

PAPER • OPEN ACCESS

Investigation on Water Level Regulation Using Floating Sensor and Arduino Uno

To cite this article: A. Susheel and S. Selvendran 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **561** 012009

Recent citations

- [An innovative technique for the development of the traditional mechanical tide gauge to improve the performance of the measurement system](#)
Gerges M. Salama *et al*

View the [article online](#) for updates and enhancements.

A promotional banner for the 240th ECS Meeting. The banner features the ECS logo on the left, followed by the text '240th ECS Meeting' in large blue font, 'Oct 10-14, 2021, Orlando, Florida' in smaller blue font, 'Register early and save up to 20% on registration costs' in bold black font, 'Early registration deadline Sep 13' in black font, and 'REGISTER NOW' in bold orange font. On the right side of the banner is a photograph of a diverse group of people in professional attire, smiling and clapping, suggesting a successful event.

ECS **240th ECS Meeting**
Oct 10-14, 2021, Orlando, Florida
**Register early and save
up to 20% on registration costs**
Early registration deadline Sep 13
REGISTER NOW

Investigation on Water Level Regulation Using Floating Sensor and Arduino Uno

A. Susheel* and S. Selvendran

CVR College of Engineering, R.R District, Telangana, India.

E-mail : *susheelankem115@gmail.com

Abstract. In this paper, a technique is implemented to regulate the water level in the overhead tank using mechanical sensor. The sensor senses the physical parameter (water level) and sends it as a different voltage level to Arduino Atmega328p. With the use of wide range of sensed data and Arduino process, different customized functionality has been performed. The functionalities include indicating the status of water level to the user and turning off the motor switch when the tank is full. Mechanical sensor is far better than Capacitive, Photo electric and Proximity sensors. It is more durable and cost effective also. Arduino Atmega328p enables various levels of control in regulation of water usage with the use of measured different physical parameter.

1. Introduction

Automation can be defined as the technology by which a processor does work without human assistance [1]. It reduces human intervention, improves efficiency and accuracy. Water level regulation can be accomplished by sensing certain physical parameters and sending the sensed data to the programmable logic circuits and thereby following certain customized functionality [2,3]. Different water level automation techniques are reported by different authors as follows, wires are used for sensing the water level which is placed in the overhead tank. By using the principle water conducts electricity, status of water level is indicated thereby motor pump is turned off when tank is full [4,5]. But, by this technique wire which is suspended into the water tank gets corroded thus it cannot be relied for a longer duration. The functionality of these kind of circuits are realized by using certain simulation software [6,7,8]. Using ultrasonic sensor, the water level can be determined and accordingly the motor pump is turned ON or OFF [9]. It is affected by temperature and the transmission speed decreases with the rise in temperature and the sensor is damaged easily. Radio Frequencies can be used to sense the water level because it is almost maintenance free [10]. But here, the probability of getting false alarm is more. Capacitive liquid level switch can also be used [11]. Due to its inaccuracy, it cannot be preferred. Because of high cost, Photo electric liquid level switch is not preferred even though it is highly precise and has good repeatability feature [12]. Float switch is simple, easy to install, maintain, highly reliable and more durable compared with other sensors. Therefore, float switch is preferred and used for sensing the water level in the circuit.

2. Design of water regulator using Arduino Uno

2.1. Work flow of proposed work

Working methodology of the circuit is illustrated using flow diagram as in Figure1. where, DC switch is user operated. When user turns ON the dc switch, Arduino UNO (AT mega 328p microcontroller) turns ON. Then the circuit begins to function. Floating ball is suspended into the overhead tank, which is connected to the normally opened part of a floating switch. The circuit initially checks the status of bob. If the water level in the overhead tank is not full, the microcontroller gives logic1 output to the relay which is connected to the water pump. By this, water pump turns ON. Thus, water is filled into the water tank. When water level in the overhead tank is full, the bob rises up and the normally opened floating switch gets closed. Then the DC signal output is received at the output of the floating switch.



IOP Conf. Series: Materials Science and Engineering **561** (2019) 012009, doi:10.1088/1757-899X/561/1/012009
 This DC output signal received from switch is given as input to the voltage divider circuit. The output is taken at the voltage dividing point in the voltage divider circuit. The output of this circuit is given as analog input to Arduino UNO. Then the following operations take place.

