MULTI-PARAMETER WATER TESTING FOR AGRICULTURE

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Introduction:

Water used for processing seafood, industrial purposes or irrigation is supposed to meet drinking water standards if it is to be considered safe.

Electrical conductivity and pH are two characteristics of water quality that can be tested periodically at the growing facility. This helps the grower get an indication of the consistency of the water supply and check the results of treatments to reduce pH or soluble salts. pH meters range from inexpensive pen types to more sophisticated units. It is recommended to purchase one that can be calibrated using calibration solutions. This ensures that the meter is giving correct readings. Electrical conductivity meters are generally more expensive than pH meters. However, they are very useful for testing water quality and media fertilizer levels during crop growth.

Regular water testing can be helpful over a long period of time to monitor any changes that occur in water quality. If this occurs, it is essential that the monitoring occurs at fixed intervals from the same point. However, it can also be a good idea to conduct water testing in response to an unexpected event such as a chemical spill. Qualitative and quantitative measurements are needed from time to time to constantly monitor the quality of water from the various sources of supply.

Test water to be used for irrigation by a reputable laboratory to determine the quality of the water for irrigation, choice of fertilizers for optimum plant growth, and to minimize the risk of discharging pollutants to surface or ground water. In this paper we present a design and development of a low-cost system for real time monitoring of the water quality in IOT (internet of things). The system consists of several sensors used to measure physical and chemical parameters of the water.

Objectives:

1. The main purpose of developing an IoT technique is to check water quality using ESP32 microcontroller, OLED display, sensors and Wi-fi module.
2. It is to develop a system which gives the end user a useful data securely and fast.
3. The major aim of this project is to identify and indicate as much of the pollutants as possible before it is discharged into to the environment.
4. Thorough scientific evaluation of the expected reliability of the water body in meeting necessary physical and chemical thresholds, we provide the framework for development of long-term monitoring requirements and verify reliable operation.

Methodology:

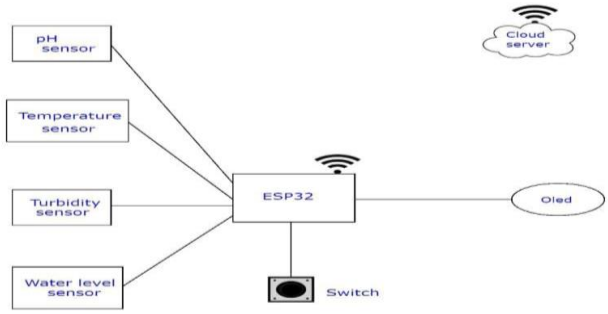

Fig 1: Block Diagram of smart water quality monitoring system

- This proposed block diagram consisting of several sensors (temperature, pH, turbidity, flow) is connected to core controller. The core controller is accessing the sensor values and processing them to transfer the data through internet. Arduino is used as a core controller. The sensor data can be viewed on the internet wi-fi system.
- The whole design of the system is based mainly on IOT which is a newly introduced concept in the world of development. There is basically two parts included, the first one is hardware & second one is software.
- The hardware part has sensors which help to measure the real time values, another one is ESP32 microcontroller which converts the analog values to digital, OLED display, displays the output from sensors and the Wi-Fi module gives the connection between hardware and software.
- Python language is used for performing machine learning.
- Ubidots cloud is used for forming training or testing datasets.
- Flask web application framework is used to build the web application for python. It provides useful tools and features that makes creating web applications easier.
- For Machine learning analysis, scikit learn software library is used.
- The PCB is designed at the first level of construction; components and sensors are mounted on it. When the system is started, DC current given to the kit and microcontroller gets on. The parameters of water are tested one by one and their result is given to the OLED display. The website when provided with hotspot gives the exact value as the OLED display shows on the kit. Thus, when the kit is located on any specific water body and Wi-fi is provided we can observe its real time values on our android phone anywhere at any time.

Conclusion:

- We have identified a suitable implementation model that consists of different sensor devices and other modules. In this implementation model we have used was ESP32 microcontroller module. Corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated.
- After sensing the data from different sensor devices, which are placed in a particular area of interest, the sensed data will be automatically sent to the web server, when a proper connection is established with server device.
- After sensing the data from different sensor devices, the sensed data will be automatically sent to the server.
- The evaluated value will be shown by the web application without any obstacle making it efficient.
- With the assistance of these modules, there be concurrent flow of data between the sensors and server.
- A bigger amount of data is transmitted continuously without any obstacle, thus making it an efficient mode of communicating.
- It ensures the better water quality monitoring for drinking purpose as well as Agriculture purpose by measuring some parameters.
- Assessment of water quality is essential to check the suitability of a water source for the designated use. Several water quality parameters are assessed and compared with their standard values to determine the acceptability of the water to be used. After prolonged research, the procedures for the assessment of the water have been standardized.

Scope for future work:

- The main purpose of developing an IoT technique to check water quality using esp32 microcontroller, OLCD display, sensors and Wi-fi module.
- It is to develop a system which gives the end user a useful data securely and fast.
- Cloud IoT-Servers: There exists many public cloud IoT-servers [82], which can access and control things, store sensors data, perform analytic analysis, generate early warning alerts, and so forth. However, most of these are not cost free for commercial activities. In addition, data security may also be at higher risk due to third party involvement.
- Most importantly, services could also be ceased without any prior acknowledgment. Hence, authors are encouraged to custom develop cloud server if feasible to minimize risks. Machine learning: Finally, authors advise developers to involve ML techniques for optimal results.
- Thorough scientific evaluation of the expected reliability of the water body in meeting necessary physical and chemical thresholds, we provide the framework for development of long-term monitoring requirements and verify reliable operation.