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Research Article

Monitoring system for aquaculture using IOT

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Abstract

In this work, we have outlined and actualized monitoring of water quality of aquaculture utilizing Raspberry Pi, various Sensors, and web link. Water quality parameters used in this work are
Temperature, pH, Turbidity, water level, gas sensor. Sensor acquisition is conducted by Raspberry Pi is used as data processing device as well as server. Android phone is used as the end device. A user can monitor the water condition using a web link through Wi-Fi within Wi-Fi range and through Internet from anywhere in the world. Some scrutiny is performed with the four parameters value to determine the overall approximate condition of the water and required action.

Keywords- Microprocessor, raspberry pi, sensors, Web link, data storage

INTRODUCTION

Aquaculture is one of the prospering segments in developing countries like India because it contributes 1.07 percentage of the GDP. It is estimated that fish consumption of the country by 2025 would be nearly 1.6 crores tones and thanks to the overfishing regular fisheries are drained therefore commercial aquaculture has been appeared.

Aquaculture comprises the arrangement of exercises, information and methods for the rearing of underwater plants and a couple of sorts of animals within the water this action has incredible significance in monetary advancement and food development. This activity has an awesome significance in financial improvement and food production. Commercial aquaculture is

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confronting numerous issues because of sudden climatic vacillation leading to changes in water quality parameters. Aqua farmers are relying upon manual testing for knowing the condition of the various parameters of the water. But this manual testing is time consuming and also give inappropriate results as parameters for measuring water quality changes continuously. It will be better if automatic monitoring can be done somehow. So modern technology should be brought to aquaculture to overcome this problem. For rural development, technologies have to support several key application areas, for example, living quality, wellbeing, environmental change etc.

METHODOLOGY

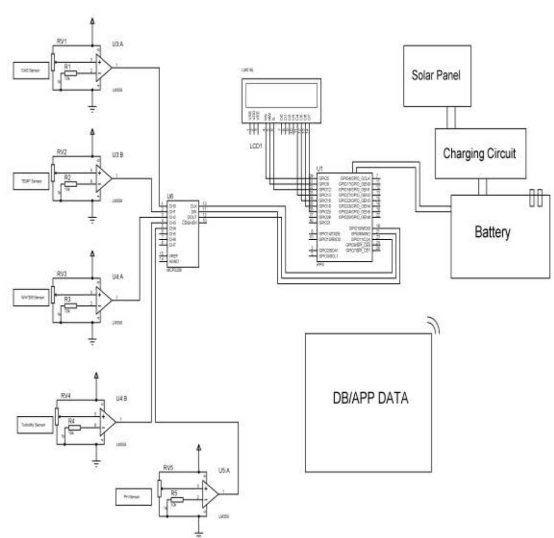
The methodology is divided into two parts

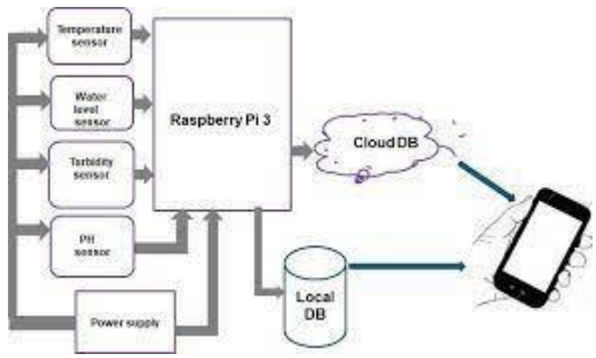
EXISTING SYSTEM - In previous systems, an automatic system for automated fish farming where they keep track of the water temperature, pH and water level, using Wi-Fi connection, which might be a lug for systems that are placed faroff from areas where cellular or any sort of internet connection is out there.

One disadvantage of this proposed system, is that the end-user after certain time gap or after a particular parameter value is reached, has to check the values and not in real-time.

PROPOSED SYSTEM –

Proposed work supports remote monitoring of the fish farming system supported Internet of Things (IOT) for Real time monitor and control of a fish farming system. This will be useful to remember of the danger and may take required safety measures. IoT is employed during this project helps updating the knowledge about water quality through the web link. PH sensor, Temperature Sensor & takes the information and sends the information through the web link if the water quality is not in the given thresholds suitable for aquatic organisms.PH sensor and temperature sensor are used to keep an eye on the water quality level.





COMPONENTS REQUIREMENTS

Components required is specified into two parts i.e., Hardware Components and Software Components

HARDWARE

RASBERRY Pi:

The central processing unit of this work is Raspberry Pi3 (shown in Fig.3) which is the heart of this system. Raspberry pi3 is small, low cost computer board using Noobs, a Debian version of the Linux operating system. It has higher speed and number of processor core than previous versions of Raspberry pi. It has inbuilt Wi-Fi and Bluetooth. Raspberry pi can conduct serial data communication with Arduino as it is a small computer

WATER LEVEL SENSOR

Supply voltage:-220v

Current:-1A

Output: - analog signal

Input: - water

The sensor working principle is it has probes to indicate water level in a tank .These probes send back information to control panel

TEMPERATURE SENSOR

Input voltage: - 4 to 30V

Range:-55oC to 150Oc

Output: - voltage is directly proportional to temperature there will be a rise of 10mV for every 1oC rise in temperature.

