Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

WINTER SEMESTER 2022 – 2023

LEAN STARTUP MANAGEMENT

TITLE : SMART WATER TANK

NAME : UDAI KUMAR K S

REG.NO:19MID0084

ABSTRACT

The smart water level monitor using an IoT ultrasonic sensor and a buzzer is a modern and efficient solution for monitoring water levels in tanks and containers. This technology is especially useful in scenarios where accurate water level measurement is essential, such as in agriculture, residential and industrial applications. With the help of an ultrasonic sensor, the distance from the top of the water surface to the sensor can be precisely measured. This data is then transmitted to an IoT platform that analyzes and processes the information, triggering the buzzer or sending alerts to the user when the water level reaches a critical level. The smart water level monitor provides a cost-effective and reliable solution to manage water supply, reduce wastage and prevent water shortages. . Overall, this is a cost-effective and reliable solution that can be implemented in various applications, including agriculture, residential, and industrial settings.

INTRODUCTION:

The Internet of Things (IoT) is a system of interrelated physical devices, vehicles, buildings, and other objects that are embedded with sensors, software, and network connectivity. These devices can collect and exchange data, enabling them to perform automated actions and interact with their environment. In the case of a smart water tank using IoT technology, an ultrasonic sensor is embedded in the tank to measure the water level accurately. Ultrasonic sensors are commonly used for distance measurements, and they work by emitting high-frequency sound waves that bounce off the surface of the water and return to the sensor. The time taken for the sound waves to travel to the water surface and back to the sensor is used to calculate the distance to the water surface accurately. This data is then transmitted to an IoT platform for analysis and processing. The IoT platform processes the data and sends alerts or triggers a buzzer when the water level reaches a critical level. These alerts can be sent to the user's smartphone or computer, allowing them to take prompt action to manage the water supply. The IoT platform can also provide historical data and trends to help users better understand their water consumption and optimize their water usage. The smart water tank using IoT technology has several benefits over traditional methods of water level measurement. These traditional methods often involve manual measurement, which can be time-consuming and not always accurate. The use of mechanical float switches or pressure sensors can also be unreliable and prone to mechanical failures. In contrast, the smart water tank using IoT technology provides a more accurate, reliable, and real-time method of water level measurement. It enables remote monitoring and control of the water level, preventing water wastage and avoiding water shortages. This technology can be implemented in various settings, including agriculture, residential, and industrial applications, promoting sustainable water management practices and ensuring efficient use of water resources.

PAIN POINT OF THE CUSTOMER :

❖ Inaccurate Water Level Measurement: One of the significant pain points for customers who do not use a smart water tank is the inaccurate measurement of water levels. Traditional methods of measuring water levels, such as manual measurement or mechanical float switches, can often be inaccurate, leading to incorrect readings.

- ❖ Water Wastage: Without a smart water tank, it can be challenging to track water usage accurately. This can lead to water wastage, resulting in higher water bills and unnecessary strain on the environment.
- ❖ Water Shortages: Traditional methods of managing water tanks can make it difficult to anticipate water shortages accurately. This can result in unexpected water shortages, which can be particularly problematic in regions where water resources are scarce.
- ❖ Time-Consuming: Traditional methods of managing water tanks can be time-consuming, requiring manual intervention to measure water levels and refill the tank when necessary. This can be particularly challenging for individuals who have busy schedules and cannot afford to spend time manually managing their water tanks.
- ❖ Difficulty in Identifying Issues: Traditional methods of managing water tanks do not provide real-time monitoring, making it difficult to identify issues such as leaks, which can result in significant water wastage and increased water bills. The inability to identify issues in a timely manner can lead to higher costs and unnecessary environmental strain.

FEEDBACKS :

USER -1 :

" This is a great solution for monitoring water levels in my well. I can finally have peace of mind knowing that my water supply won't run dry unexpectedly "

NEEDS: User want to be able to monitor their water levels remotely, without having to physically check the water level manually.

