Water Level Monitoring System using a Smart Phone

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Abstract - Water is one of the important natural resource in the world, which is used for different purposes like for irrigation, for drinking, in hydro plant, etc. so it is necessary to save wastage of water in field, in nuclear plant and hydro plant also. Decreasing water level is one of the key concerns now-a-days. Due to increasing population many water related problems like water pollution, wastage of water, water scarcity, etc., is arising day by day. So there is a need of sustainable utilisation of water resources in order to use them efficiently by present generation as well as conserving it for the future generation. Traditional methods of conservation have been implemented to conserve water. Smart devices leveraging IoT technology is the answer to taking water conservation to a new level. IoT technology will enable smart water meters, sensors, and irrigation systems to be deployed in homes and businesses with ease. Thus this project introduces a simple wireless monitoring. This IoT project helps in conserving the water by indicating the water level in the overhead water tanks. For this indicator Ultrasonic Sensor, GSM Module and Arduino Nano are used. Ultrasonic Sensor is to detect water level, Arduino Nano receives the information from the sensor and sends it to the GSM Module, which transmit real-time information to a Smart Phone via Cloud. Since the real-time measuring data could be transmitted via GSM Network, the person can check on the water level anytime.....in real-time using internet anywhere. An Andriod App "Blynk" can be used to check the water level at our convenient time using our Android Smart Phones.

Keywords **-** Smart Water Management, Internet of things, Wireless Sensor networks, Sensors, Water Monitoring, BLYNK.

I. INTRODUCTION

We need modern method to protect and preserve as much water. The wastage of water through storage tanks not only waste water but also waste electrical and mechanical energy required to utilize the pumps.

This problem motivated us to design an IoT enable architecture that can help anyone with an Internet connection to administer water storage level easily without even a click of a button. Looking at the ability to offer various features we decided to target this platform for those who do not own an Android device.

The web platform is mobile friendly which will make it easy to run on any device available today ranging from old phones to the current generation flagship devices such as iPhones and Windows 10 Phones. This product may reduce cost associated with water usage in large societies or industries.

We get motivation from our Honourable Prime Minister Sri Narendra Modi's Smart City vision which concerns to an urban development vision which concerns to an urban development vision to integrate multiple information and Communication Technology (ICT) and Internet of Things (IoT) solutions.

II. LITERATURE SURVEY

This study discusses the design and current development of system having low cost to monitor real time values and also to control the system using IoT. To measure the various parameters of the water, array of sensors are included in the system. The parameters which can be measured are like temperature, PH, turbidity of the water. Core controller can process the value measured from the sensors. The Arduino Uno model can be used to control the system. Lastly, to access the sensor data on internet, cloud computing can be used.

In 2016, Divya Kaur presented a paper on "IOT based Water Tank Control system "for prevent the water wastage. Making a control system to automatically control the water pump requires[1] careful observation of what people do as their daily activity to make sure that the tank is full. In almost all over India every state has a State Water Supply body which is responsible for development and[1] regulation of water supply in state. Due to scarcity of water the release of water is controlled and done at certain time(s) in a day. So this paper is aimed at presenting the project in embedding a control system into an automatic control system into an automatic water level controller using wi-fi module.

In 2015,N Vijayakumar and R Ramya[2] present a "Design and development of a low cost system for real time monitoring of the water quality in IoT (internet of things)".The system consists different sensors like pH, turbility, water level sensors etc. All the parameters are measured and that measured value which is stored from sensors can be processed by Raspberry PI B+.The sensor data can be shown on internet by using cloud computing and this devices are more efficient, low cost, and capable of processing, sending operation thorugh Wi-Fi module to mobile phones. This can implement for environment [2]monitoring and the data can be viewed anywhere in the world.

