P.E.S COLLEGE OF ENGINEERING,

MANDYA

(An Autonomous Institute under Visvesvaraya Technological University, Belagavi)

A mini project report on

"Automatic water overflow prevention system"

Submitted in partial fulfilment of the requirement

For the award of the

BACHELOR OF ENGINEERING DEGREE

Submitted by

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P.E.S COLLEGE OF ENGINEERING

MANDYA-571401

(An Autonomous Institution Affiliated to VTU, Belagavi)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that,

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have successfully completed the mini project work entitled **"Automatic water overflow prevention system"** in partial fulfillment for the award of degree of **Bachelor of Engineering in Electronics and communication Engineering** of **P.E.S college of Engineering, Mandya, VTU Belagavi** during the year **2023-2024**. It is certified that all corrections/suggestions indicated in internal assessment have been incorporated in the report deposited in the Library. The mini project has been approved as it satisfies the academic requirements in respect of project work prescribed for the degree **in Bachelor of Engineering.**

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Project work viva-voice examination			
Sl.No	Examiners		Date
	Name	Signature	
1			
2			

P.E.S COLLEGE OF ENGINEERING

(An Autonomous Institute under VTU, Belagavi)

MANDYA – 571401

Department of Electronics and Communication Engineering

DECLARATION

We **KAUSHIK C, KAVANA M L, KUSHAL GOWDA P M, MANU H P** students of 6th semester Bachelor of Engineering in Electronics and Communication Engineering , PESCE, Mandya, hereby declare that the project work being presented in the dissertation entitled **"Automatic water overflow prevention system"** is an authentic record of the work that has been independently carried out by us and submitted in partial fulfillment of the requirements for the award of degree in **Bachelor of Engineering in Electronics and Communication Engineering,** affiliated to **Visvesvaraya Technological University (VTU), Belagavi** during the year 2023- 2024.

The work contained in the thesis has not been submitted in part or full to any other university or institution or professional body for the award of any other degree or any fellowship.

Place: Mandya

Date: 29/07 /2024

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ABSTRACT

The Smart Water Overflow Prevention System using Arduino is a cost-effective solution aimed at preventing water wastage and damage caused by overflow in water storage systems. This system employs Arduino microcontrollers paired with proximity sensors to continuously monitor water levels. When water levels approach a predefined threshold, the system activates a solenoid valve to automatically shut off the water supply, preventing overflow. This system ensures timely intervention, preventing overflows and conserving water. Designed for easy integration with existing plumbing, it offers remote monitoring and control, enhancing user convenience and operational efficiency. The energy-efficient and user-friendly system supports sustainable water management, making it an indispensable tool for residential, commercial, and industrial applications. By leveraging open-source technology and automation, the Smart Water Overflow Prevention System promotes sustainable water use and mitigates the risk of water-related damage.

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Chapter 1

INTRODUCTION

Water wastage and overflow are common issues in households and industries, leading to significant resource loss and potential damage. Traditional manual monitoring of water levels in tanks, containers, or other storage units is inefficient and prone to human error. To address this problem, an automatic tap system is proposed. This system utilizes sensors to detect when the water starts overflowing and automatically shuts off the water supply. By implementing this solution, one can ensure efficient water usage, prevent overflow-related damage, and contribute to water conservation efforts. This system is essential for modernizing water management practices and promoting sustainability.

Chapter 2

LITERATURE SURVEY

Sanam Pudasaini, Anuj Pathak, Sukirti Dhakal, and Milan Paudel[1] concluded that the automatic water level controller is a Smart system as all processes occur automatically with continuous updates by the controller, to the user, via the GSM technique
i.e. SMS Notification. This system is deprived of any sort of noise and has effective switching action. To widen the application to this project work, the security home alarm system can match the application.

Anikka Pandey, Gargi Andhale, Anirudha Sonawane, Akshara Amrutkar, and Tejaswini Andhare[2] concluded that when this system is installed in a house, it continuously monitors the total water usage of that house. Once the amount of water used reaches a threshold value, the flow of water entering the house is reduced by a fraction of the original, the system send a message to the consumer via email once the water limit reaches 80% and 100%. Also, it periodically updates the user about the volume of water spent, along with information about the exact points in the house where consumption is maximum. This Project mainly focuses on minimizing water and electricity wastage by building an efficient automated water pump.

