

# ULTRASONIC BASED WATER LEVEL MONITORING AND CONTROLLING

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## ABSTRACT

The proposed system is an extended approach to monitor and control industrial and household systems. This system monitors the household system from any location; due to this it will save lot of time in this busy era. This paper describes design of an IoT based water level monitoring system (WLMS) that detects water level of the tank which supplies water to the industry or household. Water scarcity is one of the major problems that are being faced in major cities of the world and wastage during transmission has been identified as a major culprit. This is one of the motivations for this research, to deploy computing techniques in creating a barrier to wastage in order to not only provide more financial gains and energy saving, but also to help the environment and water cycle which in turn ensures that water is saved for future. The research is based on embedding a control system into an automatic water pump controller through the use of different technologies in its design, development, and implementation.

**KEY WORDS:** Control system, Automatic water pump controller.

## I. INTRODUCTION:

This paper is about monitoring and controlling water level in water tanks. This is a self-regulating system which plays a key role in conserving water that is being overflowed or wasted by the people in our everyday lives while filling the water tanks. This automatically controls the system by switching on and off the motor and also gives information of the water level.

### A. ROLE OF AUTOMATION

Automation is the use of various control systems for operating equipment such as machinery, processes in factories, boilers and heat treating ovens, switching in telephone networks, steering and stabilization of ships, aircraft and other applications with minimal or reduced human intervention. Some processes have been completely automated. The biggest benefit of automation is that it saves fatigue, effort however; it is also used to save energy and materials and to improve quality, accuracy and precision.

### B. ROLE OF AUTOMATION IN ELECTRONIC SYSTEMS

The rapid developments in electronics, the tremendous increase in the complexity of electronic systems, and the decrease in their geometrical dimensions, have contributed to automation from the very beginning for automation aids at all stages of the production of electronic systems and components. This has particularly been amplified since the globalization of, and the increase in competitive pressure in, the international electronics market, the volume of which is estimated to exceed US\$1.5 billion. International competition drives up production standards, leading to both high product quality and a high price/performance ratio for the product. This is achievable through a decrease in overall production time, a reduction in production costs, and an increase in product quality using automation strategies. For the same reasons, the design and rapid prototyping of new products are increasingly becoming very significant, because in this way the product development time is reduced, and experimentation at the extremely expensive and time-consuming production level is largely avoided. Rapid prototyping is especially important. This helps the designer to estimate the physical realization of the product and the performance to be expected from it, and includes simulation test runs of product behaviour.

### C. ADVANTAGES OF ELECTRONICS

On the other hand, electronics are one of the technologies being created today which are widely used all over the world. In fact, all of our gadgets and machines like computers and televisions are being generated with electronics. Therefore, without this, we cannot enjoy using the inventions that we have around us. Below are some benefits that electronics has given us:

1. These make our lives more convenient and easy. In the old days, we give so much effort just to attain what we truly want, while these technologies give us what we want in an instant manner. Like for example, computers are composing of electronics inside. In the same way, they store information and data in a well organize way that we don't need to write too much. In fact, new innovations have come now that are greatly higher than the use of mouse in clicking the computers. Computers, televisions and even mobile phones are made in multi touch screen mode wherein everything is just a click with our fingers away. Even ATM machines in the banks are created to become multi touch screen.

2. These build communication faster and easier. We already know that in ancient times they use analog phones which are bulky and the lines are choppy is very difficult to contact your love ones, especially during emergency. And also, snail mails able to reach us during a long period of time which are already late before we read the information which we ought to know. But nowadays, mobile phones, chat with web-cam and emails in the Internet making our love ones even from abroad to feel like being closer to them. We are able to convey our message easily and clearly at a very low cost using all of these gadgets.

3. These create more entertainment to us. In the past, we can notice that children go outside to run around and play with their playmates. But today, you can see most of the kids in the computer playing online games. Our black and white televisions before has transformed into a colored, flat and multi touch overlay that can really make all of the stories that we are watching more real and clear. In the same manner, these can also be found in our projector during each presentation wherein we can even control everything that we want to see in the screen. We can even draw or create our presentation more adorable to the audience that will prevent them to become sleepy. Thus, they will be ignited with the staging.

4. Lastly, we are able to gain more knowledge through Internet that is place right in our hands with a bunch of data. We are more secure in the banks with the security system like the surveillance cameras. The transportation systems are being created to become faster like the airplanes. Certainly, we should be thankful to all of these inventions through electronics. But we should not also forget the old ways because without them we cannot be able to achieve what we are actually enjoying right now.

## II. EXISTING SYSTEM:

### A. WATER LEVEL DEVICE WITH DIGITAL DISPLAY AND BUZZER

This system shows the display of water level percentage in overhead tank and alerts or rings the buzzer when it is filled. In this user has to switch ON the motor by observing the percentage and user has to switch OFF the motor when buzzer makes the sound. If user wants to switch off the motor before the buzzer sounded by seeing the percentage is also possible.

Since it is a buzzer based system it is not possible all the time to observe the water level on the display and even it is difficult to switch the motor on or off whenever the person is away from home.

### B. GSM BASED WATER LEVEL CONTROLLER

This system provides the controlling of motor through mobile. In this, user wants to switch ON the motor when he is in the outside and at that time he can switch on the motor through his mobile. And he can also switch OFF the motor through the mobile. And the controller will send alert messages of every action happened to user through mobile.

