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# ESP-32 Oriented Automated Water Level Controller System

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**ABSTRACT:** Our study is entitled AWMS (Automatic Water Level Controller System using ESP-32) and it is based on the Water Flow Management System. It essentially controls the excessive flow of water from the tank, which results in natural resource waste. As technology progresses, so does the implementation, so the control system we'll utilise is already in place, but we've added a new component: the android application connection.

**KEYWORDS:** ESP-32, Relay, Submersible Motor, Breadboard, Jumper Wires, Ultrasonic Sensor, Arduino IDE, MIT App Inventor.

## I. INTRODUCTION

AWMS is an automatic system that regulates the excessive flow of water from a tank. Around 70% of the hardware resources and 30% of the software resources are included in this system. So, as technology advances, so does implementation, so the control system that we will utilise is already in place, but we have added a new component, which is an android application connection. Most residences have subterranean water motors that pump water to rooftop water tanks. When the water motor isn't turned off, a lot of water spills, and when the water tank reaches its full capacity, it begins to leak, wasting both water and electricity. Because India is currently experiencing an electricity and water crisis, it is imperative that all measures and procedures be taken to conserve water and electricity. We offered AWMS as a solution to this problem (Automatic Water Management System).

## II. RESEARCH IN LITERATURE

Santosh Anand, et al [1] This paper is about an automatic water control system that uses IoT sensors to detect water movement, then displays the water level within the container and sends information to the owner via a pop-up message. Smartphones, laptops, computers, and various sensors are all part of the Internet of Things. Their technology features a built-in water level sensor as well as an IR sensor for managing the flow of water from the faucet. The 120db water leak alarm can detect and inform you to a leak in a pipe. Continuous water flow from the tap in the situation of a low, medium, or high amount of water in the water tank. The water leak alarm will send a pop-up message to your phone informing you that there is a leak in the pipe. As a result, users are free to make their own choices. The working principle of the project will be demonstrated here. i.e., an automatic water control system that monitors water flow, displays the water level within the container, and alerts the owner via a pop-up message.

Mallikarjun.G. Hudedmani a., et al [2] This paper describes the Automatic Water Level Controller as a solution to this problem. The water level controller's functionality is dependent on the fact that water has overflowed.

as well as concerns over electricity. When the water level rises or lowers, the controller's detecting probes and circuits detect it. Depending on the situation, these signals are used to turn on or off the pump motor. As an optional feature, a buzzer will be incorporated to stop the input water for the subterranean tank's water level. To avoid overflow, future shortages, and wasteful water billing by the water supply board, turn off the tap.

P. Nancy Rachel a., et al [3] This paper describes an Arduino-based water level indicator and controller. To manage the water level, an ultrasonic sensor will be mounted on top of the water tank. When sound waves move through the environment and encounter a barrier, they return to their source as an echo. To compute the delay time, they usually use an ultrasonic sensor. This delay duration can be used to put a code into the Arduino to determine the distance between the water level and the sensor. Based on the requirements, maximum and minimum limits can be computed, and this information can then be used to automatically turn on or off the water supply.

Ms. Pooja K a.,et al [4] This paper first determines the water level and signals it, allowing the pump to be turned off at the appropriate time, conserving water, electricity, and time. The focus of this piece is usually on utilising the least amount of labour and making the installation process easier to use for everyone. Because of the minimal manpower needs and ease of installation, this "Water Level Indicator and Controller Using Arduino" project may be beneficial on a large scale, making it more accessible to everyone.

### III. PROPOSED METHODOLOGY

An ultrasonic sensor will be utilised in an automatic water management system to keep track of water levels. The ESP-32 will have instructions and programmes that will allow it to control the relay appropriately. The user will be given an Android application that will provide him or her with important information and alerts. Water motor controls will be available within the application, eliminating the need for the user to physically turn on or off the switch. The user will be notified when the motor is turned on or off. If the user is unable to turn off the motor, alert messages will be issued. If the user is unable to turn off the motor, AWMS will automatically detect water levels and turn it off in time. The user can entirely rely on AWMS and not be concerned about water or electricity waste.

