May - June 2020
ISSN: 0193-4120 Page No. 5068-5071

Ingenious Water Heating Coil Using IoT

[1]Vooka Sai Divya, [2]Bhaskar Reddy P. V, [3]Y. Sai Lakshmi, [4]Y. Sathya Tejaswi

[1, 3, 4]III B.Tech, [2]Professor, [1,2,3,4]School of Computing and Information Technology,
REVA University, Bengaluru
[1]vookasaidivya@gmail.com, [2]bhaskarreddy.pv@reva.edu.in , [3]sailaksshmi2000@gmail.com
[4]yenepallisathyatejaswi@gmail.com

Article Info
Volume 83
Page Number: 5068-5071
Publication Issue:
May - June 2020

Article History
Article Received:*19 November 2019*
Revised: *27 January 2020*
Accepted: *24 February 2020*
Publication: *16 May 2020*

Abstract

In our everyday lives, electric water heaters are very useful. Water heaters are variously referred to as devices for the continuous supply of warm water. Water heaters are also one of the most common solutions for heating household water and the use of this heating coil is a crucial use of electricity. The use of hot water is one example of the use of technology developed for bathing. You can obtain water at higher temperatures using a Water Heater device. Though, the time the heater takes to achieve the target temperature cannot be determined. However, it takes a long time to heat the water to reach the desired temperature and to fill the tub for use. An automatic faucet that can be active in line with the water temperature is designed for this device and which also needs less power and is economically productive. The sensor uses a computer device powered by an Android microcontroller based on Arduino UNO. Also, we avoided any adverse effects due to overheating and less temperature-resistant, which can be caused by short circuit overheating or electric shocks.

Keywords: *Arduino Uno, smart water heater, temperature sensor, buzzer, faucet, relay.*

1. Introduction

Internet of Things has been linked with smart houses, traffic lights and also with the cities, and where there is also an unknown reality that the Internet Of Things may also play an important role in water management for our day to day activities, such as IoT. Where since man stepped on this earth water use has increased in many ways and the importance of water has increased.

This paper's focal point is to build a reliable, cost-effective water heater[6]. So low economy people can also purchase these heaters. Water heaters have a modern device with a temperature sensor and buzzer. To achieve hot water at the desired temperature one can get it by buying advanced geysers. But these advanced geysers are not cost-friendly.

Water is a vital tool for any human being that is used in everyday life. The water heater is very vital for those want the high-temperature water[5] to have a nice bath. But to obtain the desired temperature, one should wait a long time and can't be estimated the time.

So, we are coming up with a new water heater with a temperature sensor and buzzer for the problem mentioned above. Wherever the desired temperature can be given and when water reaches the desired temperature, the buzzer is triggered, and one can know that the desired temperature has been reached.

2. Literature Survey

Research on smart bath water heater proposed on hot water usage for bathing [1].In this model, the user can set the water temperature. The ultrasonic sensor used determines the water level as the cold water and hot water from the tank are combined according to the user's specified temperature.

A water heater timer switch was implemented by L. Yogesh Amuthavalli [2].Using the MCU node, relay, transistor. This model has a timer switch capable of starting and stopping the electric water heater. This timer switch described here can be controlled by phone from the Blynk app.

In[3], The authors proposed a smart water network based on IoT. They built a device capable of regulating water flow and tracking water levels using a mobile app.

May - June 2020
ISSN: 0193-4120 Page No. 5068-5071

Using an Arduino Uno, ultrasonic sensor and fuzzy logic algorithm to conserve water by using automated devices that open and close the water tab to minimize water wastage[4].

3. Problem Formulation

The water heater we use in our homes is neither we know the temperature of the water nor regulate it without human intervention. The biggest concern is that we switch the heater on and decline to toggle it off. It can contribute to the electric shock and the short circuit. Because of this, it absorbs a huge amount of electricity.

4. Proposed System

The main aim of the paper is to build a low-cost system that is accessible to everyone. To design a system by which the desired temperature can be set. In this paper, the relay we use lets the heater turn off automatically when the temperature is reached. So that, without human interference, this can be handled.

5. Methodology

a) Use Case Diagram

A use case diagram is a UML diagram of interactions or behaviours. Using case diagrams to model a system's features using the actors and use cases. Use cases are a collection of acts, resources, and functions that must be carried out by the program.

