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1 | Page AUTOMATIC WATER PUMPING AND QUALITY MONITORING SYSTEM

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Abstract: This project presents an innovative solution for automatic water pumping and real-time quality monitoring using the Blynk platform. It's designed to enhance water quality and pumping efficiency, ideal for hydroponics, aquaponics, and irrigation. Key components include an Arduino Uno, ultrasonic sensor for liquid levels, a relay for pump control, and a pH sensor. The system maintains water levels within defined thresholds and monitors pH levels, activating the pump when needed. Key Word: Automatic water pumping; Quality monitoring; Arduino UNO; pH sensor; Blynk platform

I.INTRODUCTION

The project, "Automatic Water Pumping and Quality Monitoring" employs an Arduino microcontroller to control water pumps and monitor water quality in real-time. It ensures timely pumping and quality checks, preventing contamination and conserving water resources. The system integrates pH sensing and uses Blynk for remote monitoring, allowing users to access realtime pH data via the app. This automation and pH monitoring blend addresses agricultural water challenges and promotes efficient resource use. By leveraging Arduino Uno, ultrasonic and pH sensors and the Blynk platform, it offers a versatile tool for improved water management and sustainable farming. It has the potential to transform global water access and sustainability.

II.COMPONENTS

• ESP8266 ESP-01 • Mini water pump(9V) • pH electrode • pH sensor module • Relay(5v) • Jumper wire • Arduino uno • Ultrasonic sensor • 5V Piezo buzzer

1. ESP8266 ESP-01: The ESP8266 ESP-01 is a compact Wi-Fi module enabling wireless communication. It interfaces with the Arduino Uno using UART. It's known for low power usage and features GPIO pins for external devices. The module is configured using AT commands.

Role in the Project: The ESP-01 connects the Arduino Uno to Wi-Fi and communicates with the Blynk platform, enabling remote control and monitoring through a mobile device.

Advantages: • Affordable and accessible. • Simplifies Wi-Fi connectivity for Arduino projects. • Compact and energy-efficient. • Suitable for various IoT applications.

Page Limitations: • Limited GPIO pins for extensive projects. • Requires some familiarity with AT commands for setup and updates. • The ESP8266 ESP-01 enhances the project by providing wireless connectivity and enabling remote access, making it a valuable component for IoT applications. Fig 1: ESP8266 ESP-01 2. Mini water pump(9V): The mini water pump is a compact and efficient device designed for pumping liquids, often used in small-scale applications. It operates on a 9V power supply and features a submersible design suitable for water-based environments. It typically has an inlet and outlet for liquid flow and is known for its low power consumption and quiet operation. Role in the Project: The mini water pump plays a critical role in the project by pumping water from a water source (e.g., a reservoir or tank) to the desired location, such as a plant's root system in hydroponic or irrigation systems. It ensures precise control over water levels, preventing overflows or under-watering. Advantages: • Compact and lightweight. • Low power consumption. • Suitable for small-scale water pumping applications. • Submersible design for versatile placement. Limitations: • Limited to low-flow applications. • Typically operates on a fixed voltage (e.g., 9V). • May require additional components for flow rate control. The 9V mini water pump is a fundamental component in the project, providing efficient water delivery for precise control over water levels, contributing to the overall success of the automatic water pumping and quality monitoring system. Fig 2: Mini water pump (9V)

Page 3. pH electrode: The pH electrode is a crucial component in this project, serving as the primary sensor for monitoring water quality. This specialized sensor is specifically designed to measure the acidity or alkalinity of a liquid solution. It consists of a glass electrode filled with a pH-sensitive solution and a reference electrode. When immersed in the liquid, it generates a voltage that varies with the pH level, providing highly accurate and precise pH measurements. In this