Firstly, logic 0 DC output is given to the relay which is connected to the water pump. This turns OFF the water pump. Secondly, logic 1 digital output is given by Arduino UNO to the buzzer. This indicates the user to turn OFF the DC switch. So, the circuit gets turned OFF. This is done because if the circuit remains ON, Arduino UNO and other components gets heated up and this might damage the circuit. On the other hand, if the circuit remains active even after turning OFF the pump, water level may decrease to a certain point. It will turn ON the water pump even though it might not be necessary for the user to fill the tank. So, the user is indicated to turn OFF the DC switch by using the buzzer. If water pump is automatically turned ON to fill the water in the overhead tank that would turn ON the water pump unnecessarily when the user does not intend to turn it ON. That would waste power unnecessarily and it would not be reliable.

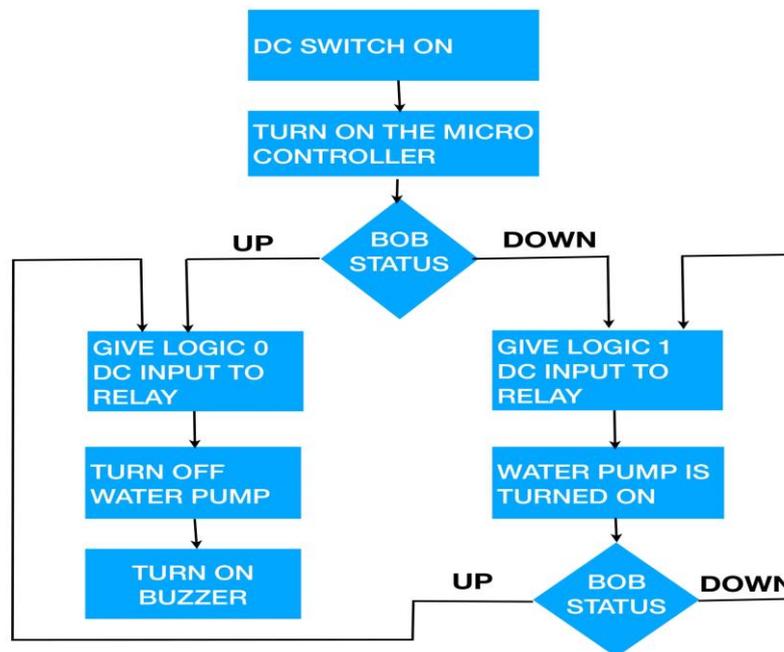


Figure 1. Flow diagram of our proposed work

2.2. Floating bob as water level sensor

Floating ball is suspended over the overhead tank as in figure 4. It is connected to the floating switch, which consists of normally open and normally closed switches as in figure3. The positive part of DC input from Arduino UNO is connected to normally opened terminal of the floating switch as in figure2. When water level in the overhead tank is not full, then bob goes down and the switch remains closed thereby it does not pass voltage at the output of floating switch and remains as open circuit. When water level rises up, the bob rises up and the floating switch connected to bob which is normally open, closes, thereby positive part of DC voltage is received at the output of the floating switch. This positive part of DC voltage is given as input to the voltage divider circuit which acts as voltmeter. At the voltage dividing point of the circuit, the output is taken and is connected to analog input pin of Arduino UNO. Therefore, if voltage appears across the analog input terminal of Arduino UNO, it is assumed that overhead tank is full and if 0 volts appears as input across the analog input terminal of Arduino UNO, then it is assumed that overhead tank is not full.

