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CONTROL OF MOTOR BASED ON WATER QUALITY AND ALERTING SYSTEM USING IOT

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Abstract : In today's world, water quality is diminishing due to global warming, limited water resources, population increase, and other causes. Water is the most important element for all living things, hence preserving it is critical. e valuation is one of the first steps in the responsible development and management of water resources. As a result, better techniques for detecting water quality parameters in real time are required. As a result, we built a water quality monitoring system that incorporates temperature, pH, and turbidity sensors, as well as Arduino and GSM. This system can actively monitor water conditions, provide parameter values on a smartphone, send messages or warnings if a value exceeds a given threshold, and turn off the water supply. Our work presents a low-cost solution for water quality monitoring based on the fore mentioned constraints.

IndexTerms **- Arduino UNO, pH sensor, Temperature sensor, Turbidity sensor, GSM Module, AC water Pump.**

I. INTRODUCTION

As a result of rising worldwide industrial output and over-utilization of land and sea resources, the quality of water available to humanity has deteriorated drastically. The increasing use of fertilizers in agriculture, as well as other chemicals in industries like construction and mining, has contributed significantly to global water quality degradation. Manufacturing waste, sewage, and medical waste continue to pollute the environment.

Agriculture is primarily based on lakes and ponds. One of the food producing sectors is aquaculture. However, high-quality aquaculture production necessitates good water quality. Dissolved oxygen (DO), temperature, pH, and salinity are water parameters that influence fish growth. A slight rise in water quality parameters above the standard has an impact on life patterns, and a larger increase may even result in mortality. In a super-intensive aquaculture system, the best water quality is critical for optimal fish growth.

Procedures for detecting water quality should be improved, and testing methods should be more efficient. As a result, water quality must be tracked and monitored and water parameters must be fixed so that they remain constant within the acceptable limits.

II. METHOLODOGY

The suggested solution is mostly based on the Internet of Things (IoT). Physical [temperature and turbidity], chemical [pH and dissolved oxygen], and biological [algae] qualities all exist in water. This system uses an IoT-based sensor system that comprises sensors like pH, temperature, and turbidity, as well as other components like Arduino UNO, GSM, and a water pump to monitor physical and chemical properties of water sources.

A. Arduino Uno

Arduino Uno board is based on ATmega 328 microcontroller. It consists of 14 digital input/output pins, six analogue inputs, a 16 MHz crystal oscillator, a power jack, and a rest button. It comes with every feature needed to work with the microcontroller. It can be connected to a computer using USB and an AC to DC adapter is used to power it. The Arduino UNO is the current series of Arduino boards.

B. Gsm Modem

A GSM modem is a modem which will work same like a mobile phone, supports a SIM card and operates on a subscription to a network operator. GSM modem is a device used for sending and receiving SMS and MMS messages. GSM is an open and digital cellular system that uses the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands to provide mobile voice and data services.

C. pH Sensor

The pH of water indicates how acidic or basic alkaline it is. The concentration of hydrogen ions in the negative logarithm is called as Ph. On a logarithmic scale, the pH scale spans from 0 to 14. It is low for acidic solutions, whereas it is high for alkaline solutions. Water from a natural source has a pH of about 7. The two electrodes of pH sensor are measuring electrode and reference electrode. The positive terminal of the battery is joined to the measuring electrode, while the negative terminal is linked to the reference electrode. The reference electrode creates a consistent potential when the pH sensor is submerged in the solution.

D. Temperature Sensor

Whether the water is cold or hot will be evaluated by the temperature sensor. Temperature has an effect on the amount of oxygen dissolved in water. The density of water varies with temperature, and it is the primary factor which affects other variables. The temperature of the water vary with depth but is practically constant at the surface. Temperature should be taken at various depths to test the quality of water. The range of temperature is -55°C to 150°C.

E. Water pump motor

An electric motor that runs on alternating current (AC) is known as an AC motor. Centrifugal pumps are another name for this type of pump. It consists mostly of a pump impeller that is coupled to a motor shaft. When the motor turns, the liquid is pushed towards it and ejected via the volute's opening due to the centrifugal force caused. The pump creates a pressure differential between the water inflow and exit. The water is able to flow through the pipes because of the pressure differential.