project, the pH electrode plays a pivotal role in ensuring that the water's pH level remains within the desired range. It continuously measures the pH level of the water, providing real-time data for analysis and decision-making. This capability is particularly essential for applications such as hydroponics and aquaponics, where maintaining the correct pH level is critical for the health of plants and aquatic life. Despite its high precision and accuracy, the pH electrode requires periodic calibration to ensure its readings remain reliable over time. Additionally, it is sensitive to contamination and damage, so proper care and maintenance are essential. To interpret the data generated by the pH electrode, it is integrated with a compatible pH meter or microcontroller, allowing for seamless monitoring and control of water quality throughout the project. Fig 3: pH electrode 4. pH sensor module: The pH sensor module is a vital component within this project, dedicated to the precise measurement of water quality by assessing its pH level. It encompasses a pH electrode, often made of glass, featuring a pH-sensitive solution that generates voltage variations proportional to the pH level in the surrounding liquid. This voltage signal is then processed by the sensor module to provide accurate pH readings. In the context of this project, the pH sensor module plays a central role in ensuring that water quality remains within specified parameters. It continuously monitors the pH level of the water, supplying real-time data for analysis and immediate action when pH fluctuations are detected. This function is particularly critical in hydroponics, aquaponics and other applications where maintaining the ideal pH level is imperative for the health and growth of plants or aquatic organisms. The pH sensor module offers the advantages of high precision and repeatability, although it necessitates regular calibration to sustain measurement accuracy over time. Moreover, it is sensitive to contamination and physical damage, demanding proper handling and maintenance. To interpret the pH data effectively, the module is integrated with a microcontroller or pH meter, allowing seamless monitoring and control of water quality throughout the project's operation. Fig 4: pH sensor module

Page 5. Relay(5v): The 5V relay is a pivotal component in this project, serving as an electrical switch

that allows or interrupts the flow of electricity to the water pump. Relays are crucial in automating systems, ensuring that devices like pumps are turned on and off as needed without direct manual control. In this project, the 5V relay acts as a bridge between the Arduino Uno microcontroller and the water pump. When triggered by the Arduino, it completes or interrupts the electrical circuit, effectively turning the pump on or off. This functionality is vital for maintaining precise control over water levels within the reservoir. The 5V relay operates at a low voltage, which is compatible with the Arduino Uno's output pins, making it an ideal choice for this application. It provides a reliable means of controlling the water pump's operation, ensuring that water is pumped when necessary to maintain optimal water levels while conserving resources when water levels are sufficient. It's important to note that the 5V relay should be chosen based on the specific requirements of the water pump, ensuring it can handle the pump's voltage and current specifications. Proper electrical connections and safety precautions should also be observed to prevent damage to the components and ensure the system's safe operation. Fig 5: Relay(5V) 6. Jumper wire: Jumper wires are fundamental components in this project, serving as essential connectors for establishing electrical connections between various components. These wires are typically made of flexible, insulated conductive material, allowing for easy and versatile circuit connections. In the project, jumper wires play a pivotal role in interconnecting components like sensors, the microcontroller and other electronic modules. Their flexibility and ease of use make jumper wires invaluable for rapidly prototyping and constructing circuits without the need for soldering. These wires come in different lengths and colors, enabling efficient organization and management of connections within the project. For instance, they can be used to connect the pH sensor to the Arduino Uno, facilitating the transfer of pH data for real-time monitoring. Additionally, jumper wires provide a level of modularity, allowing for quick adjustments and modifications to the project's circuitry. This versatility simplifies the testing and troubleshooting process, ensuring that the system operates smoothly. In summary, jumper wires are indispensable tools for maintaining the flexibility, accessibility and functionality of the project's electronic components. Fig 6: Jumper Wire