± 0.5oC accuracy.

If the temperature is 0oC then the output will be 0V.There will be arise of 0.01V for every degree Celsius rise in temperature.

PH SENSOR

Input voltage:-5V

Measuring range:-0-14ph Accuracy:-±0.1ph (25oC) Temperature range:-0oC to 80oC.

Output:-analog in mV potential.

The working principle of ph. sensor depends upon the exchange of ions from sample solution to inner solution of glass membrane.

TURBIDITY SENSOR:

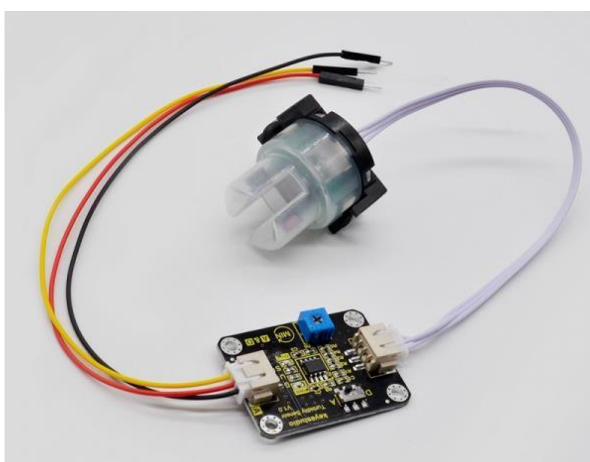
Input voltage:-5V

Operating current:-40mA

Operating temperature:-5oC to 90oC

Output: - analog: - 0-4.5V digital:-high/low signal

The turbidity works by sending a light beam into the water to be tested. This light will then be scattered by any suspended particle. The amount of light reflected back is used to measure the particle density in water.



GAS SENSOR

Input voltage:-5V

Output:-analog signal

Operating range:-0 to 50oC

Working current:-5mA

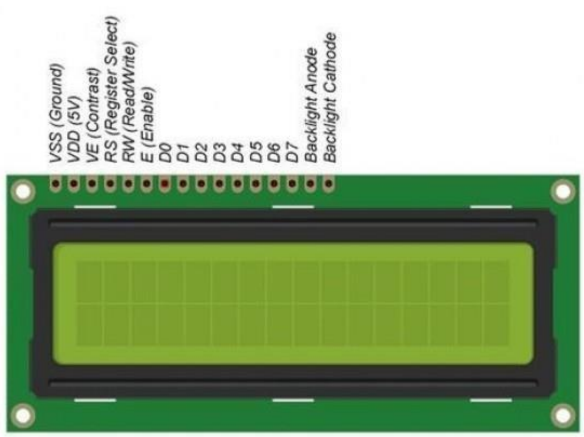
The working of gas sensor when tin-dioxide is heated in air at high temperature oxygen is absorbed on surface this prevents electric flow and this will lead to flow of current in the sensor which then alerts.

LCD

Operating voltage:-4.7-5.3V

Power consumption:-1mA

The LM016L it has 11 pins from that 8 are data pins D0-D7 and 3 are control pins RS(register select),R/W(read/write),E(enable). It has 2 rows each can hold of 16 characters.



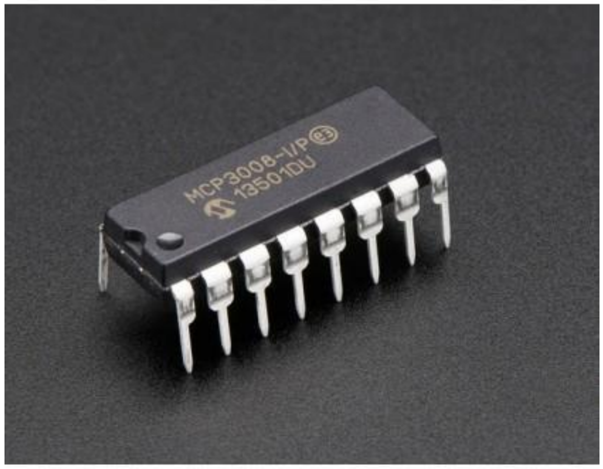
ANALOG TO DIGITAL CONVERTER

Input voltage:- 0 - 5.5V

Supply current:-400mA

Interface:-SPI

Sample rate:-100k samples The MCP3208 is a 12 bit ADC it has SPI serial interface with 8 single ended input and 12 bit resolution.