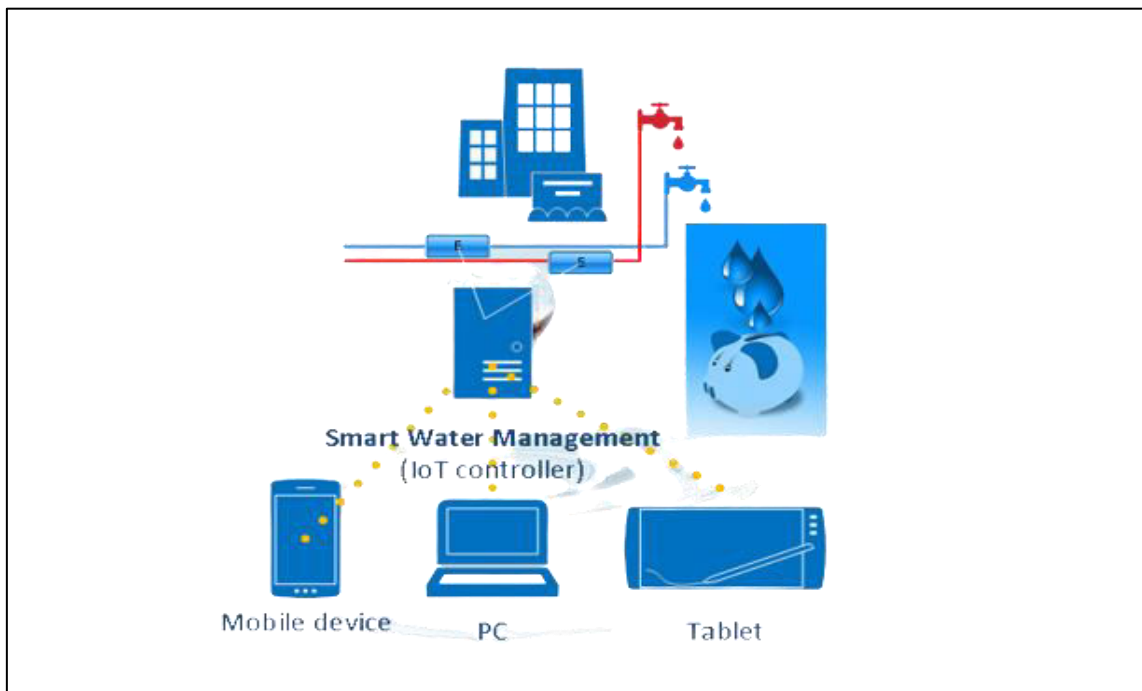


Fig.1

### IV. WORKING PRINCIPLE

#### ❖ SYSTEM ARCHITECTURE AND SCHEMATIC CIRCUIT

Figure 2 exhibits the architecture of the proposed system, which depicts the integration of sensors with the ESP32 function as a microcontroller, as well as the connection between the controller and the Android application. On the application interface, there are sensors such as an ultrasonic sensor for water flow, a power supply, a relay, and live water levels.