Page 7. Arduino Uno: The Arduino Uno serves as the central microcontroller in this project, playing a pivotal role in automating water pumping and monitoring water quality. It is a compact and versatile development board based on the ATmega328P microcontroller. In this project, the Arduino Uno is responsible for several critical functions: • Water Pump Control: The Arduino Uno interfaces with a relay to control the water pump's operation. It processes input from the ultrasonic distance sensor to determine when to activate the pump to maintain the water level within predefined thresholds. • Data Processing: It receives data from the pH electrode, responsible for measuring water acidity levels. The Arduino processes this data, making real-time pH level determinations and sending relevant information to the Blynk platform for remote monitoring. • Communication: The Arduino Uno is capable of communication via serial connections. In this project, it communicates with both the ultrasonic sensor for liquid level measurement and the pH electrode for data retrieval. It also establishes a connection with the ESP8266 ESP-01 module for internet connectivity. • Blynk Integration: The Arduino Uno is programmed to communicate with the Blynk platform via the ESP8266 module, enabling remote monitoring and control through the Blynk mobile app. It sends pH level data to Blynk, allowing users to access real-time water quality information. • Logic and Control: The Arduino Uno executes the logic required to manage water levels effectively. It activates and deactivates the water pump based on input from the ultrasonic sensor and ensures the pH level. The Arduino Uno's flexibility, abundant library support and ease of programming make it an ideal choice for this project. It combines hardware control and data processing capabilities, making it a key component in the development of an efficient and automatic water pumping and quality monitoring system. Fig 7: Arduino Uno 8. Ultrasonic sensor: The ultrasonic sensor is a fundamental component in this project, employed for accurate and non-contact measurement of liquid levels. It operates based on the principle of sending out ultrasonic waves and measuring the time it takes for these waves to bounce back after hitting a surface. This time delay is then used to calculate the distance to the surface, providing precise liquid level measurements. In the context of this project, the ultrasonic sensor is responsible for monitoring and managing water levels within a reservoir or tank. By continuously sending out ultrasonic pulses and detecting their reflections, it accurately determines

the current water level. When the water level falls below a predefined threshold, the system triggers the water pump to activate and refill the reservoir. Conversely, when the water level rises above another threshold, the pump is deactivated to prevent overflow. The ultrasonic sensor's non-contact nature makes it ideal for applications where liquid levels need to be measured without direct contact with the fluid. It offers high reliability, minimal maintenance and consistent performance, making it a critical component for effective water management in this project. Additionally, its integration with the Arduino Uno microcontroller allows for real-time data processing and decision-making, enhancing the overall efficiency and precision of the system. Fig 8: Ultrasonic Sensor

Page 9. 5V Piezo Buzzer: The 5V piezo buzzer is a vital acoustic component employed in this project to provide audio alerts and notifications. It is a compact and versatile device that generates sound when an electrical signal is applied to it. The key feature of this buzzer is its ability to produce different tones and frequencies, making it suitable for various audible signaling applications. In the context of this project, the 5V piezo buzzer serves as an auditory indicator to alert users when specific conditions are met. For example, when the water level exceeds predefined limits or when the pH level falls outside the desired range, the buzzer is activated. This audio feedback provides immediate and noticeable alerts to users, drawing their attention to potential issues with the water system. The buzzer's compact size and low power consumption make it an excellent choice for embedded systems like this one. Its simple interfacing, usually requiring just a digital signal to produce sound, ensures ease of integration into the project. Overall, the 5V piezo buzzer enhances the project's usability by providing real-time audio feedback, contributing to efficient water management and water quality control. Fig 9: 5V Piezo Buzzer 10. Arduino IDE Software: The Arduino Integrated Development Environment (IDE) is the software backbone of this project, facilitating code development, uploading and real-time monitoring of the Arduino Uno microcontroller. It's a user-friendly and versatile platform designed for programming and managing Arduino-based projects. In

this project, the Arduino IDE is used to write and upload the firmware to the Arduino Uno. It provides an intuitive code editor with syntax highlighting and auto-completion features, simplifying the coding process. The IDE also supports a vast library of pre-built functions and example codes, making it easier to integrate sensors, modules and components into the project. Additionally, 1 the Arduino IDE offers robust debugging tools, allowing developers to identify and fix errors efficiently. This feature is invaluable during the project's development phase. 3 One of the IDE's most significant advantages is its compatibility with the Arduino ecosystem. It supports various Arduino boards, shields and third-party components, ensuring seamless integration. Moreover, it connects effortlessly with the Blynk platform, enabling remote monitoring and control through a mobile application. Overall, 1 the Arduino IDE streamlines the software development process, making it accessible to both beginners and experienced developers. Its flexibility and extensive community support make it an ideal choice for this project, ensuring smooth programming and efficient management of the Arduino Uno. Fig 10: Arduino IDE logo

