Development of Real Time Water Quality MonitoringSystem.

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Abstract- Pollution of water is one of the main threats in recent times as drinking water is getting contaminated and polluted. The polluted water can cause various diseases to humans and animals, which in turn affects the life cycle of the ecosystem. If water pollution is detected in an early stage, suitable measures can be taken and critical situations can be avoided.
Proposed system has various sensors to check and ensure the quality of water-based on pH, temperature, turbidity, and free residual chlorine. Data is collected through sensors and send for further processing. LEDs deployed on the system are for general users to immediately identify the water quality. The system aims to reduce the delay in existing systems by deploying indictors on system itself so that the person using the system will be able to decide whether water is safe to drink or not, which can avoid further health hazards. Implemented system is economical and dynamic. Use of LEDs on system makes it user friendly and even common people can assure quality of water.

Keywords- Atmega 328p, pH sensor, Water quality, Sensors

I. INTRODUCTION

Nowadays, water is considered as one of the scarcest natural resources on our planet. It is important to humankind, animals, and plants. Depending on the quality of water, it may either be a source of life and good health or a source of diseases and deaths. The growing environmental degradation in recent years brought about by development, population increase and climate change increases the need for researchers to look into its negative impact in the environment, especially in water sources and its implication. Increasing water pollution in oceans, lake, and river triggers worldwide demand more advanced methods in environmental monitoring systems particularly in the field of water quality monitoring. published research work also provides a big weight-age to get admissions in reputed varsity. Now, here we enlist the proven steps to publish the research paper in a journal.

II. WORKING

The system is composed of components: Atmega328, PH sensor, LM35, and Turbidity sensors and IOT module.

All sensors and output component are integrated with ATMEGA328 microcontroller.12v adapter or power supply provide to run the system.
There will be three main sensors are used for the monitoring the quality of the water. PH sensor, LM35, and turbidity sensor.
PH sensor will be detect the PH value of the water which is 7.
LM35 sensor will be detect the temperature of the water.
Turbidity sensor will be detect the water is fresh or not.
If the any value of the sensor gives outputs than threshold value threw will be indicated on the LCD Display and alert through buzzer. Also Red LED glows.
On the other side all the sensor data is stored on the IOT in graphically format using thingspeak.com website via ESP8266A IOT module.
Also show the name of the project on the LCD Display.

A. IOT Module(ESP8266)

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. This module comes with AT commands firmware which allows you to get functionality like arduino wi fi shield, however you can load different firmware to make your own application on the modules' memory and processor. It's a very economic module and has a huge and growing community support.
Specifications :-

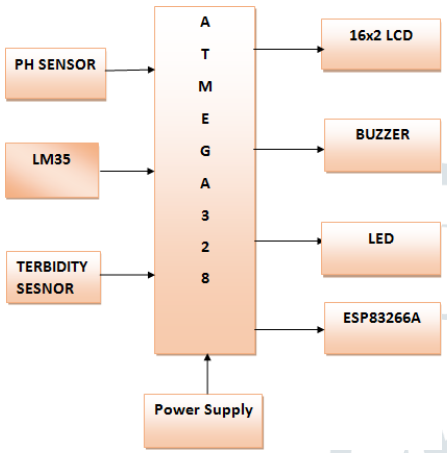
- 802.11 b/g/n
- 1Mb Flash size
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network.
- Integrated PLLs, regulators, DCXO and power management units.
- +19.5dBm output power in 802.11b mode.
- Power down leakage current of <10uA.

B. Thingspeak IoT Cloud Platform

ThingSpeak is IoT Cloud platform where you can send sensor data to the cloud. You can also analyze and visualize your data with MATLAB or other software, including making your own applications. sensors, or things, sense data and typically act locally.

ThingSpeak enables sensors, instruments, and websites to send data to the cloud where it is stored in either a private or a public channel. ThingSpeak stores data in private channels by default, but public channels can be used to share data with others. Once data is in a ThingSpeak channel, you can analyze and visualize it.

C. Block Diagram



D. Software Requirement

1) PROGRAMMING LANGUAGE: - Embedded

2) COMPILER: - Keil 4.0

3) DUMPING SOFTWARE: - Flash Magic/Preload Software

E. Hardware Requirement

1. Atmega328 microcontroller
2. Ph sensor
3. Dissolved o2 sensor
4. Turbidity sensor
5. Lcd 16*2
6. Buzzer
7. Led
8. Wi fi module
9. Lm35
10. Power supply

F. Atmega 328p Microcontroller

Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programing language compiler and a bootloader that executes on the microcontroller.