❖ CONNECTION

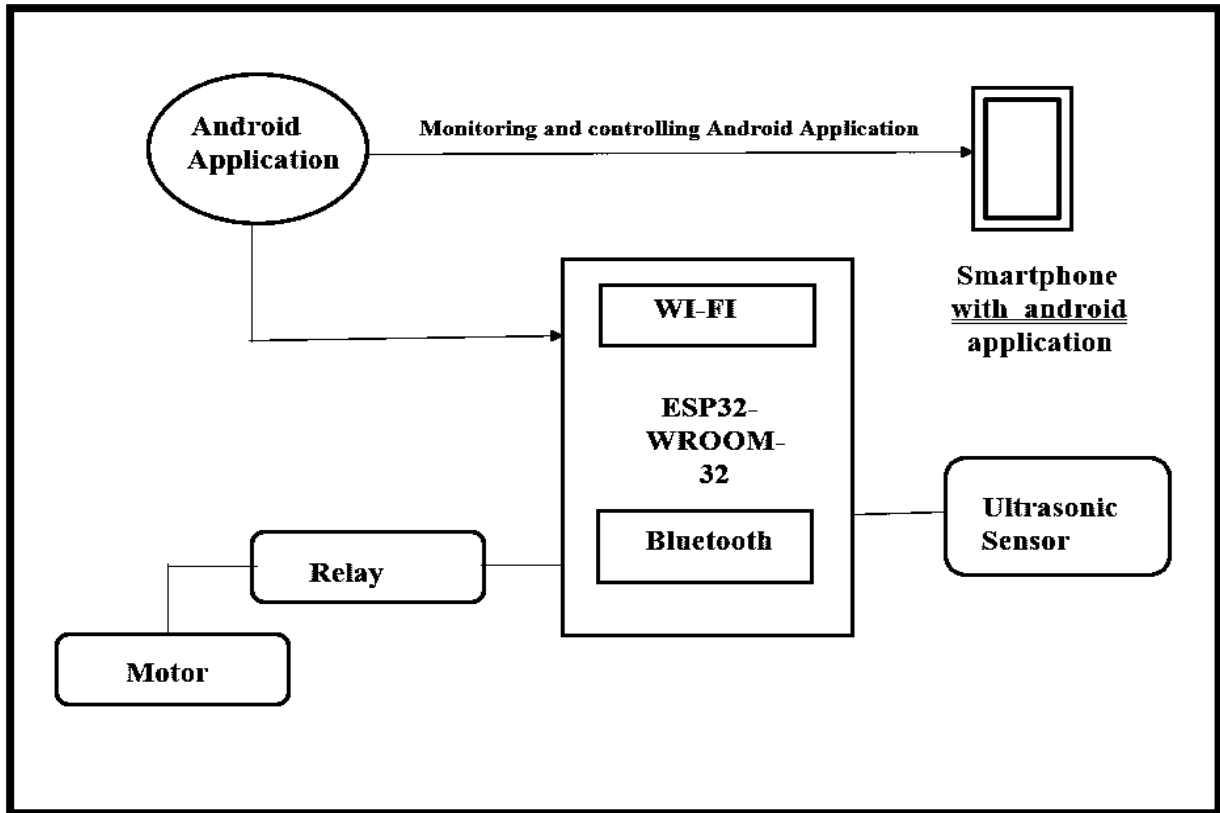


Fig.2

❖ PROCEDURE

• **In terms of Infrastructure :**

We created an Android application that consists of pre-defined functions with parameters set by the system's user, and it will monitor the entire project and send instructions to the ESP-32 based on the user's requirements, which the ESP-32 will receive via WI-FI or Bluetooth connection and transmit to the relay. Before that, an ultrasonic sensor will measure the distance covered by water and alert the ESP 32, which will then regulate the relay functions to turn on and off the motor based on user inputs.

We began with the ESP 32, configuring and testing the Bluetooth module, and successfully connecting the app interface created on the MIT app creator platform to the ESP 32 through Bluetooth. All of our difficult side coding has been completed (.i.e. Mostly related to Hardware connecting using software like Arduino IDE) Sensor for ultrasonic waves: We've used this sensor in a variety of ways in our project, including automatic mode and manual mode, where the user may manually pick water levels. We're also utilising it to display LIVE water levels on the app interface with our system. We also constructed and configured all of the components to fulfill the project's specifications..

• **In terms of Application :**

The Android application was the most significant part of our project, and we created an app that includes live water level readings and two interfaces, one manual and the other automatic.

1. Manual Mode: - This interface will have two buttons, one for on and one for off, which the user can swap as needed. The ultrasonic sensor will then reflect those distances on the application screen, resetting or overriding the End point value or the End Level to which water should be filled. As a result, this mode is responsible for manually adjusting the amount of water added to the tank. The user can interact with the system and manage the water in his region as a result of this mode.



2. Automatic Mode:- This interface is the Water Management system's default mode of operation, with a default starting value of 0 and an ending value of 1. i.e. at the 80th percentile. And This Is Fully Automatic Mode . i.e. user Interaction is not required.

❖ **ALGORITHM AND FLOWCHART**

**Work flow of the AWMS:**

Step 1: Start

Step 2: select the operational mode of water management system – 1. Automatic mode 2.manual mode.