RECOMMENDATION : User recommend a device that can be controlled remotely through a mobile app or web interface.

USER -2 :

"I love how easy this is to set up and use. I'm not very tech-savvy, but I was able to get this up and running in no time."

NEEDS: User want a device that can accurately measure water levels in different types of containers, including tanks, barrels, and wells.

RECOMMENDATION : User recommend a device that is made of high-quality materials and is designed to withstand harsh environmental conditions

USER 3:

"The buzzer is a great addition, but can we have an option to receive alerts via email or text message as well? That way, I can be notified even if I'm not near the device."

NEEDS: User need a device that can send alerts and notifications in real-time when water levels reach certain thresholds

RECOMMENDATION : User recommend a device that can be easily integrated with other smart home devices and services, such as IFTTT, to provide more customized and automated control over water usage.

USER -4 :

"The accuracy of the water level measurements is impressive. I can see this being very useful in industrial applications where precision is key."

NEEDS: User want a device that is affordable and provides value for money. They also want a device that is backed by a reliable customer support team in case of any issues.

RECOMMENDATION : User recommend a device that is affordable and provides good value for money. They also recommend a device that has a reliable customer support team that can provide timely and effective solutions to any issues.

USER -5 :

"I appreciate that this is an eco-friendly solution that can help me conserve water. By monitoring the water level, I can be more conscious of my usage and avoid waste."

NEEDS: User want a device that is compatible with different communication protocols and can be easily connected to other IoT devices.

RECOMMENDATION : User recommend a device that is compatible with different communication protocols, such as Wi-Fi, Bluetooth, and Zigbee.

USER -6 :

"The device is quite small and unobtrusive, which is great for my home setup. I don't want something big and bulky taking up space in my basement."

NEEDS: User want a device that is easy to use and provides accurate readings.

RECOMMENDATION : A smart water level detector that uses advanced sensors and analytics to provide highly precise and scalable water level monitoring for industrial applications.

USER -7:

"The device is very easy to install and maintain. It requires very little maintenance and can be set up by almost anyone."

NEEDS: A smart water level detector that uses advanced ultrasonic sensors and can monitor water levels in deep wells or boreholes.

RECOMMENDATION : NO

WHAT'S NEW :

Before the smart water level monitor using an IoT ultrasonic sensor and a buzzer, traditional methods were used to measure water levels in tanks and containers. These methods often involved manual measurement or the use of mechanical float switches or pressure sensors. These methods were not always accurate, and it was difficult to detect a sudden change in water level. Also, they did not offer real-time monitoring and required manual intervention.

The new concept of the smart water level monitor using an IoT ultrasonic sensor and a buzzer is a significant improvement over traditional methods. The ultrasonic sensor provides a more accurate and reliable method of measuring water levels, which is transmitted to an IoT platform for real-time monitoring and analysis.. Additionally, the buzzer or alert system helps to prevent water wastage and avoid water shortages, ensuring the efficient use of water resources. Firstly, the initial setup and installation can be complex, requiring technical expertise. Secondly, the system may require a stable and reliable internet connection to transmit data to the IoT platform, which can be a challenge in remote areas with poor connectivity.

METHODOLOGY:

The smart water level detector using IoT and ultrasonic sensor works by measuring the distance between the water surface and the sensor using ultrasonic waves . Ultrasonic sensors emit high-frequency sound waves that bounce off the water surface and return to the sensor, which then calculates the distance between the sensor and the water surface based on the time it took for the sound waves to travel and return.

