON" and also notifies when the tank is full by sending message "PUMP IS TURNED OFF". This will help the flat members to manage their household chores.
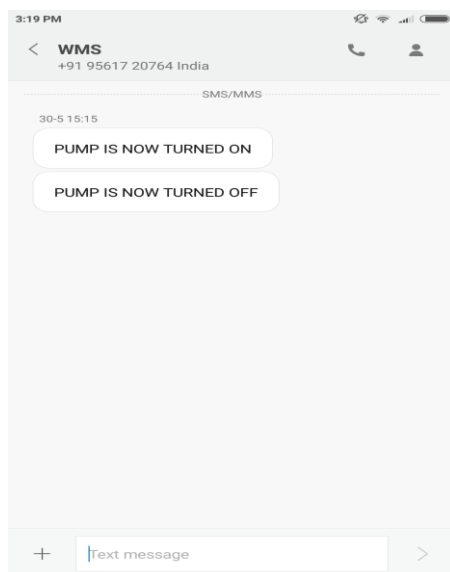


**Fig-5.** Screenshot of SMS sent by system to users

## 4. CONCLUSION

Water one of the important resource should be used very efficiently. The uncontrolled use of water leads to wastage of water and ultimately causes water scarcity. This system helps to monitor the usage of water and people can use water in an efficient way. It will help the society members to check the water level in the tank. Also members will be able to monitor their per flat water usage on the Android app. Water wastage can be avoided using the Android app by cutting off the water supply of the particular flat. Like whenever the member is not at home and the taps are left open then water is cut-off through Android app using Solenoidal Valve. This all automation helps to reduce human efforts and helps to manage water carefully and will also reduce the problem of water scarcity.

## ACKNOWLEDGEMENT

## REFERENCES

[1].https://www.researchgate.net/profile/Luigi_Atzori2/publication/222571757_The_Internet_of_Things_A_Survey/links/546b36df0cf2f5eb180914e5/The-Internet-of-Things-A-Survey.pdf

[2].https://www.digitaldoughnut.com/articles/2016/april/understanding-the-internet-of-things-and-its-impac

[3].https://www.arduino.cc/en/Main/ArduinoBoardMega2560

[4].http://www.engineersgarage.com/articles/gsm-gprsmodules

[5].https://www.elprocus.com/gsm-architecture-featuresworking/

[6].http://arduinoinfo.wikispaces.com/Ultrasonic+Distance+Sensor

[7].http://www.futurlec.com/Flow_Sensor.shtml

[8].http://www.solenoid-valve-info.com