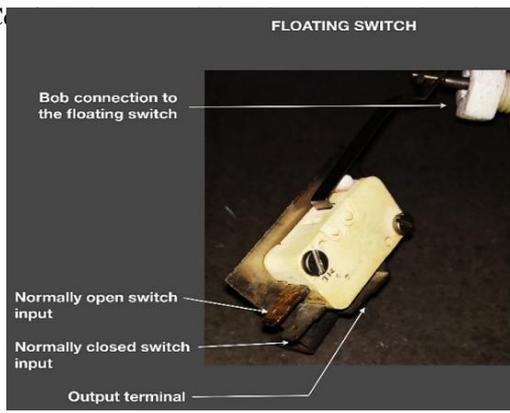


Figure 2. Terminals of floating switch

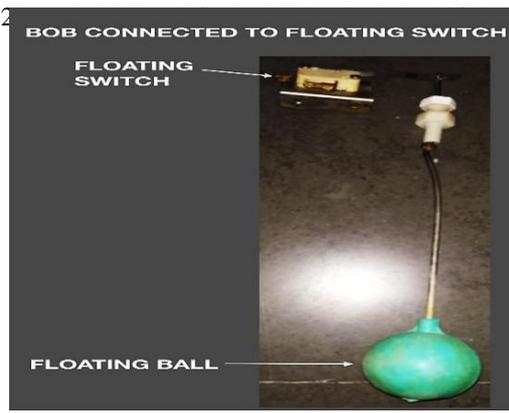


Figure 3. Bob connected to floating switch



Figure 4. Bob connected floating switch suspended into water tank

2.3. Components used for water regulation

Arduino UNO consists of Atmega 328p microcontroller as in figure5. It follows AVR 8-bit RISC architecture which is available in DIP package. It supports up to 20 MHz clock and consists of 1kb SRAM and 32kB flash memory. It has 23 programmable I/O channels with six 10-bit ADC inputs, three timers/counters, six PWM outputs and 3V operated buzzer. It can be controlled directly by a wide range of microcontrollers such as Arduino, AVR, PIC, ARM and so on. 5V relay module uses a low-level triggered control signal (3.3-5V_{DC}) to control the relay. Triggering the relay operates the normally open or normally closed contacts. It is frequently used in an automatic control circuit. To put it simply, it is an automatic switch to control a high-current circuit with a low-current signal. 5V relay signal input voltage range, 0-5V. 5V input to the relay is given from Arduino UNO. Voltage divider circuit comprises of 33kΩ resistor and 1kΩ resistor as in figure9. Male to Male and Male to Female wires are used as connecting wires to connect different components of the circuit. Water pump of 0.5 HP is used to fill the overhead tank as in figure7. Buzzer is used to indicate user to turn off the circuit as in figure 6. The proposed circuit is shown in figure 8.

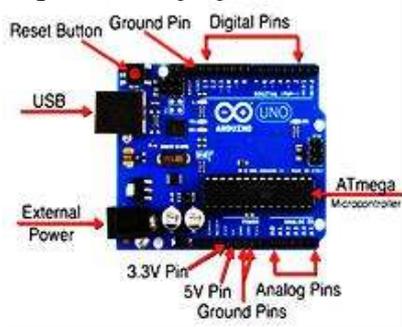


Figure 5. Arduino Uno



Figure 6. Buzzer



Figure 7. 0.5 HP water motor pump

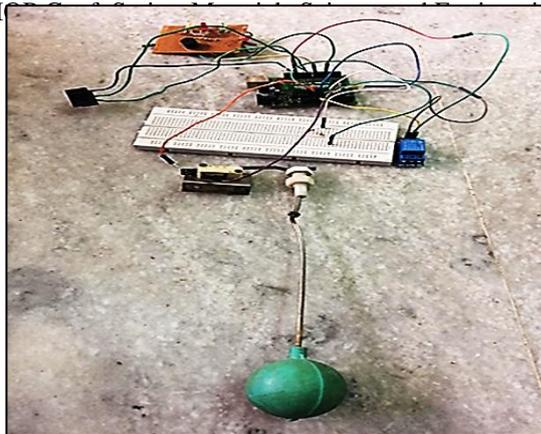


Figure 8. Proposed circuit design

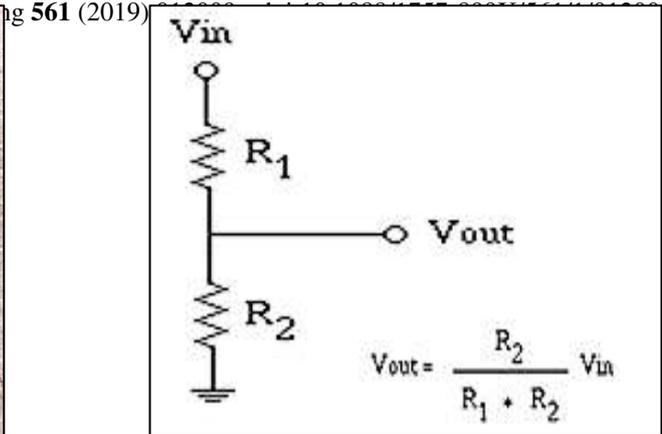


Figure 9. Voltage divider circuit

3. Results and discussion

We used mechanical sensors to sense the status of water level in the overhead tank. Whenever the overhead tank is full, the floating switch gets closed by forming a short circuit which is normally opened. The output of the switch is connected as input voltage to the voltage divider circuit with $R_1=33\text{ k}\Omega$ and $R_2=1\text{ K}\Omega$. The v_{out} is expected to be 0.14 V when tank is full. This data is analog in nature which is read by analog pin of Arduino. If the overhead tank is not full 0 V appears at the output (v_{out}) of voltage divider circuit, then control signal is generated from Arduino Uno to turn ON the motor pump. This can be observed in the serial monitor as in figure10. Whereas, when tank is full, 0.14 V appears across the output (v_{out}) then motor pump is turned OFF automatically and buzzer is turned ON to indicate the user. In serial monitor the status is shown as in figure 11.