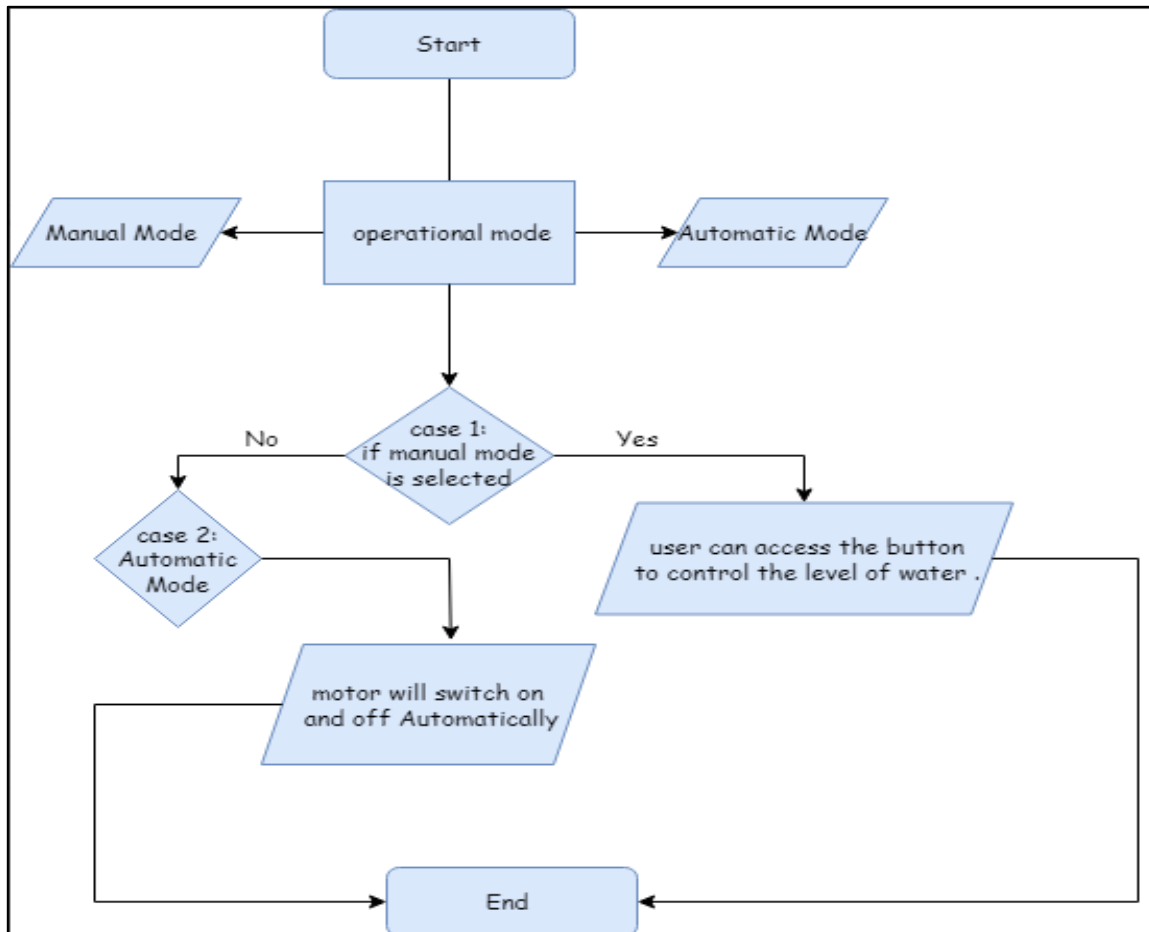
Step 3: if automatic mode is selected then the motor will get turned on/off without user control.

Step 4:if manual mode is selected then user will have the access to those buttons and using buttons user can modify the level of water in his/her tank.

Step 5: water will get filled according to user input.ESP will act according to user inputs that he wants water to get filled.

Step 6: End.