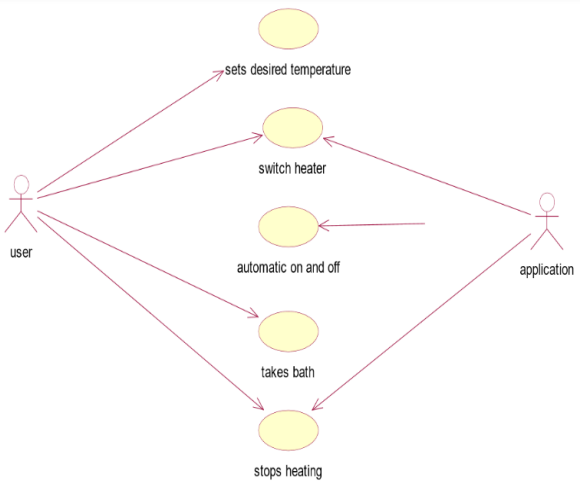

Figure 1: Use case Diagram for Smart bath water heater

b) Sequence Diagram

At first, the user enters the desired temperature and turns the heater on and the heater begins heating, now the temperature sensor tests the water temperature if the water exceeds the desired temperature buzzer is triggered and stops heating, if the water temperature does not meet the target temperature then the heating continues and then the temperature tests whether it exceeds the desired temperature.

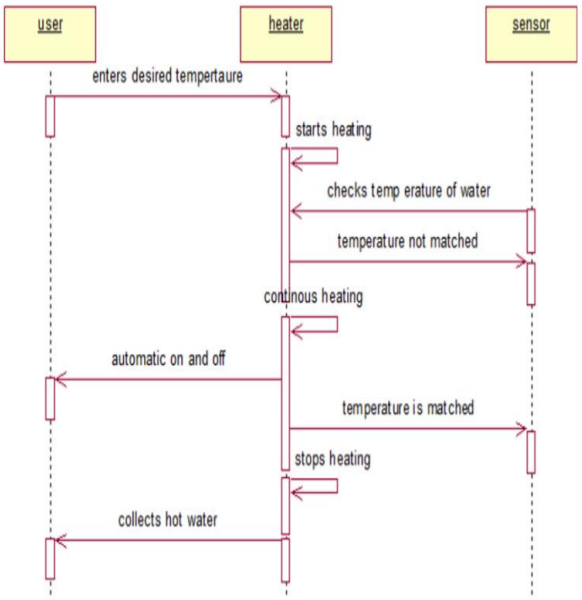

Figure 2: Sequence chart Diagram for Smart Bathwater Heater

c) Star chart Diagram

The proposed system is to introduce water heaters using Arduino with a temperature sensor and buzzer. At first, the user switches on the heater and the heater switches on, now the user sets the desired temperature and water heats up and when the water reaches the desired temperature the buzzer is triggered and stops heating and the user takes bath.

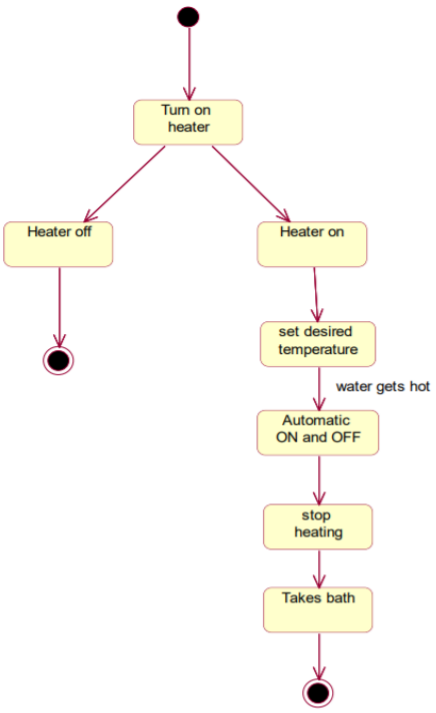

Figure 3: Start chat Diagram

TEST Engineering & Management

May - June 2020
ISSN: 0193-4120 Page No. 5068-5071

6. Schematic Design

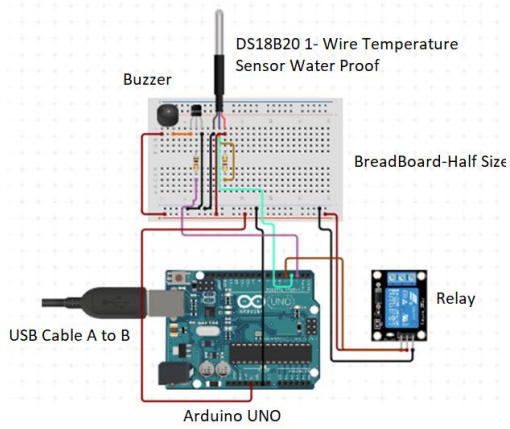

Figure 4: Circuit Diagram

The schematic design of the circuit is done using circuit.io. Arduino UNO and breadboard used in this hardware design to connect other components of the system.