Beza Negash Getu and Hussain A. Attia [3] concluded that the system first senses the amount of water available in the tank by the level detector part and then adjusts the state of the water pump according to the water level information. This electronic design achieves automation through sequential logic implemented using a flip-flop. This integrated design includes a seven-segment display and a relay-based motor pump driving circuit. The water pump automatically turns on and starts filling the tank when the water level is empty or level ONE and turns off and stops filling the tank when the water level reaches maximum-level NINE.

Gomathy, C. K., et al[4] developed an efficient water level management system using an ultrasonic sensor to monitor water levels in a tank. The system automatically controls a motor pump based on the detected water levels, preventing overflow and ensuring optimal water

usage. It includes an LCD display to show real-time water levels and pump status. The system is designed to reduce water wastage and energy consumption by operating the pump only when necessary. Additionally, it provides a cost-effective solution for water management in residential and industrial settings. The implementation aims to promote sustainable water usage practices.

Sen, Satyaki, et al[5], developed an automatic water level control system with dry run protection for pumps. The system monitors water levels in both overhead and underground tanks, ensuring the pump operates only when necessary. It uses an Arduino UNO microcontroller to control the pump via a relay circuit. The system prevents the pump from running when the underground tank is empty, protecting it from damage. This approach conserves energy and prevents water wastage by ensuring the pump runs only when needed. The system also provides real-time water level monitoring and control, making it suitable for both domestic and industrial applications. The implementation aims to enhance water management efficiency and pump longevity.

Chapter 3:

PROBLEM STATEMENT AND OBJECTIVES

3.1 Problem statement

Developing an automatic water overflow prevention system that detects and controls the overflow of water in real-time, reducing water waste.

3.2 Objectives

- To design and develop a system that prevents water wastage.
- Testing the working of the system.

Chapter 4:

