

IoT: Automatic Water Dispenser using Arduino

The fundamental concept of the Automatic Water Dispenser is based on utilizing the HC-SR04 ultrasonic sensor to detect the presence of an object, such as a glass, placed beneath the dispenser tap. Water flow control is managed through a solenoid valve that opens when energized and closes automatically when de-energized. The Arduino microcontroller is chosen for its affordability and ease of programming, allowing continuous monitoring of the sensor's vicinity. When an object is detected, the solenoid valve is activated to allow water flow, which continues until the object is removed, at which point the valve closes to stop the water supply.

However, based on literature reviews from several related studies, conventional methods exhibit significant limitations in water flow control. These systems still rely on manual interaction to stop the water flow—either by physically removing the container from the sensor's detection range or by setting a timer to halt flow after a predefined interval. This approach is considered inefficient because it does not account for the actual volume of water dispensed, potentially leading to water wastage and inaccurate filling.

To address this limitation, we propose an innovative approach that integrates a flow sensor with the ultrasonic sensor to enable more precise volume measurement. The ultrasonic sensor measures the water surface level inside the bottle based on the reflection principle of ultrasonic waves, while the flow sensor provides real-time data on the volume of water dispensed. By combining the bottle height with the distance measured by the ultrasonic sensor, the system can automatically calculate the water level through the difference between the bottle height and the detected distance. This method facilitates automatic and accurate control of water flow without requiring manual intervention, significantly improving water usage efficiency in the dispensing system.

Tools

- Arduino IDE for programming the microcontroller.
- Soldering iron for assembling electronic components.
- Multimeter for testing electrical connections.
- Breadboard for prototyping the circuit.

Materials

- Arduino Uno R3: The microcontroller for processing inputs and controlling outputs.
- HC-SR04 Ultrasonic Sensor: For detecting the presence and height of the bottle.
- YF-S201 Flow Sensor: For measuring the volume of water dispensed.
- Solenoid Valve (12V): For controlling the water flow.
- MOSFET IRF540N: For switching the solenoid valve on and off.
- Resistors (1k & 10k): For circuit stability and signal conditioning.
- Breadboard & Jumper Wires: For assembling the circuit.