In 2013 Saima Maqbool , Nidhi Chandra presented a paper on "Real Time Wireless Monitoring and Control of Water Systems using Zigbee 802.15.4" in which the architecture which comprises a number of elements likes water quality sensor water level sensor, GSM modem , PC, XBee, and a database. Sensor nodes are performing the particular function or job , sense the data and those data are

transmitted to the end tool or machine via inverter. Sensed data is coordinated by network equipments like Router. [3]Router will gather data from the end tool like XBees which in turn from sensors and sends the data to coordinator. In the computer all information are presented. In the Computer; river level, bore water level and bore water level is shown by using C sharp program. From computer particular task can be executed like "SMS" is forwarded to user's system and at alarm are blows at the desired level. All these data can be kept and saved in database which will be utilized to implement a "water expert system" through a long term supervising and investigation.

III. ABOUT THE "BLYNK"

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other things.

There are three major components in the platform:

- **Blynk App** - allows to you create amazing interfaces for your projects using various widgets we provide.
- **Blynk Server** - responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
- **Blynk Libraries** - for all the popular hardware platforms - enable communication with the server and process all the incoming and out-coming commands.

Now imagine: every time you press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blynk of an eye.

Blynk app configuration -

- Open blynk app and create new project
- Give a project title and select Hardware Model as "Arduino Nano"
- AUTH TOKEN will be given, which can be changed by using "Refresh".
- New Project can be created now.
- Now Controllerscan be added i.e., Display and other Widgets
- Now the Arduino code can be uploaded to ESP
- Depending on the OS, Serial Terminal can be installed to communicate with the ESP 12.
- If Arduino IDE installed then the Serial Monitor present inside can be used by navigating to Tools > Ports. Select the port that the CP2102 was detected on, and then open the Serial Monitor.
- To add Widget to Project, add two "value display s" display widgets and Tap on the display widget to name them and assign virtual pins as per your code (v1).
- Add meter gauge to constantly monitor the water level sitting anywhere in the world.

IV. BLOCK DIAGRAM

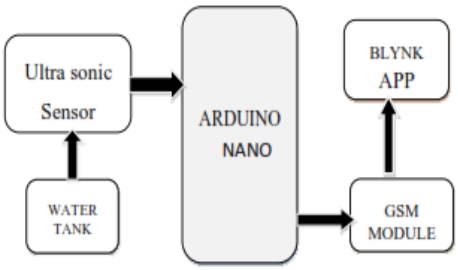


Figure 1: Block Diagram

V. SCHEMATIC DIAGRAM

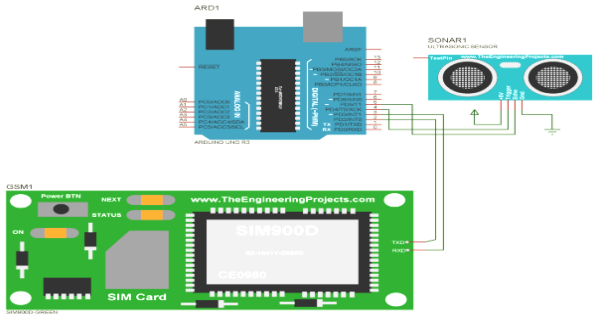


Figure 2: Schematic Diagram

Working of the System - This IoT project works as follows, when this complete module is fixed inside the tank, firstly the Ultrasonic Sensor senses the level of water by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the water. The data from the Ultrasonic Sensor is received by the Arduino Nano.

a) Ultrasonic Sensor - Ultrasonic Sensors (also known as **transceivers** when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

Figure 3: Ultrasonic Sensors

b) Adruino Nano - Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use

hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing). Arduino projects can be stand-alone or they can communicate with software on running on a computer (e.g. Flash, Processing, MaxMSP).

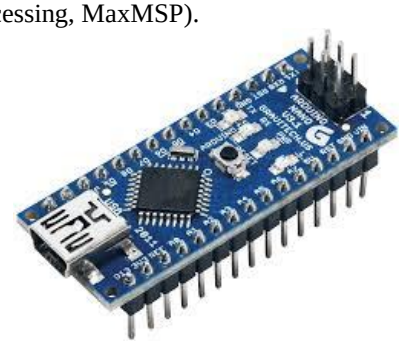


Figure 3: Adruino Nano

c) GSM Module - GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service).