The process of measuring the water level using the ultrasonic sensor is as follows:

- ❖ The ultrasonic sensor is mounted at the top of the container or tank, facing downwards towards the water surface.
- ❖ The sensor emits a high-frequency sound wave towards the water surface.
- ❖ The sound wave hits the water surface and bounces back towards the sensor.
- ❖ The sensor receives the reflected sound wave and calculates the time it took for the wave to travel from the sensor to the water surface and back.
- ❖ Based on the time it took for the sound wave to travel, the sensor calculates the distance between the sensor and the water surface.
- ❖ The sensor sends the distance data to the centralized control system.
- ❖ The IoT device or gateway analyzes the distance data and compares it with the pre-set threshold values to determine if the water level is below or above the desired level.
- ❖ If the water level is below the desired level, the IoT device triggers a buzzer sound to alert the user of the low water level. If the water level is above the desired level, the IoT device can trigger a notification or provide other alerts to the user.

IMPLEMENTATION:

CODE:

```
// Define pins for ultrasonic sensor and buzzer

const int trigPin = 9;

const int echoPin = 10;

const int buzzerPin = 11;

long duration, distance;
```
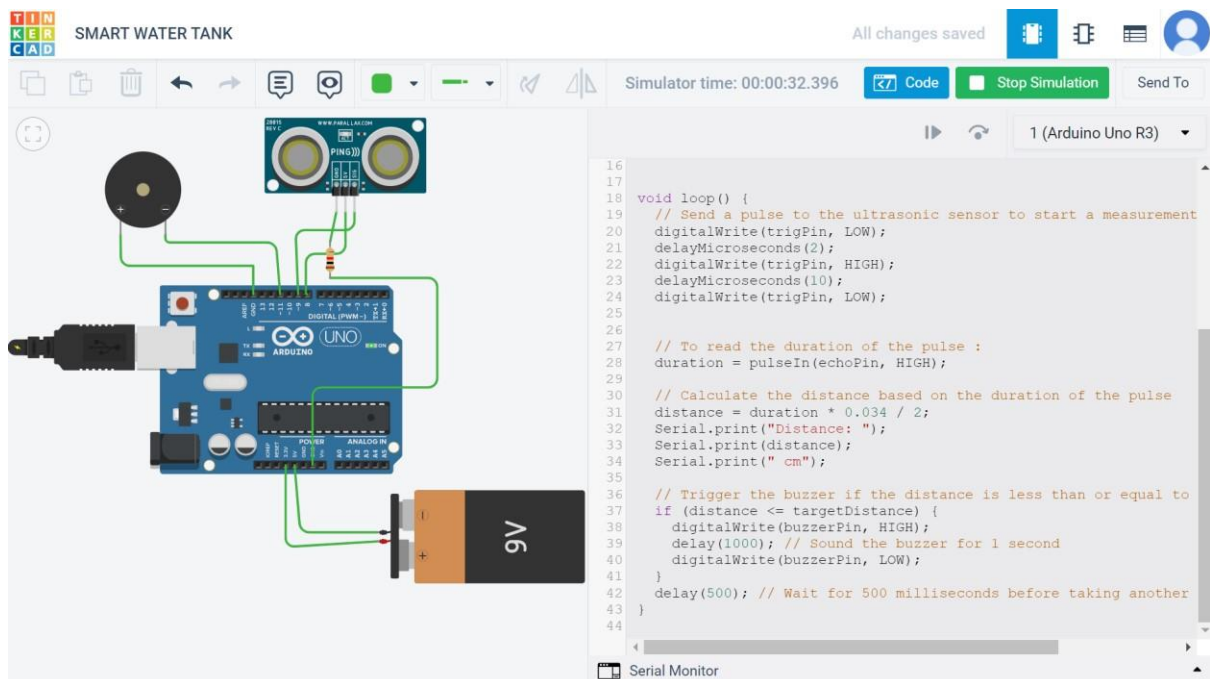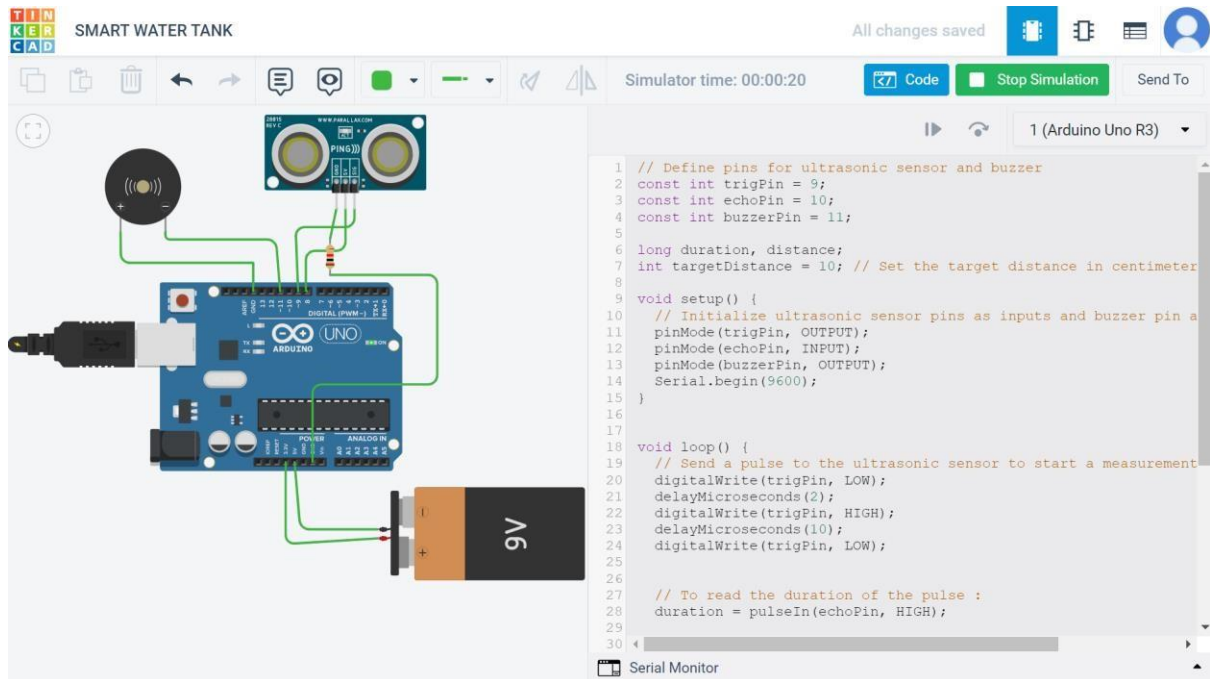
```arduino
int targetDistance = 10; // Set the target distance in centimeters
void setup() {
// Initialize ultrasonic sensor pins as inputs and buzzer pin as output
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
pinMode(buzzerPin, OUTPUT);
Serial.begin(9600);
}
void loop() {
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
```