WORKING METHODOLOGY AND IMPLEMENTATION

4.1 Block Diagram:

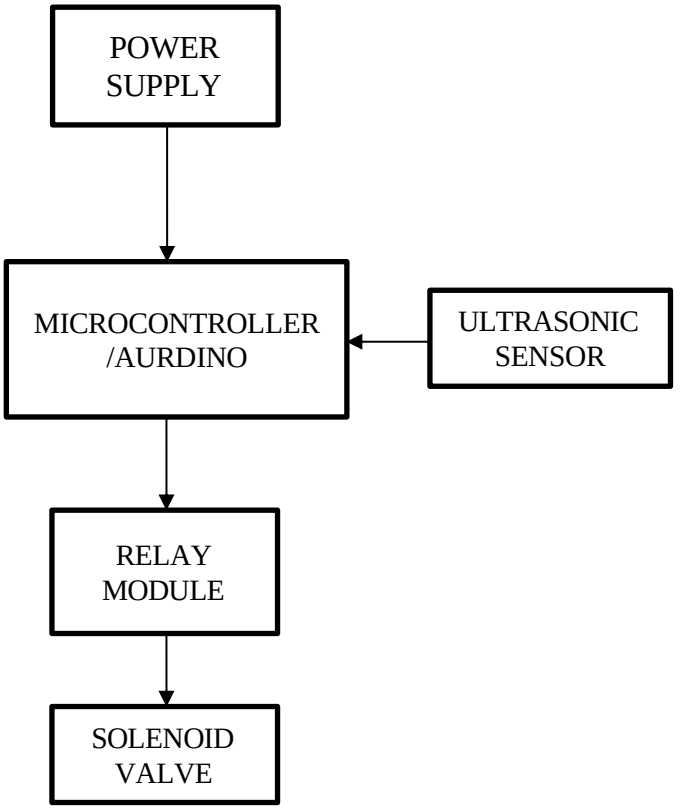

Fig.4.1: Block Diagram of Automatic Water Overflow Prevention System

4.2 Circuit Diagram:

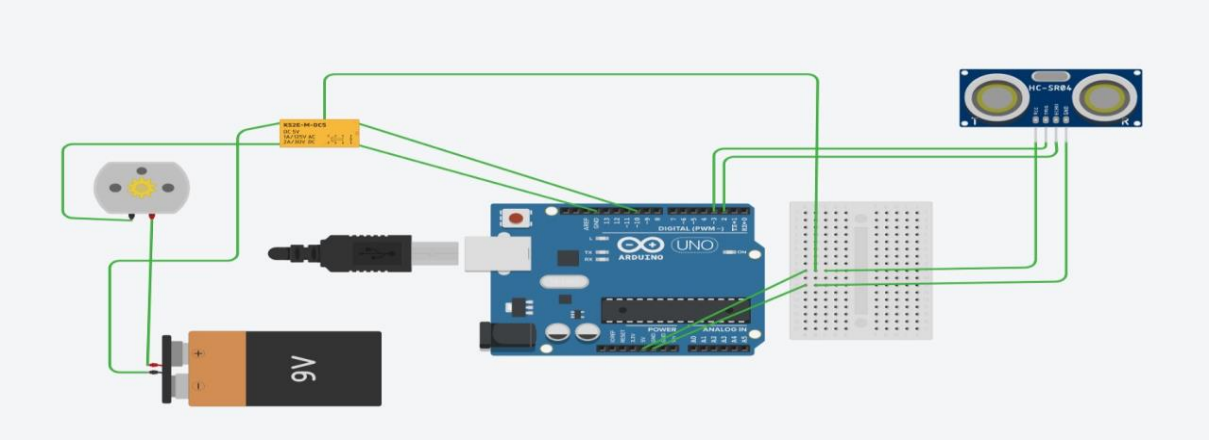

Fig. 4.2: Circuit Diagram

4.3 Components and their functions:

An automatic water overflow prevention system typically includes several key components, each with specific functions to ensure efficient monitoring and control of water levels. Here are the main components and their functions:

1. **Ultrasonic Sensor**: Measures the distance to the water surface by emitting ultrasonic sound waves and calculating the time it takes for the echo to return. This helps in determining the water level in the tank.
2. **Infrared Proximity Sensor:** Detects the presence of objects or water at a specific level using infrared light. It helps in providing additional confirmation of water levels and can be used for overflow detection.
3. **Arduino UNO:** Acts as the central microcontroller that processes input signals from the sensors and controls the relay and solenoid valve based on the programmed logic.
4. **Relay Module:** Functions as an electrically operated switch that allows the Arduino to control high-power devices like the solenoid valve. It isolates the low-power control circuit from the high-power load.
5. **Solenoid Valve:** Controls the flow of water by opening or closing based on the signal received from the relay. It ensures that water flow is stopped when the tank is full to prevent overflow[5].
6. **Power Supply to Arduino UNO:** Provides the necessary electrical power to the Arduino UNO and other connected components, ensuring the system operates smoothly.

4.4 Methodology:

The methodology for implementing the smart water overflow prevention system using a microcontroller/Arduino involved several key steps.

Firstly, connecting the proximity sensors and relay module to the Arduino and then connecting the solenoid valve to the relay.

Further, the programming part measures distance using proximity sensors and controls the relay based on water level readings (activates a relay to close the valve when the water level is high).

Working principle of the Automatic Water Overflow Prevention System

1. **Water Level Detection**: The **ultrasonic sensor** continuously measures the distance to the water surface in the tank. The **infrared proximity sensor** provides additional confirmation of water levels at specific points.
2. **Data Processing**: The **Arduino UNO** receives input signals from both ultrasonic and

infrared sensors. It processes these signals to determine the current water level in the tank.

3. **Control Logic**: Based on the programmed logic, the Arduino decides whether the water level is within the desired range or if it has reached the overflow threshold.
4. **Actuation**: If the water level is too high, the Arduino sends a signal to the **relay module**. The relay module, acting as a switch, controls the **solenoid valve**.
5. **Water Flow Regulation**: The **solenoid valve** opens or closes based on the signal from the relay. When the water level is high, the solenoid valve closes to stop the water flow, preventing overflow.
6. **Power Supply**: The **power supply** ensures that the Arduino UNO and all connected components receive the necessary electrical power to operate smoothly.

This system ensures efficient water level management by automatically controlling the water flow and preventing overflow.

CHAPTER 5:

RESULT

The smart water overflow prevention system will continuously monitor the water level in a tank using the HC-SR04 ultrasonic sensor. When the water level approaches a predetermined threshold, the system will trigger the relay to activate the solenoid valve, thereby closing it to prevent any further water inflow and avoid overflow.

Steps-

- The solenoid valve remains open, allowing water to fill the tank.
- When the water level reaches the set threshold, the ultrasonic sensor detects this change.
- The Arduino processes the sensor data, and if the water level is too high, it sends a signal to the relay module to close the solenoid valve.
- The valve closure stops additional water from entering the tank, preventing overflow.
- The system continues to monitor the water level and reopens the valve when the level drops below the threshold.