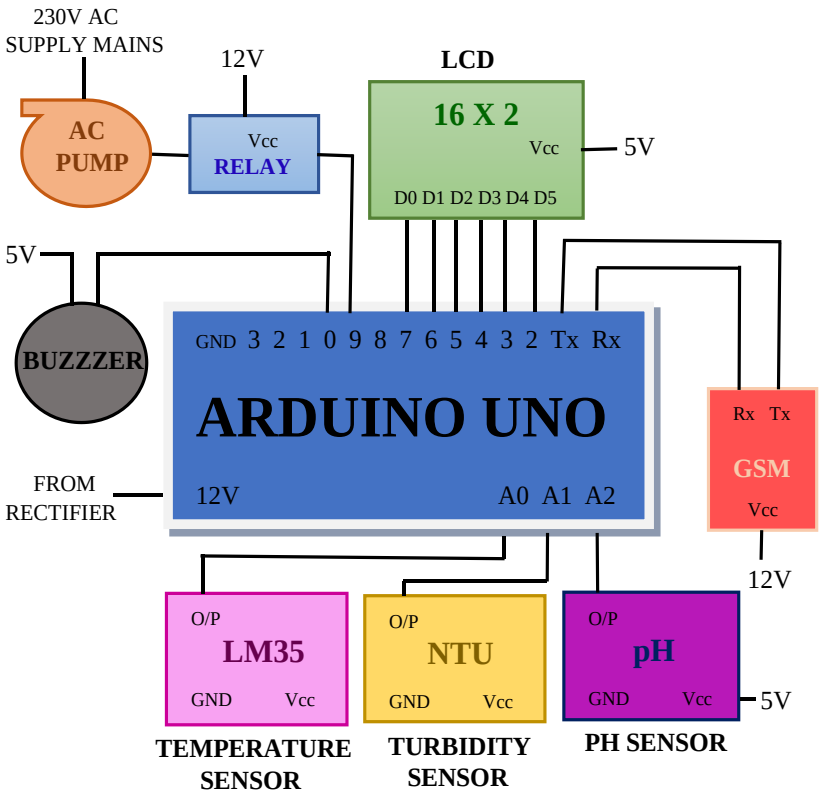

Figure 1: Model diagram of Water quality measurement and Alerting system

III. IMPLEMENTATION

This system consists of various sensors, data collecting and transmitting module. Data collecting module consists of Arduino Uno. Information transmission module consists of GSM module. This project includes the hardware and software parts. Both systems are controlled by arduino uno board can be used as a core controller, GSM module to send SMS and an LCD screen to display the values. There are several sensors like pH, turbidity and temperature sensor. The sensors will measure the corresponding water values.

As the sensor outputs are analogue in nature and the microcontroller can only cope with digital signals, a device that transforms analogue signals to digital signals is necessary. As a result, the system is made up of an Analog to Digital converter. Because the sensors' outputs are analogue, they are sent into an analog to digital converter, which converts analog signals into digital signals.

These digital signals are accepted by Arduino, which subsequently operate the data gathered from the sensors. The microcontroller of Arduino board will process this digital information and evaluate it for establishing communication which is handled by the GSM module. The GSM module is used to send an SMS with the measurements of water quality to a smartphone and also the values will be displayed on the LCD connected to the arduino.

The relay circuit is utilized to stop pumping of water when the sensor readings exceed a threshold value. This complete process is done with the help of coding. C-programming is used to write the code and Arduino software is used to simulate the code.

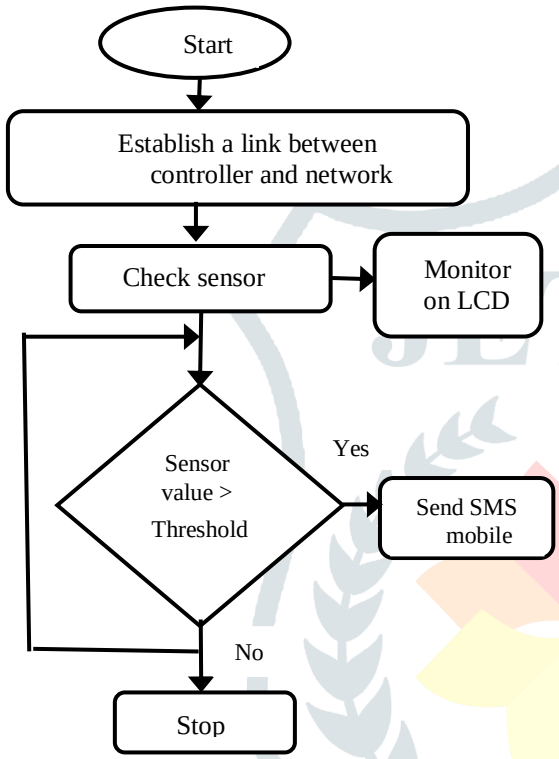

Figure 2: Flow diagram of Arduino Code

The proposed system works based on the above flow diagram that ensures the efficient implementation. It will reduce time and manpower to manage and monitor the system. It also provides the continuous monitoring of water quality and easy to make necessary action. It also gives alert if the water quality is not within the limit.