 11.Blynk Software: Blynk software plays a pivotal role in this project, offering a user-friendly and versatile platform for remote monitoring and control of the automatic water pumping and quality monitoring system. Blynk 1 is a powerful Internet of Things (IoT) solution that allows users to create custom mobile applications to interact with hardware and sensors. Blynk Software: Blynk is a robust and intuitive IoT development platform that empowers users to design customized mobile applications for managing and monitoring hardware projects remotely. It offers a range of widgets and features, including real-time data visualization, notifications and control interfaces. 3 In this project, Blynk acts as the bridge between the Arduino Uno microcontroller and the user's mobile device. Key Features: • Real-Time Monitoring: Blynk enables real-time monitoring of critical 2 parameters, such as pH levels, water levels and pump status, from anywhere with an internet connection. Users can stay informed about the system's performance and respond to changes promptly. • Data Visualization: The platform provides interactive and customizable widgets like graphs, gauges and value displays. These

widgets visually represent data, making it easy for users to interpret information and track trends in water quality and system operation. • Alerts and Notifications: Blynk allows users to set up alerts and notifications based on predefined thresholds or conditions. This feature ensures that users are promptly informed of any critical issues, such as pH level deviations or pump failures. • User-Friendly Interface: Blynk offers an intuitive drag-and-drop interface for designing mobile applications, making it accessible to users with varying levels of technical expertise. It simplifies the process of creating an interface for the project. • Remote Control: Beyond monitoring, Blynk enables users to remotely control system functions. For example, users can remotely turn the water pump on or off as needed, enhancing convenience and system efficiency. Integration: Blynk is integrated into the project by linking the Arduino Uno microcontroller, pH sensor and ultrasonic distance sensor to the Blynk mobile application. This integration allows users to access real-time pH readings, water level data and control functions via the Blynk app on their mobile devices. Overall, Blynk software significantly enhances the functionality and accessibility of the water pumping and quality monitoring system, making it a valuable tool for remote management and data-driven decision-making. Fig 11: Logo of Blynk app III.SYSTEM ARCHITECTURE & WORKING Fig 12: Block Diagram of Water Pumping System Fig 13: Block Diagram of Quality Monitoring System pH sensor Blynk Software

 Block Diagram Components: • Arduino Uno Microcontroller: The project's central processing unit is the Arduino Uno microcontroller. It serves as the brain of the system, orchestrating the interaction between various components. The Arduino collects data from sensors and controls the water pump and buzzer. • Ultrasonic Distance Sensor: This sensor is responsible for measuring water levels. It uses ultrasonic waves to determine the distance between the sensor and the water surface. If water levels are too low or too high, the Arduino triggers the water pump accordingly to maintain the desired range. • pH Sensor: The pH sensor is a critical component for monitoring water quality. It continuously measures the pH level of the water, which is crucial for optimal plant growth. Any

deviations from the desired pH range can be addressed promptly. • Relay: The relay is an electromechanical switch that controls the water pump. Based on the data received from the ultrasonic sensor and the pH sensor, the Arduino triggers the relay to turn the pump on or off to maintain the desired water level and pH range. • Buzzer: The buzzer provides audible notifications for system events. It can alert users to critical situations such as pump failures or pH level deviations. • ESP8266 WiFi Module: This WiFi module enables connectivity to the Blynk cloud server. It establishes a wireless connection to the internet, allowing users to remotely monitor the system's pH values through the Blynk app. • Blynk App: The Blynk app is the user interface for remote monitoring and control. It provides real-time pH value readings and allows users to interact with the system, making it user-friendly and accessible from anywhere with an internet connection. System Operation: • The Arduino Uno collects data from the ultrasonic distance sensor and pH sensor continuously. • Based on the water level data from the ultrasonic sensor, the Arduino triggers the relay to control the water pump, maintaining water levels within the desired range. • Simultaneously, the pH sensor data is monitored to ensure that the pH level remains within the optimal range for plant growth. • If any parameter falls outside the predefined range, the system can trigger the buzzer for audible alerts. • The ESP8266 WiFi module establishes a connection to the Blynk cloud server, enabling remote access. • Users can monitor real-time pH values and system status through the Blynk app, allowing for prompt responses to any issues. This system amalgamates automated water control and meticulous pH monitoring, enhancing water resource management and supporting the well-being of both humans and cultivated plants. IV.PROJECT OVERVIEW This innovative project combines IoT technology, sensor automation and real-time monitoring for efficient water management and pH control. It features an automatic water pumping system using an ultrasonic sensor to maintain optimal water levels and a pH monitoring system to ensure the desired pH range. Integrated with Blynk, it offers remote real-time pH monitoring via a mobile app, making it ideal for various applications, including agriculture and remote locations. Overall, it optimizes water distribution, promotes plant growth and supports environmental conservation. Fig 9: Working of proposed system