CONCLUSION AND FUTURE SCOPE:

The Automatic Water Overflow Prevention System operates by using an ultrasonic sensor to continuously measure the water level in a tank. The sensor emits ultrasonic waves and calculates the distance to the water surface based on the time it takes for the echo to return. An infrared proximity sensor provides additional confirmation of water levels at specific points. The Arduino UNO processes the input signals from both sensors to determine the current water level. If the water level exceeds the set threshold, the Arduino sends a signal to the relay module, which acts as a switch to control the solenoid valve. The solenoid valve then closes to stop the water flow, preventing overflow. The entire system is powered by a dedicated power supply to ensure smooth operation. This setup ensures efficient water management by automatically controlling the water flow and preventing wastage.

The future scope of the Automatic Water Overflow Prevention System are as follows:

1. **Integration with IoT**: Incorporate Internet of Things (IoT) technology to enable remote monitoring and control of water levels through a smartphone app or web interface.
2. **Advanced Data Analytics**: Utilize data analytics to predict water usage patterns and optimize water management strategies, potentially integrating with smart home systems.
3. **Enhanced Sensor Technology**: Upgrade to more advanced sensors for higher accuracy and reliability, including multi-point sensing for larger tanks or complex water systems.
4. **Energy Efficiency Improvements**: Implement energy-efficient components and algorithms to further reduce power consumption and enhance the sustainability of the system.
5. **Scalability for Industrial Use**: Adapt the system for larger-scale industrial applications, including integration with existing industrial water management systems.
6. **Automated Maintenance Alerts**: Develop features for automated maintenance alerts and diagnostics to ensure the system remains operational with minimal manual intervention.
7. **Water Quality Monitoring**: Add sensors to monitor water quality parameters such as pH, turbidity, and temperature, providing a comprehensive water management solution.

Overall, the future scope of automatic water overflow prevention systems is vast, with significant potential to contribute to water conservation, safety, and efficiency across various domains.

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3. Getu, Beza Negash, and Hussain A. Attia. "Automatic water level sensor and controller system." *2016 5th International Conference on Electronic Devices, Systems and Applications (ICEDSA)*. IEEE, 2016.

4. Gomathy, C. K., et al. "The Efficient Automatic Water Control Level Management Using Ultrasonic Sensor." *International Journal of Computer Applications* 975 (2020): 8887.

5. Sen, Satyaki, et al. "Automatic Water Level Control With Dry Run Protection of Pump." (2019).

APPENDIX:

```
#define echoPin 2 // attach pin D2 Arduino to pin Echo of HC-SR04
#define trigPin 3
#define motor  10
long duration; // Variable to store time taken to the pulse
 // to reach receiver
int distance; // Variable to store distance calculated using
// formula
void setup()
{
   pinMode(trigPin,
         OUTPUT); // Sets the trigPin as an OUTPUT
   pinMode(echoPin, INPUT); // Sets the echoPin as an INPUT
   pinMode(motor,OUTPUT);
   // Serial Communication is starting with 9600 of
   // baudrate speed
   Serial.begin(9600);
   // The text to be printed in serial monitor
   Serial.println("Distance measurement using Arduino Uno.");
   delay(500);
   digitalWrite(motor,LOW);
}
void loop()
{
   digitalWrite(trigPin, LOW);
   delayMicroseconds(2); // wait for 2 ms to avoid
   // collision in serial monitor

   digitalWrite(trigPin, HIGH); // turn on the Trigger to generate pulse
   delayMicroseconds(
      10); // keep the trigger "ON" for 10 ms to generate
         // pulse for 10 ms.
    digitalWrite(trigPin, LOW); // Turn off the pulse trigger to stop
                  // pulse generation
```

```
  // If pulse reached the receiver echoPin
  // become high Then pulseIn() returns the
  // time taken by the pulse to reach the
  // receiver

  duration = pulseIn(echoPin, HIGH);
  distance
     = duration * 0.0344 / 2+1; // Expression to calculate
                          // distance using time

  Serial.print("Distance: ");
  Serial.print(
     distance); // Print the output in serial monitor
  Serial.println(" cm");
  delay(200);
  if(distance<=12){
   digitalWrite(10,LOW);
  }
  else{
   digitalWrite(motor,HIGH);
  }

}
```

Guide signature:

(M. Subramanyam

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