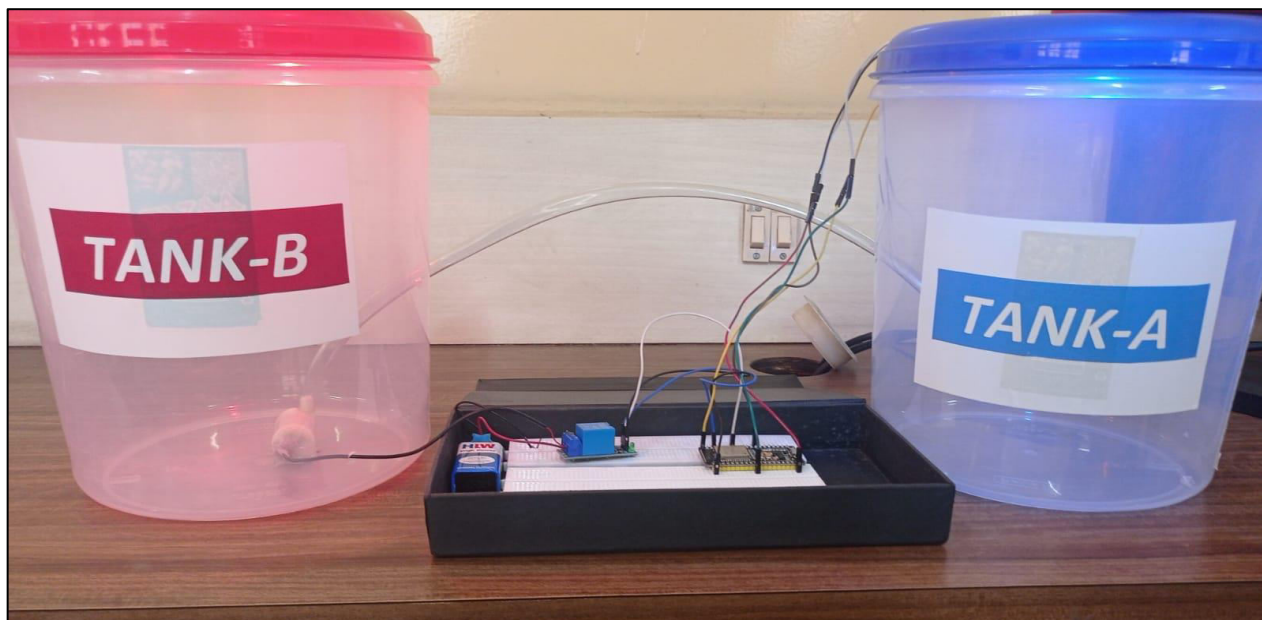
**Flowchart :**



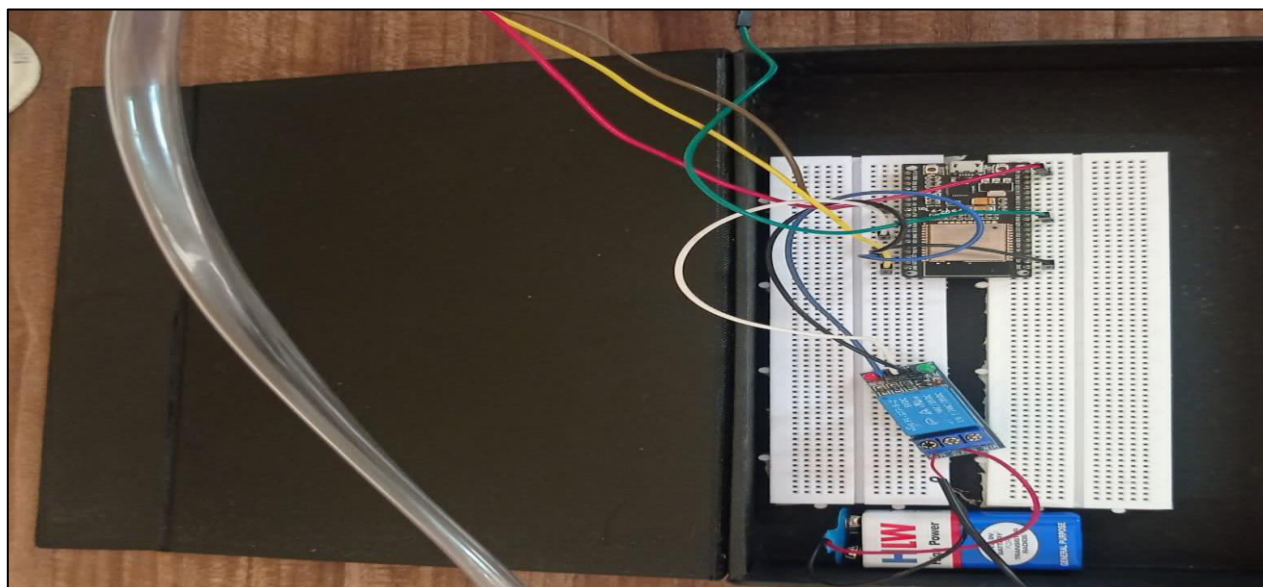


❖ **OUTPUTS :**

**Hardware Module :**



**Fig.3 AWMS Module**