SOLAR PANNEL

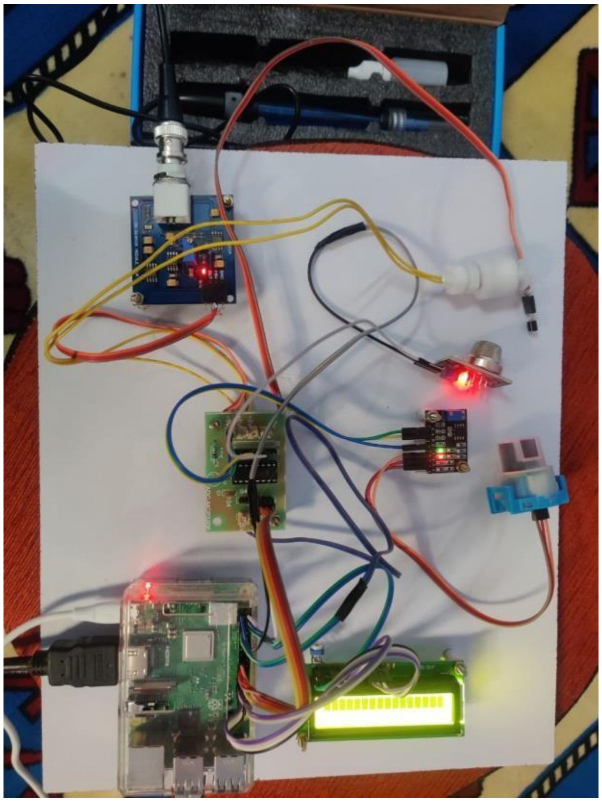
A solar panel, or photo-voltaic (PV) module, is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of PV modules is called a PV panel, and a system of panels is an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

SOFTWARE

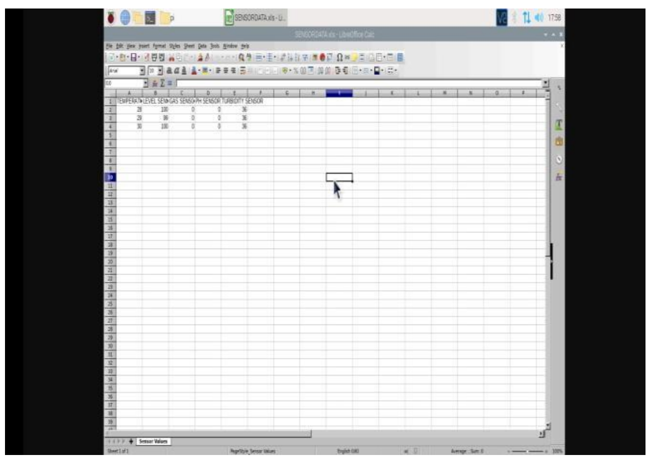
PYTHON:
Python is an interpreted high-level generalpurpose programming language. Python's design theories prioritize code readability with its notable use of significant indentation. Its language constructs as well as its objectoriented approach aim to help programmers write clear, logical code for small and largescale projects.

THONNY:
Thonny is an integrated development environment for Python that is designed for beginners. It supports different ways of stepping through the code, step-by-step expression evaluation, detailed visualization of the call stack and a mode for explaining the concepts of references and heap.

IMPLEMENTATION AND RESULTS



We have identified a suitable implementation model that consists of different sensor devices and other modules, their functionalities are shown in figure. In this implementation model we used raspberry pi which has Wi-Fi module. ADC and Wi-Fi module connects the embedded device to internet. Sensors are connected to raspberry pi through ADC for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be updated in raspberry pi. After sensing the data from different sensor devices. The sensed data will be sent to the web server, when a stable connection is established with sever device.



The sensor information is sent to the distributed storage just as the end client. The information can be examined down anyplace at any time. On the off chance that the sensor parameters are more than the limit level, at that point.The user is able to see values coming from the sensor node, and also manually control the aquaculture. Initially, Raspberry-pi has been powered on with 5V DC battery. Then all the sensors were interfaced and measure the respective values using the controller, then the measured values and threshold values are compared to provide a solution to the aqua farmer's .Now the system has been connected with a solar panel to improve portability.

CONCLUSION & FUTURE SCOPE

The methodology executed can facilitate the aqua-farmers for the precise and reliable observance of water parameters, the actual fact that physical testing do take longer time and water quality parameters might change with time. It additionally takes pro-active measures before any harm was done. Despite the fact that the initial cost is high, there will be no major secondary expense and maintenance once it is installed. Thus, the framework implemented will reach the farmers for reducing the harm from climatic changes and confirms growth and health for aquatic life. This increases productivity, helps in improving foreign trade and increases the GDP of the country. More the gathered information can be examined utilizing big data analytics and necessary steps can be taken before the water quality parameter crosses the edge value range. The aqua- system automated using IoT, decreases

the energy labour cost and consumption

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