# Automatic Water Level Controller

Gaurav Aidasani (160010004, *gaurav.aidasani.16001@iitgoa.ac.in*),
Neha Shah (160020001, *neha.shah.16002@iitgoa.ac.in*),
Tanmay Maheshwari (160010008, *tanmay.maheshwari.16001@iitgoa.ac.in*),
Rahul Kumar (160020004, *rahul.kumar.16002@iitgoa.ac.in*), and
Aman Kumar (160010030, *aman.kumar.16001@iitgoa.ac.in*)

## Introduction

The water crisis in IIT Goa is reaching alarming proportions. Hence, it is of utmost importance to preserve water for the students. There is unnecessary wastage of water due to overflow in overhead tanks. Automatic Water Level Indicator and Controller can provide a solution to this problem. A water level indicator is defined as a system by which we can get information of the water level within the reservoir. The aim of our project is to control the level of water in the supply tank and display the water level in the tank. We hope that our solution to the water shortage crisis will be helpful to avoid a nation-wide crisis in the future.

## System Overview

A block diagram of the system is given in Fig. 1.

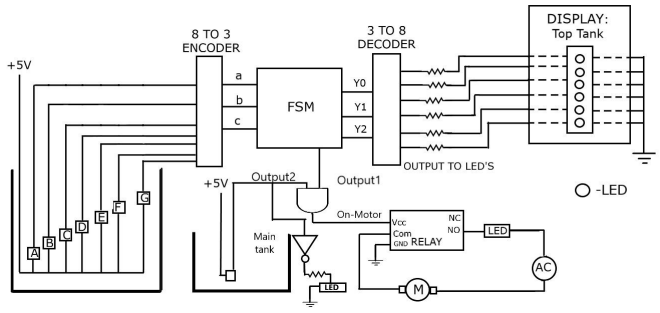


Fig. 1: Circuit Diagram

The water supply tank has seven sensors placed at different heights, each corresponding to a different water level. The signal sent through each of these sensors is passed into an encoder which outputs a three bit binary output which is then sent to the Finite State Machine. The FSM has states corresponding to each various water level. The output of the FSM goes high when it reaches to a state corresponding to the minimum water level. This output is driven into a relay circuit which turns on the motor (we have used a pump for demonstration purposes). There are three more outputs (the three bit binary number assigned to each state). These outputs are decoded and signals are generated. These signals are sent to the display which is a PCB which contains LEDs. Each LED corresponds to a particular water level and will light up to indicate the water level of the tank.

## Implementation Details

The water level controller operates on the basis that water conducts electricity due to the presence of minerals within it. Hence, water can be used to open or close a circuit. As the water level rises or falls, different circuits in the controller send different signals. These signals are used to switch ON or switch OFF the motor pump as per our requirements. We have used two buckets, one as the water supply tank and one as the main tank. We have used plastic bottle caps as water sensors and kept them at appropriate heights in the supply tank. A pump is being used to drive water from the main tank to the supply tank.

## Detailed description of FSM

The FSM uses 14 states. Seven states are used for each water level. As the water level decreases the current state shifts to the next state corresponding to the new water level. Once the water level reaches the lowermost state, the output of the FSM goes high and the motor(pump) gets switched on. To ensure the water level does not oscillate between the second last and the last level, we use another set of five states. These states ensure that once the motor starts working it will get only get switched off after the tank is full.

## Results

An image of the project is shown at the end of the document in Fig 2. After completing the setup, we observed that whenever water was at a sufficient level in the bucket(water tank), the corresponding LEDs lit up. However, when we drained the water down to the last level, the motor(pump) automatically got switched on and the water started flowing from the mug(main tank) into the bucket(water tank). Hence, our project worked as expected.

## Conclusion

We have designed the system in such a way that its components are easily available and the setup is inexpensive. The whole system operates automatically. Hence, it does not need any experts to operate it. We are controlling the level of water in the tank with logic circuits which are described above. All the inherent parts of the circuit are performing consistently. With the features that it inherits, it seems to be extremely advantageous to the present era.

## References

[1] Stephen Brown,Zvonko Vranesic, “Fundamentals of Digital Logic with VHDL Design”, 2009 (year of publication).

[2] Digital Design Course Lecture Notes