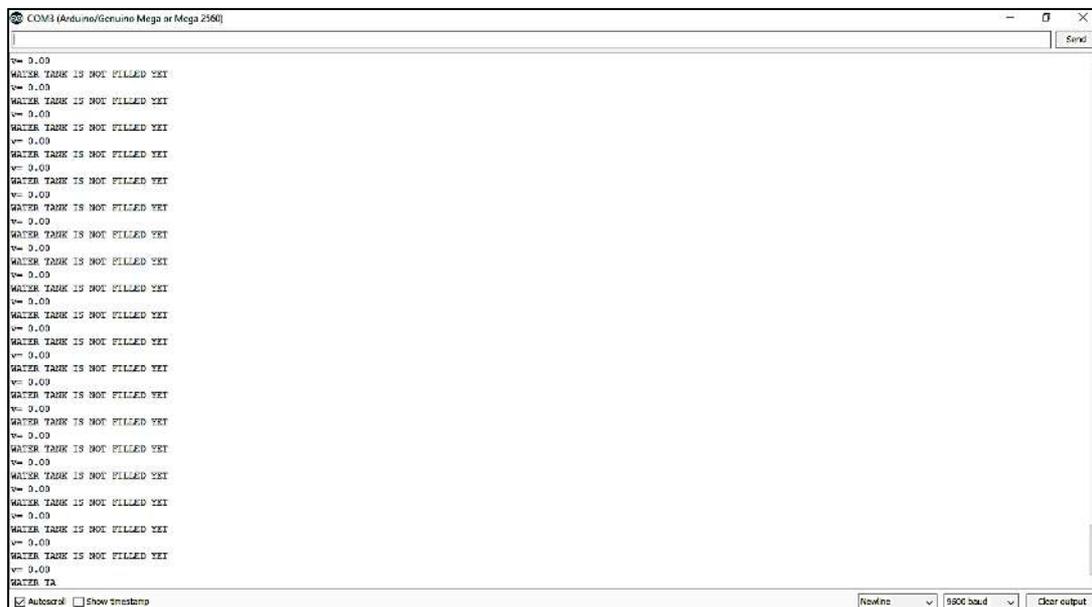


Figure 10. Indicating tank is not filled yet in the serial monitor



Figure 11. Indicating that tank is full in the serial monitor

4. Conclusion

We have demonstrated the water level regulation using a mechanical floating switch with bob. It gives better performance as compared with the other techniques. The installation and maintenance are very simple. The features incorporated in the system helps the user in saving power and precious water, thus economical.

References

- [1] Mikell P. Groover 2014 Fundamentals of Modern Manufacturing: Materials, Processes, and Systems (John Wiley & Sons; 4th Edition edition,2014), pp.886-907.
- [2] Mallikarjun G Hudedmani, R M Umayal, Shiva Kumar Kabberalli and Raghavendra Hittalamani 2017 Programmable Logic Controller in Automation Adv. J. Grad. Res., 2 1 37-45.
- [3] Ahmed Abdullah, Md. Galib Anwar, Takilur Rahman, and Sayera Aznabi 2015 American Journal of Engineering Research 4 788-92
- [4] Sanket Shukla 2016 International Journal of Scientific Research and Management Studies 212459-466.
- [5] JeyaKumar, K., AjaiSander, P., Eswaran, V. and Guna, G 2016 International Journal of Recent Advances in Multidisciplinary Research3 122112-2115
- [6] S.Mahata, A.Maiti, and C.K Maiti 2010 IEEE- International Conference on Technology for Education (Mumbai, India) DOI: 10.1109/T4E.2010.5550110.
- [7] Raghava.R, M.Uttara Kumari, and S.A.Hariparsad 2013 International Journal of Advanced Research in Computer Science and Software Engineering311328-332.

- IOP Conf. Ser. [8] Mohd. Tabrej Alam, Piyush Charan, Zohaib Hasan Khan, Mohd Amir Ansari 2015 International Journal for Science and Advance Research in Technology 11091-95.
- [9] R. S. Sunmonu, M. A. Sodunke, O. S. Abdulai and E. A. Agboola 2017 *International Journal for Research in Electrical Engineering* 351-11.
- [10] Rohit Kanyawal, Amit Saxena, Rohit Sharma, Sadiq Ali Khan, and Sanket Shukla 2006 *International Journal of Scientific Research and Management Studies* 29383-390.
- [11] Hubert Zangel 2010 *Procedia Engineering* 5 (Elsevier) pp:393-399.
- [12] X P Xu, G Y Zhang, N Zhang and L Y Wang 2006 *J.Phy:Conf.Ser.* 48 771.