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IoT Based pH Level Monitoring and Controlling of Water Quality Systems

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ABSTRACT: Potential of Hydrogen (pH) level is one of the main characteristics of any chemical solution. It plays a significant role in chemistry, pharmacy, medicine, agriculture, fish farming, and industries. Lately, Internet of Things (IoT) appears as a new era of research and applications. IoT is designed to connect both digital and physical objects using communication technology. The main objective is to build a tool that allows real-time control of the pH level of a specific solution or product using the Internet of Things (IoT) concept. Specifically, it is made of an Arduino that is connected to both a designed mobile app and a physical device using the internet.It allow the user to choose either automatic (auto) or manual (manual) control modes. In the former, the system will behave as a feedback control scheme where the user will be requested to specify the desired pH value and the specific period needed to keep the experiment running. In the later (manual), the user should set the amounts of acidic and alkaline solutions in each pumping process. The hardware and software descriptions set out here will be realized as a prototype system.

1 Introduction

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A pH is a measure of the material acidic or basic property. It is scaled from 0 to 14. A solution, with a value near 0, is extremely acidic however, a value near 14 is extremely alkaline. Meanwhile, a pH of 7 is perfect. Controlling the level of pH is very sensitive and important due to some kinds of plants which need a water with a a specific pH value. Similarly, some kinds of fishes live only inside water with a specific value. Since the internet of things is a grid of things ingrained with sensors, software's, electronics, and internet connectivity, which allows the connected objects to fetch and interchange data and control their parts, our objective is to build a tool to control pH level of a specific solution or product using the IoT concept where the microcontroller Arduino is the main control component. In addition, Blynk, a software tool, is used to build the phone app.

2. Proposed System

In order to control the pH level, a controlling and monitoring system is designed and implemented using IoT concept. The system consists of Arduino Uno which is the control element in the system which gets the current value of the pH using a pH sensor meter. After that, the Arduino will send this value to the app using Blynk tool. In the Blynk app, the user is able to choose either automatic (auto) or manual controlling modes. In the auto-controlling mode, the system will behave as a feedback control scheme where the user will be requested to specify the desired pH value and the specific period needed to keep the experiment running. If the value of the pH is changed, due to an external disturbance, pumps will inject more of the acidic or alkaline solution as needed. The quantity added will be based on the readings of the sensor to fix the value of the pH for the specified time. Besides, if the user selects the manual control status, he should set the amounts of acidic and alkaline solutions in each pumping process.

Best Outcomes:

Checking the quality of water in real time through various sensor to measure the quality of water. IoT module transfers wirelessly the data from

the microcontroller to the smart phone/PC. Alerting the officials by sending a message to them via the IoT module incase someone tries to pollute the water body.

3. Module Description:

Power supply is used to current passing all the system. Arduino Uno is a process of ATmega328(14 pins). Relay is used to bypass. Flow sensor is work by an alert the leakage.

1. Controller

The controller controls the data and transmits to wifi-module.

2. IoT Module

The module is used to connect to the hardware device to mobile. If mobile can connected to message check with blynk app.

3. pH Sensor:

A high volume, dual junction salt bridge is utilized to maximize the in-service lifetime of the sensor. Theannular junction provides a large surface area to minimize the chance of fouling. Large electrolyte volume and dual reference junctions minimize contamination of the reference solution. The salt bridge is replaceable. The reference element of the sensor is a second glass pH electrode immersed in a reference buffer solution. This glass reference system greatly increases the range of sensor applications. An integral preamplifier is encapsulated in the body of the sensor. This creates a low impedance signal output which ensures stable readings in noisy environments and increases the maximum possible distance between sensor and transmitter to 3,000 feet (914 meters).

4. Transformer:

A transformer is a static electrical device that transfers energy by inductive coupling between its winding circuits. A varying current in the primary winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic flux through the secondary winding. This varying magnetic flux induces a varying electromotive force (EMF), or "voltage", in the secondary winding.

5. Relays:

Relays are electrically controlled switches. In the usual type, a coil pulls in an armature when sufficient coil current flows. Many varieties are available including “latching” and “stepping” relays; the later provided the cornerstone for telephone switching stations, and they’re still popular in pinball machines. Relays are available for dc or ac excitation, and coil voltages from 5 volts up to 110 volts are common. “Mercury-wetted” are “reed” relays are intended for high-speed (~ 1ms) applications, and giant relays intended to switch thousands of amps are used by power companies. Many previous relay applications are now handled with transistor or FET switches, and devices known, as solid-state relays are now available to handle ac switching applications.

6. Arduino Uno:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serialconverter.

4. Conclusion:

This paper deals with the design of a pH level monitoring and control. The concept of Internet objects (IoT) is proposed to build a system that allows real-time control and monitoring of the pH level. Both hardware and software parts are working fine but the complete system is still pending. As a future work, this system can be used to monitor water quality and to provide a keen control of the environmental pollution; hydrology, air pollution, and industrial and agricultural production.

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