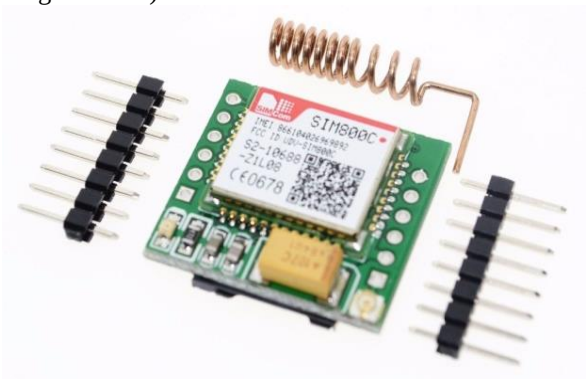
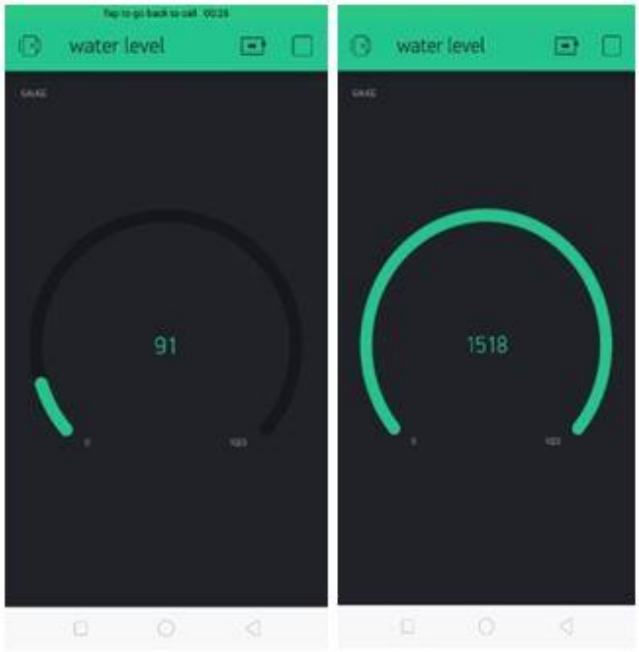


Figure 4

VI. RESULT AND DISCUSSIONS

The ultra-sonic sensor is used to detect the water level in the over head tank. We get the information using the BLYNK mobile app. The meter in below figures indicates us the water level by measuring the distance between the sensor and the water.



VII. FUTURE SCOPE

This project can be tweaked to get the liquid level details in message on any mobile phone. Eg. If a certain chemical used in a factory goes beyond 50%, a message is triggered and sent to any registered number or a notification is sent over an app.

We can use this with motor by turning it ON when the water level is low and by turning it OFF when the water level is high.

By using the solar panels we can provide the power supply to the circuit even in the times of power cut.

Either way, this project can also be developed on Bluetooth technology.

VIII. CONCLUSIONS

Many entities and problem solvers have tackled the problem of water wastage in their own way. We have made a serious attempt at solving this problem and saving one of the most precious commodity this world will ever have- “water”. We focused on the problem of water wastage through overflow of water reservoirs or tanks.

This project has successfully addressed this problem and will most definitely help control it. The application uses Internet of Things and Android platform to monitor water level changes and also allows user to administer the water tank from different corners of the world. It has automated the entire process thus reducing energy wastage and manual labour.

Android is one of the most widely used platform for deploying applications. Various features of wi-fi module and its ability to utilize sensor data and support for development environment proved beneficial.

The system is going to help home owners and organizations to cut back economic loss and provide a reliable way to manage water reservoirs without any hassle. Future developments can improve the system and make it more scalable.

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