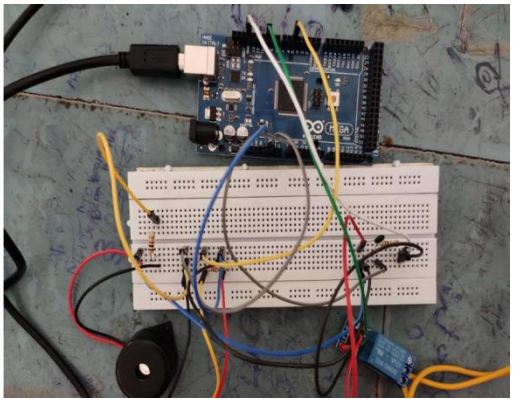

Figure 5: Experimental Set up

7. Algorithm

1. **Procedure Ingenious Water Heater**
2. *Include OneWire.h*
3. *Include DallasTemperature.h*
4. *Define ONE_WIRE_BUS* 5
5. *OneWireOneWire (ONE_WIRE_BUS)*
6. *DallasTemperature sensor(&OneWire)*
7. *Celsius* ← 0
8. *Fahrenheit* ← 0
9. *Relay* ←*PinNumber*
10. *Volatile_byte_relaystate* ← *LOW*
11. *Buzzer* ← *PinNumber*
12. *Setup (void) from step 13 to 17*
13. **Pinmode** (*Relay*,OUTPUT)
14. **Pinmode** (*Buzzer*,OUTPUT)
15. **digitalWrite**(*Relay*,HIGH)
16. **digitalWrite**(*Buzzer*,HIGH)
17. **serial.begin**(9600)
18. *End of the function*
19. *Loop:*
20. *sensors.requestTemperatures()*
21. *Celsius* ← *sensors.getTempCByIndex(*0)
22. *Fahrenheit* ← *sensors.toFahrenheit(Celsius)*
23. *Serial.println "*ON*"*
24. *Serial.println "*C*"*
25. *Serial.print (Celsius)*
26. *Serial.println "*F*"*
27. *Serial.print (Fahrenheit)*
28. **If** *(Celsius >UserTemperature)***then**
29. **digitalWrite***(Relay*,HIGH*)*
30. *Serial.println* "OFF"
31. *Relaystate*← LOW
32. **Tone**(*Buzzer*,1000)
33. **delay**(2000)
34. **else**
35. **digitalWrite***(Relay*,1000*)*
36. *Serial.println* "ON"
37. *Relaystate*← HIGH
38. **NoTone**(*Buzzer*)
39. **delay**(1000)
40. **goto***loop*