19MID0084

UDAI KUMAR K S

```arduino
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
// To read the duration of the pulse :
duration = pulseIn(echoPin, HIGH);
// Calculate the distance based on the duration of the pulse
distance = duration * 0.034 / 2;
Serial.print("Distance: ");
Serial.print(distance);
Serial.print(" cm");
// Trigger the buzzer if the distance is less than or equal to the target distance
if (distance <= targetDistance) {
digitalWrite(buzzerPin, HIGH);
delay(1000); // Sound the buzzer for 1 second
```

```
digitalWrite(buzzerPin, LOW);

}

delay(500);

}
```

SCREENSHOT:

PIN-CONFIGURATION :

Assuming that you are using an Arduino Uno board, the pin configuration can be as follows:

- Connect the VCC pin of the ultrasonic sensor to the 5V pin of the Arduino board.
- Connect the GND pin of the ultrasonic sensor to the GND pin of the Arduino board.
- Connect the TRIG pin of the ultrasonic sensor to digital pin 9 of the Arduino board.
- Connect the ECHO pin of the ultrasonic sensor to digital pin 10 of the Arduino board.
- Connect the positive pin of the buzzer to digital pin 11 of the Arduino board.
- Connect the negative pin of the buzzer to the GND pin of the Arduino board.

OUTPUT:
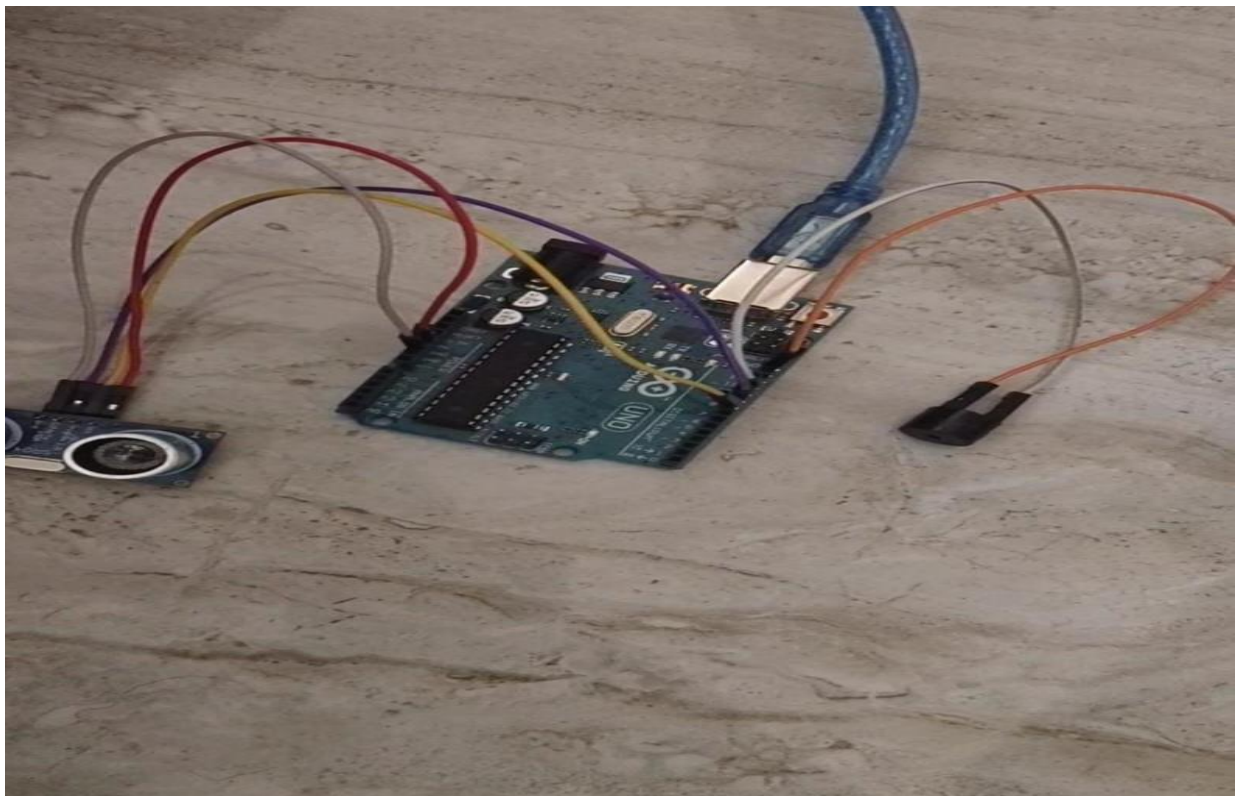
COCLUSION :

In conclusion, the smart water level monitor using an IoT ultrasonic sensor and a buzzer is an innovative and effective solution to manage water supply and prevent water wastage and shortages. This technology offers a reliable and cost-effective method of accurately measuring water levels in tanks and containers, making it ideal for various applications, including residential, agriculture, and industrial settings. With the ability to send alerts or trigger a buzzer, this system ensures timely action can be taken to prevent water wastage or shortages. Overall, the smart water level monitor promotes sustainable water management practices, which is essential in our current world, where water resources are becoming increasingly scarce. By utilizing this technology, we can ensure the efficient use of water resources while contributing towards a better future.