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An IOT Based Remote Aquaculture Monitoring System

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ABSTRACT

Aquaculture is one of the generally stretching out ventures inferable from the quick interest for fish and fish everywhere throughout the world This undertaking proposes an ongoing monitoring answer for estimating the physiochemical parameters of water and a choice emotionally supportive network for information stockpiling, monitoring, breaking down and sending the correct data to the correct people required at the ideal time and furthermore the proposed framework underpins remote monitoring of fish cultivating in light of web of things (IoT) for genuine screen and control of fish cultivating framework. In this undertaking, we utilize different sensors like pH esteem, temperature sensors and computerized angle sustaining is prepared. By utilizing these all the work is mechanized and it will likewise be anything but difficult to screen the fish cultivating remotely.

We have additionally utilized a remote camera to empower live monitoring of the water refined locales and their environment. The video from remote camera can likewise be recorded and spared.

Keywords:- IOT

I. INTRODUCTION

The term aquaculture is alluded as the development of fish, plants and creatures in different sorts of situations that incorporates waterways, lakes and seas. Aquaculture comprises of two sorts i.e. one is marine aquaculture that is only the development of species in sea and another is freshwater water culture where species are developed in local water bodies. In shrimp culture, it is watched that examples that are thought about to anticipate low levels in broke down oxygen, temperature, saltiness and pH levels. Contemplating every one of these parameters conveying sensors in shrimp culture for monitoring water quality and alarm in regards to contaminants in water will yield remarkable outcomes. The investigation of water quality wants reliable perception of water depended parameters in critical catchments. The different parameters which we consider are pH, water temperature and outside temperature and stickiness. Influencing utilization of different perfect instruments to like sensors and remote sensor systems will create better outcomes. The selection of IoT for overall access and minimal effort module of remote sensor arrange is produced continuously data framework, in which it comprises of little sensor hubs, organizer or passage hub and PC. In this framework the keen sensor hub screen the natural parameters, for example, water temperature and pH and transmits it to the organizer or door hub from which information is again exchanged to the versatile application, which is Blynk. The utilization of remote sensor arranges in different fields for location of natural parameters and exchanging information to database utilizing system.

II. LITERATURE SURVEY

As our framework depends on monitoring water quality parameters and taking preventive measures, we explored on sensors used to screen water parameters[6]. In 2012, teacher of K.L University outlined monitoring framework with the assistance of Zigbee Module and ARM7 controller to control constant aquaculture ecological factors and achieve the issues raised. Daudi S. Simbeye and Shi Feng Yang gave the outline of water quality monitoring and control framework for aquaculture in view of remote sensor systems and single chip PC innovation as a base in the genuine activity. It understands monitoring of the water natural parameters for escalated aquaculture and caution ,Zhu Wang Qi Wang, Xiao Qiang Hao examined the issue of the manual explanatory technique received in water

quality location with awful ongoing character and presented a novel sort of remote water quality estimating and monitoring framework in view of WSN. Shruti Sridharan et al. tended to in their venture about building up a productive remote sensor organize (WSN) based water quality monitoring framework, which looks at water quality.

III.PROPOSED SYSTEM

We propose the usage of remote sensor systems to have a conveyed gathering of sensor hubs organized together to exchange the crude information to a focal area known as base station through web (IoT). Each sensor hub comprises of a small scale controller, a few sensors and a radio handset for correspondence. The small scale controller is utilized for in-organize preparing for exchanging required data rather than crude information. The data which is moved is saved in a database and broke down for additionally process. After investigation the information from database is sent to the ranchers as a message (In Blynk App.) to their portable in their individual dialects to alarm them about the unhygienic ecological conditions. The proposed framework makes agriculturists mindful about the vulnerabilities in order to determine them.

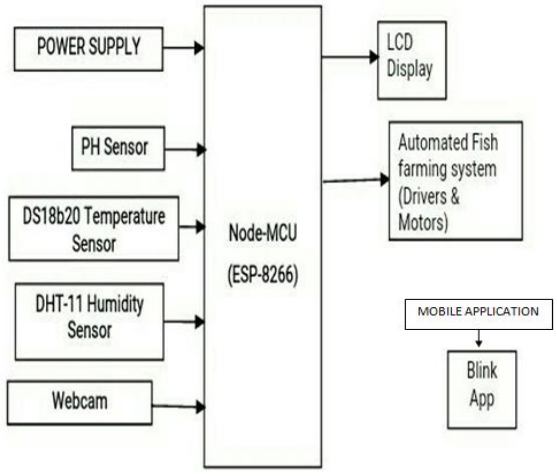

Fig 1: Block Diagram of Proposed System

A.NODE MCU:

The Node MCU is an open-source firmware and development kit that helps you to Prototype your IoT product within a few Lua script lines. It includes firmware which runs on the ESP8266 Wi-Fi SOC from Espressif Systems, and hardware which is based on the ESP-12 module.