The device can be used for two purposes domestic and industrial. It is used to detect the problems in aquaculture so that farmers can take preventive measures before things get out of control. It can operate in ponds where aquatic animals are made to develop in their natural habitat.

IV. RESULT

In order to demonstrate water quality the sensors like pH, turbidity and temperature are placed in a water-filled container. We can see that the pH of the water stays between 7 and 7.5implying that the water is in its natural state. The water temperature will be in range of 25 to 30 degrees. Turbidity will range from 60 to 65.

When the sensors are placed in mud water, the turbidity of water exceeded the limit of 100 and thus the user got an alert message indicating impure water. The parameters will be monitored continuously by the sensors and as a conclusion, the data is matched with the ideal condition values, listed in table 1.

Parameter	Required value	Maximum limit
pH	7.5-8.5	8.5
Turbidity	1 ntu ~ 60 -90	100
Temperature	23-27 degrees	30

Table 1: Optimum values

The below Figure 4 shows the system implementation.

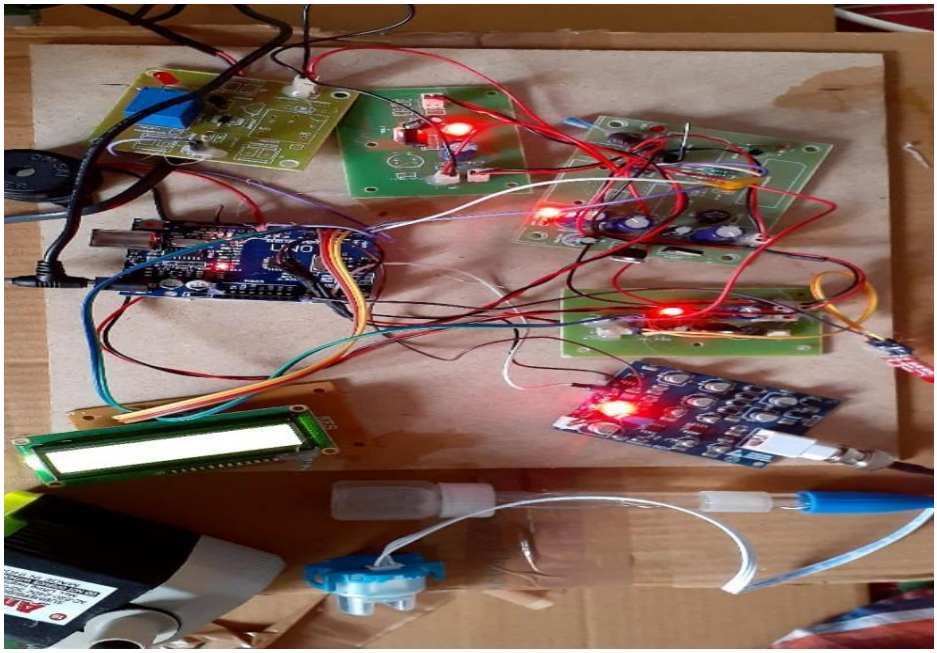

Figure 3: System design model

If the reading of the sensors exceed the standard threshold values, the user will get an alert message to the user mobile through GSM as shown in Figure 4.

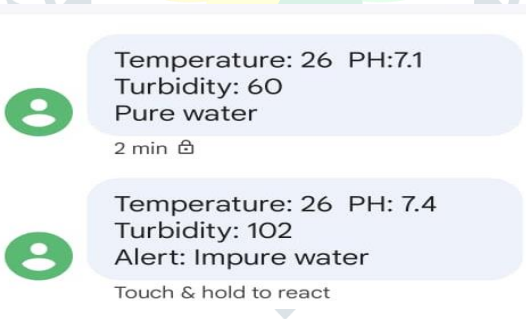

Figure 4: SMS Alert

As a result, the owner may see all of the data in real time and does not have to be in the pond all day. The data on the smartphone can be viewed by the owner. As a result, working time is less.

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