Specifications:-

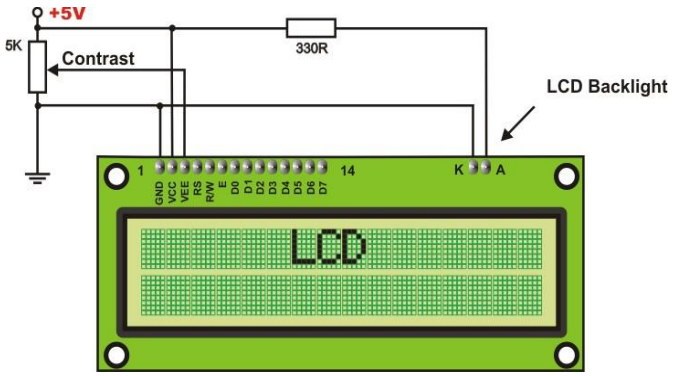
- Operating Voltage: 5V
- Input Voltage (recommended):7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40mA
- DC Current for 3.3V Pin: 50mA
- Flash Memory: 32 KB (ATmega328)
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

G. Liquid Crystal Display (LCD)

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

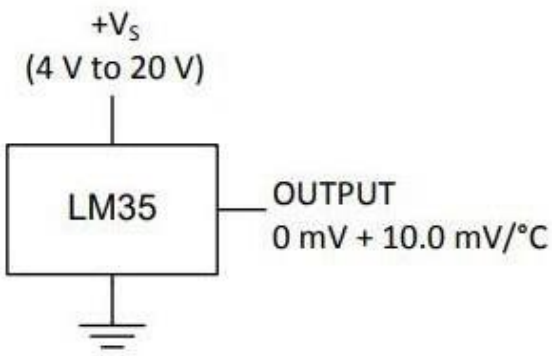
1. The declining prices of LCDs.
2. The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
4. Ease of programming for characters and graphics.

These components are “specialized” for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.



H. LM35 Temperature Sensor

LM35 is a type of commonly used temperature sensor that can be used to measure temperature with an electrical output comparative to the temperature in (°C). It can measure temperature in a better way than thermistor. LM35 is an Integrated Circuit Temperature Sensor whose output voltage varies depending on the temperature around it. It is a small and cheap IC that can be used to measure temperatures anywhere from-55°C to 150°C. It can be easily interfaced with any Microcontroller that has ADC function or any development platform like arduino.



If the temperature is 0°C, the output voltage will also be 0V. There will be an increase of 0.01V (10mV) for each degree of temperature increase. The voltage can be converted to temperature using the formulas below.

$$V_{OUT} = 10\ mv/°C \times T$$

I. Turbidity Sensor

The sensor operates on the principle that when light is passed through a sample of water, the amount of light transmitted through the sample is dependent on the amount of soil in the water. As the soil level increases, the amount of transmitted light decreases.

Specifications:-

- Operating Voltage: 5V DC
- Operating Current: 40mA (MAX)
- Response Time : <500ms
- Insulation Resistance: 100M (Min)
- Output Method:
  - Analog output: 0-4.5V
  - Digital Output: High/Low level signal (you can adjust the threshold value by adjusting the potentiometer)
- Operating Temperature: 5℃~90℃
- Storage Temperature: -10℃~90℃
- Weight: 30g
- Adapter Dimensions: 38mm*28mm*10mm/1.5inches *1.1inches*0.4inches.

J. PH Sensor

This PH Sensor Module is Compatible for Arduino. The pH stands for the power of hydrogen, which is a measurement of the hydrogen ion concentration in the body. This is used in Water quality testing and Aquaculture. The total pH scale ranges from 1 to 14, with 7 considered to be neutral. The overall working principle of pH sensor and pH meter depends upon the exchange of ions from sample solution to the inner solution (pH 7 buffer) of glass electrode through the glass membrane.

Specifications:-

- Module Size : 43mm×32mm
- Measuring Range:0-14PH
- Measuring Temperature :0-60 ℃
- Accuracy : ± 0.1pH (25 ℃)
- Response Time : ≤ 1min
- pH Sensor with BNC Connector
- PH2.0 Interface (3 foot patch)
- Gain Adjustment Potentiometer
- Power Indicator LED
- Cable Length from sensor to BNC connector:660mm

III. ADVANTAGES

1. Automatic monetization of water quality.
2. Less man power needed.
3. Highly efficient.
4. Versatile usage of the system.
5. Non-editable readings to avoid unwanted human interference.

IV. APPLICATIONS

1. Household water lines
2. Commercial building's water lines.
3. Industrial water lines.
4. Remotely located water bodies.

V. CONCLUSION

The results obtained matched with the expected results obtained through research. The temperature relation with pH and conductivity were also observed for all the water samples. Turbidity sensor quantitative measure of suspended particles in the fluid or liquid. Water with high turbidity is murky, while water with low turbidity is clear. pH sensor, commonly used for water measurements, is a measure of acidity and alkalinity, or the caustic .In the system has proved its worth by delivering accurate and consistent data throughout the testing period and with the added feature of incorporating IoT platforms for real time water monitoring, this should be an excellent contender in real time water monitoring solutions. Our main intention was to reduce the time required for testing of water in laboratories, and we have been able to achieve it but with lesser accuracy.

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