**Fig.4 Connection with ESP-32**

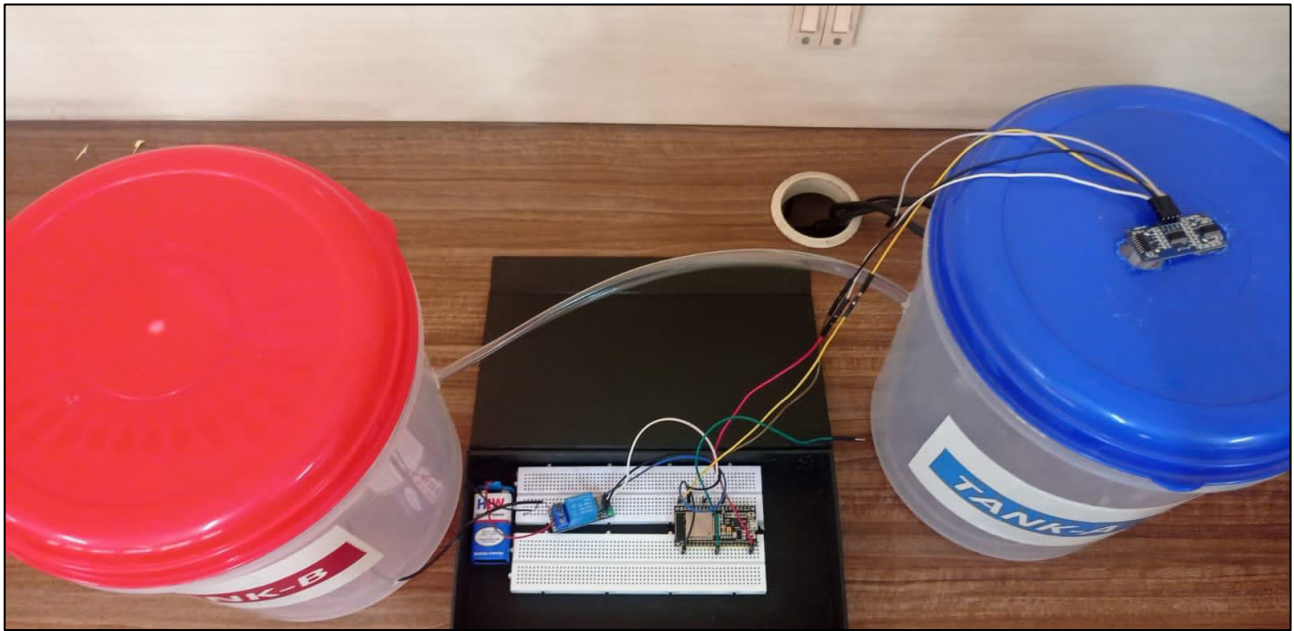
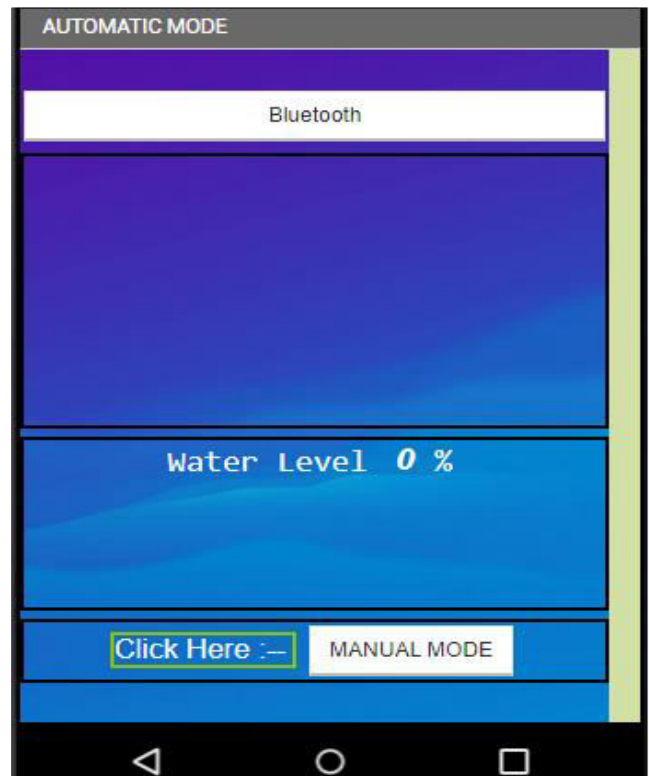
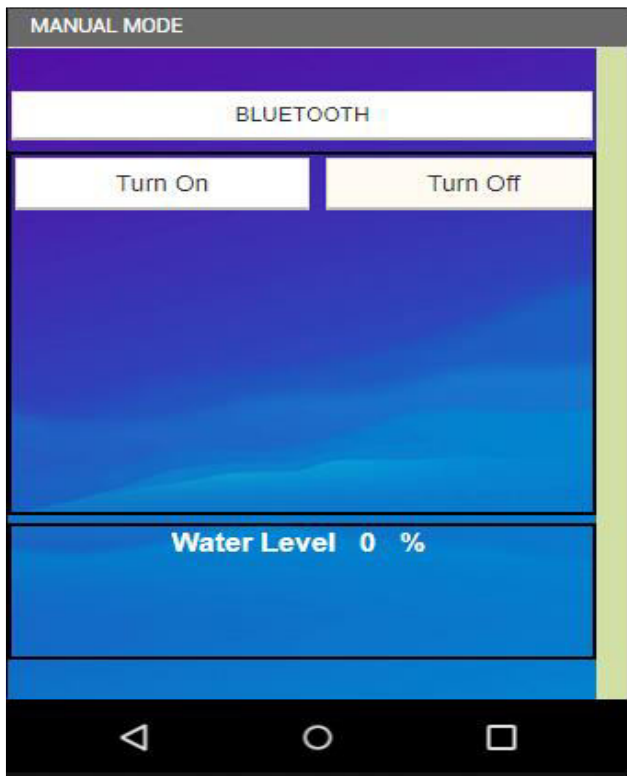