8. Result

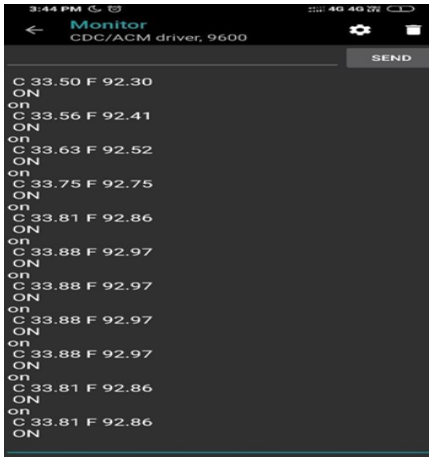

Figure A

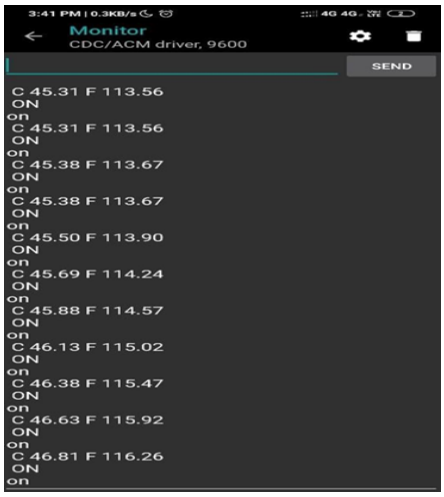

Figure B

TEST Engineering & Management

May - June 2020
ISSN: 0193-4120 Page No. 5068-5071

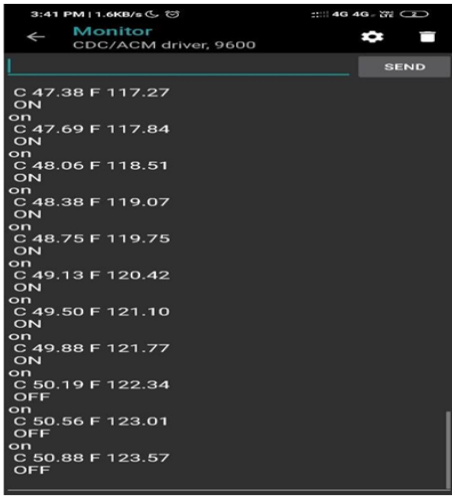

Figure C

The water heater and temperature sensor are put in the water tub first. After taking the desired temperature from the customer, the water then gets started heating. Initially, the temperature sensor starts by taking temperature readings. Figure A & B displays the original noted temperature readings displayed in the values Celcius and Fahrenheit. It is therefore written as "ON," since it is less than the temperature desired. In Figure C, it is written as "OFF" after hitting the target temperature, which makes the buzzer sound and also automatically turns off the heater.

9. Conclusion

We used android based Arduino operations, relying on the design of the water heater with the desired temperature can be achieved, and the following recapitulation is concluded. Depending on the device design scheme, the running of the water heater operating with determined control temperature can be accomplished. The layout setup will execute the sketches provided. Besides, with the help of the Android app, the temperature sensors that are placed in the tub will allow the code to read the input values and compiles until the temperature is reached and then make a buzzer tone and turn off the heater.

10. Future Improvement

Some of the mentioned suggestions can be followed for future research. Arduino UNO device can be displaced with Arduino Wido. So that it is not necessary to use devices that use wifi to send values of the sensor to the internet. Further, the addition of a water heater with a tank or water heater with a tankless will make the process of heating faster and placing sensors of temperature at the tip of the water tap. So the setting procedure for water heating temperature will not be done in the tub, but rather it will be done on the water tap setting used.

11. Acknowledgment

Our appreciation goes to Dr. Bhaskar Reddy P.V, Professor of Computer Sciences at the Reva University. For his strong ongoing support for the research, so that, amid a maze of possibilities and shortcomings for achieving a planned objective.

References

[1] Muhammad DioKhairunnas, EndroAriyanto, SidikPrabowo, "Design and implementation of the smart bath water heater using Arduino",2018 6th International Conference on Information and Communication Technology(ICoICT),Bandung, Indonesia.

[2] Kobra, Khadija &Debnath, Arnab &Rawshan, Proteeti, "Temperature and Power Control of Water Geyser Using Learning Technique",2018 3rd International conference for convergencein technology (I2CT), Pune, DOI:10.1109/I2CT.2018.8529715.

[3] M.S.BennetPrana, Naresh Rengaswamy, Vishal, O. Deepak, "IOT Based smart water system",2018 International conference on communication and electronic system (ICCES), Coimbatore, India, DOI:10.1109/CESYS.2018.8723969.

[4] T. Mantoro and W. Istiono, "Saving water with water level detection ina smart home bathtub using ultrasonic sensor and Fuzzy logic," 2017 Second International Conference on Informatics and Computing (ICIC),Jayapura, 2017, pp. 1-5. DOI: 10.1109/IAC.2017.8280602.

[5] Henze, Gregor P,Yuill, David P, Coward, Andrew H, "Development of a model predictive controller for tankless water heaters", 2009 In HVAC and R Research. 2, Vol. 15, No. 1. pp. 3-23.

[6] P. E. Hertzog, "Cost-effective solar water heater monitoring system using the internet of things", 2017 4thIEEE International Conference on Engineering Technologies and Applied Sciences (ICETAS),Salmabad, Bahrain, pp. 1-6, 2017.