## III. PROPOSED SYSTEM:

Here the proposed system is based on IoT (Internet of Things) that makes monitoring systems technically feasible and even decreasing cost of sensors makes it economically feasible. Technology has improved our living accordingly and people are ready to accept such kind of solutions which improve their living.

This prototype is based on idea that the level of water can be a very important parameter especially in disaster prone areas. It is a device that manages water levels on a variety of systems such as water tanks, pumps and swimming pools without human intervention. It saves power, energy. This is a model of a water tank in house. The ultrasonic sensor measures the water level in the tank, based on this level the controller will switch on or off the motor.

### A. SYSTEM BLOCK DIAGRAM

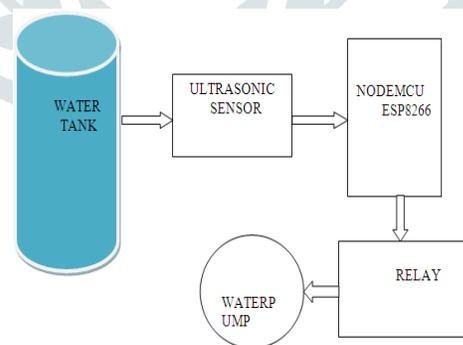


Fig 1: Block diagram

The water level in the tank is measured by using ultrasonic sensor and the data is sent to the NodeMcu. When NodeMcu sends low power signal to relay then the motor will turn on otherwise motor will be turned off. By this water can be conserved. Here IFTTT a web based service or a mobile app is used to create a chain of simple conditional statements called applets. By using this applet a mail can be received whether the tank is filled or empty.

### B. ULTRASONIC SENSOR

The ultrasonic sensor is a transducer which converts electrical energy into sound waves and vice versa. The sensor regularly transmits a short burst of ultrasonic sound to a target which reflects the sound back to the sensor.



Fig 2: Ultrasonic sensor

### C. Node MCU

Node MCU is an open source IOT platform. It is a micro controller with inbuilt wifi. It includes firmware which runs on the ESP8266 WI-FI SoC from Espressif Systems, and hardware which is based on ESP-12 module.

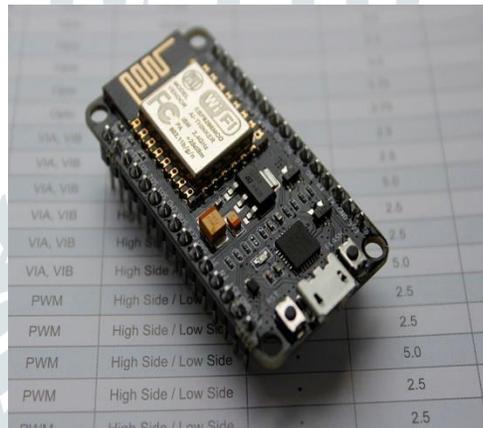


Fig 3: Node MCU

### D. Relay

Relays are simple switches which are operated both electrically and mechanically. The switching mechanism is carried out with the help of the electromagnet.



Fig 4: Relay

### E. IFTTT:

If This Then That, also known as IFTTT, is a free web-based service to create chains of simple conditional statements, called applets. An applet is triggered by changes that occur within other web services such as Gmail, Facebook, Telegram, Instagram, or pinterest.

For example, an applet may send an e-mail message if the user tweets using a hash tag, or copy a photo on Facebook to a user's archive if someone tags a user in a photo. IFTTT is both a website and a mobile app.

#### IV. Results:

Assume the length of the tank is about 5m. Ultrasonic sensor is placed at the top of the tank. Distance can be measured from this sensor. When the water level is at bottom say at 1m then ultrasonic sensor senses the distance and the motor will turn on. When the water reaches the top level say 4.9m then motor will turn off automatically.

Ex: The ultrasonic sensor measured time is 2.89ms

Speed of sound waves is 341m/s

Distance = speed \* time

From this the distance measured is 1m then controller automatically turns on the motor.



Fig 5: Working model

#### V. CONCLUSION:

Water monitoring system is a proposed system that can be applied in household supply. This system is the solution to help the user to pump water from into the water tank using automatic pumping system and monitor the water level. As water conserving is focused now a day, it is important to apply this project in wide form.

Knowledge about selecting the sensor to detect the water is very important. The detector is a great addition to detect the distance of the object. They are quite inexpensive, use very little power, fit in small place, and have a unique range that is ideally suited to small robots in human space such as hallways, rooms.

This proposed system was successful, where it achieves the goal. It can be concluded that theories learned are proven true indeed. During developing this system, there are some difficulties that occur such as misconnection and unsynchronized programming with the hardware. This contribute problem to the design flow and need very determined trouble shooting.

#### RECOMMENDATION FOR FUTURE WORK:

Water monitoring system has a good potential to implement in future especially for household and agriculture sector. This paper will be more effective if it can be replaced with multiple connections of tanks at apartments without use of "hard wired" connection. With wireless communication, the information data can be transferred more efficiently between monitor system and pump system for any distance involved.

The proposed work described in this paper can be extended by using multiple connections of tanks at apartments to avoid the problem of shortage of water to the people at living at top floor of the apartments.

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