Fig. 5 Association with Ultrasonic Sensor

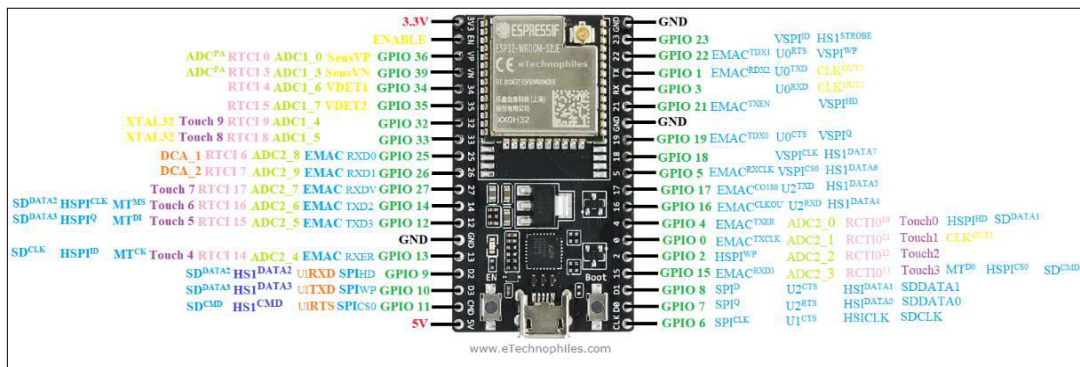
Application Interface :