Automatic Water Pumping and Quality Monitoring

Page V.CONCLUSION AND FUTURE SCOPE "Automatic Water Pumping and Quality Monitoring System" represents a significant advancement in water management and quality control. By integrating IoT technology, sensor-based automation and real-time monitoring through the Blynk platform, it provides an all-encompassing solution for maintaining optimal water levels and pH values in diverse applications. This project streamlines water resource utilization, promotes plant growth and offers remote monitoring and corrective capabilities, reducing manual intervention. Future prospects include expanding sensor integration, implementing machine learning for predictive insights, enhancing the mobile application, enabling remote actuation and broadening its applicability to larger agricultural operations and environmental monitoring. This project lays the groundwork for a sustainable and technologically-driven approach to water management and quality maintenance. REFERENCES 1. "Arduino Automatic Water Pump System." Arduino Experiment, [Online]. Available: https://arduinoexperiment.wixsite.com/arduinoexperiment/arduinoautomaticwaterpumpsystem. [Accessed: 10/03/2023]. 2. Title: IoT Water Quality Monitoring using Arduino, pH Sensor, and NodeMCU ESP8266 Link:https://www.electroniclinic.com/iot-water-quality-monitoring-using-arduinoph-sensornodemcu-esp8266/ This reference contributes to the understanding of IoT-based water quality monitoring, providing context for our project's objectives, hardware setup, code implementation and data visualization strategies. 3. "How2Electronics. IoT-Based TDS Meter Using ESP8266 for Water Quality Monitoring". Retrieved [11/03/2023], from [https://how2electronics.com/iot-based-tds-meter-using-esp8266-for-water-quality-monitoring/]. 4. The study titled 'LOW COST AUTOMATIC WATER LEVEL CONTROL FOR DOMESTIC APPLICATIONS' by Ishwar Chandra Murmu (109EE0288) offers relevant insights into an automatic water level control system. This work serves as a valuable reference for our project, 'Automatic Water Pumping and Quality Monitoring System.' The site: https://www.academia.edu/9907129/LOW_COST_AUTOMATIC_WATER_LEVEL_CONTROL_FOR_DOMESTI C_APPLICATIONS_ISHWAR_CHANDRA_MURMU_109EE0288 5. S. M. Khaled Reza, Shah Ahsanuzzaman Md. Tariq, S.M. Mohsin Reza,"Microcontroller Based Automated Water

Level Sensing and Controlling: Design and Implementation Issue", 0, San Francisco, USA 6. SanamPudasaini, Anuj Pathak, SukirtiDhakal, Milan Paudel,"Automatic Water Level Controller with Short Messaging Service (SMS) Notification", Kathmandu University, Nepal. 7. A.T. Demetillo and E.B. Taboada, RealTime Water Quality Monitoring For Small Aquatic Area Using Unmanned Surface Vehicle Engineering, Technology & Applied Science Research,9(2), pp. 3959-3964, 2019. 8. I. Hussain, M. Das, K.U. Ahamad, and P. Nath, Water salinity detection using a smartphone. Sensors and Actuators B: Chemical, 239, pp. 1042-1050, 2017.

Sources

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