## V. COMPONENTS

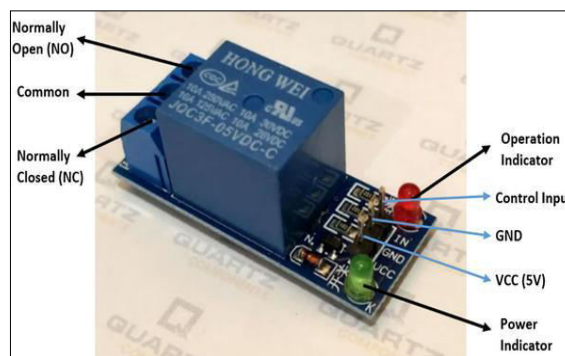
### 1. ESP-32

ESP32-WROOM-32 (ESP-WROOM-32) is a powerful, generic Wi-Fi+BT MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding. At the core of this module is the ESP32-D0WDQ6 chip\*. The chip embedded is designed to be scalable and adaptive. There are two CPU cores that can be individually controlled, and the clock frequency is adjustable from 80 MHz to 240 MHz. The user may also power off the CPU and make use of the low-power co-processor to constantly monitor the peripherals for changes or crossing of thresholds. ESP32 integrates a rich set of peripherals, ranging from capacitive touch sensors, Hall sensors, SD card interface, Ethernet, high-speed SPI, UART, I2S and I2C. So We are going to use this module to process the instruction and provide the output through its input and output pins and we are also going to use Wi-Fi and Bluetooth modules to connect our android app to establish connection between ESP 32 and module.



### 2. Relay

A power relay module is an electrical switch that is operated by an electromagnet. When electrical current is passed through a coil, it generates a magnetic field that in turn activates the armature. This movement of the movable contacts makes or breaks a connection with the fixed contact. So the use of relay in our project is that we are using it for switching the motor to on and off when instructions are passed from ESP 32. So that automation of motor can be established and the control of motor should be in the hands of the ESP 32 Module .



### 3. Submersible Motor

Mini submersible water pumps are frequently seated at the bottom of water tanks, and are designed to push water upwards through the top of the roof. Given their water pumping mechanism, mini submersible water pumps are normally used in tanks where water needs to be pumped up to the surface. A mini submersible pump is a smaller version of the submersible water pumps which is lightweight, small size, low consumption, and makes little noise. So as this motor have property of submersible so it has made it more convenient to be under the water and pump water from source to destination that are tanks.





#### 4. Breadboard

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting diode). So we are mainly going to use bread board for attaching the ESP 32 on it and make the connection more safer and easy.



#### 5. Jumper wires

A jumper wire is an electrical wire, or group of them in a cable, with a connector or pin at each end which is normally used to interconnect the components of a breadboard or other prototype or test So in our project we are going to use Jumper wires for all wiring connection of components with ESP 32, relay, ultrasonic sensor and etc.



#### 6. Ultrasonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity So we are using ultrasonic sensor for measuring the water level and showing the live water level on the app in the form of bar graph. To make it more interactive and user would be able to see live water level on the device and can make changes accordingly.



## VI. CONCLUSION

Our project's conclusion is that many individuals nowadays waste water. We used esp-32 to create our project in order to save or prevent this problem. The motor is the crucial component that will switch on and off our water flow or water stock in our project's most important domain. As a result, due to the minimal manpower needs and ease of installation, the "AUTOMATIC WATER LEVEL CONTROLLER SYSTEM USING ESP-32" project may be advantageous on a large scale, making it more accessible to everyone.

## ACKNOWLEDGEMENTS

This research and development document has taken a lot of time and effort to get to this stage. In any case, it would not have been possible without the wonderful help and support of a number of people and organisations. We owe our gratitude to each of them from the bottom of our hearts. We are quite pleased with this report on "automated water level controller system using esp 32." Prof. M.A.Parlikar, our colleague, deserves special thanks for his invaluable assistance in conducting a thorough evaluation of our study. We'd also want to express our gratitude to Ms. S.L. Mortale, the Information Technology HOD, for providing the necessary resources.

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