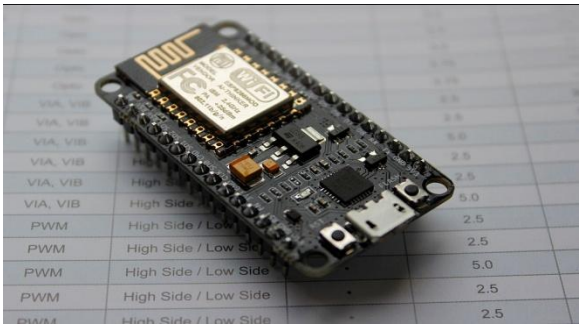

Fig. 2: NODE-MCU

Arduino-like hardware IO:

It is an Advanced API for hardware I/O, which can dramatically reduce the redundant work for configuring and manipulating hardware. Code like arduino, but interactively in Lua script.

Node.js style network API:

Event-driven API for network applications, which facilitates developers writing code running on a 5mm*5mm, sized MCU in Node.js style. Greatly speed up your IOT application developing process.

B.ESP-12E WI-FI MODULE:

ESP-12E Wi-Fi module is developed by Ai-thinker Team. Core processor ESP8266 in smaller sizes of the module encapsulates Tensilica L106 integrates industry-leading ultra low power 32-bit MCU micro, with the 16-bit short mode, Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.

ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash.

C.DHT-11 TEMPERATURE AND HUMIDITY SENSOR:

DHT11 digital temperature and humidity sensor is a calibrated digital signal output of the temperature and humidity combined sensor. It uses a dedicated digital modules capture technology and the temperature and humidity sensor technology to ensure that products with high reliability and excellent long-term stability. Sensor includes a resistive element and a sense of wet NTC temperature measurement devices and with a high-performance 8-bit microcontroller connected.

DHT11 output calibrated digital signal. It utilizes exclusive digital-signal-collecting-technique and humidity sensing technology, assuring its reliability and stability. Its sensing elements are connected with 8-bit single-chip computer.

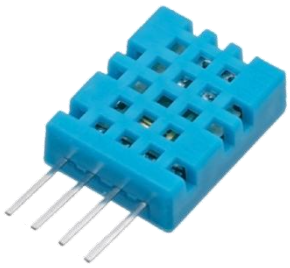

Fig. 3: DHT-11 Sensor

D.DS18B20 TEMPERATURE SENSOR:

The DS18B20 Digital Thermometer provides 9 to 12-bit (configurable) temperature readings which indicate the temperature of the device. Information is sent to/from the DS18B20 over a 1-Wire interface, so that only one wire (and ground) needs to be connected from a central microprocessor to a DS18B20. Power for reading, writing, and performing temperature conversions can be derived from the data line itself with no need for an external power source. Because each DS18B20 contains a unique silicon serial number, multiple DS18B20s can exist on the same 1-Wire bus. This allows for placing temperature sensors in many different places. Applications where this feature is useful include HVAC environmental controls, sensing temperatures inside buildings, equipment or machinery, and process monitoring and control.

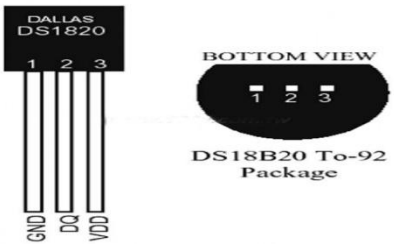

Fig 4: DS18B20 Temperature Sensor

E.pH SENSOR:

pH is the numeric representation of gram-equivalent per liter of hydrogen ion concentration in any solution. It varies between 0 to14. It is the logarithmic measurement of moles of hydrogen ions per litre of solution. The solutions having pH value between 0 to 7 are acidic solutions with large concentration of hydrogen ions whereas solutions having pH value between 8 to 14 are basic solutions with small hydrogen concentration. The solutions having pH value of 7 are neutral solutions. Measuring the pH gives the measure of alkalinity or acidity of a solution.

pH meter basically works on the fact that interface of two liquids produces a electric potential which can be measured. In other words when a liquid inside an enclosure made of glass is placed inside a solution other than that liquid, there exists an electrochemical potential between the two liquids.

F.9G SERVO MOTOR:

A **servo motor** is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through **servo mechanism**. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo

motor in a small and light weight packages. Doe to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc.

Servo motors are rated in kg/cm (kilogram per centimetre) most hobby servo motors are rated at 3kg/cm or 6kg/cm or 12kg/cm. This kg/cm tells you how much weight your servo motor can lift at a particular distance. For example: A 6kg/cm Servo motor should be able to lift 6kg if the load is suspended 1cm away from the motors shaft, the greater the distance the lesser the weight carrying capacity.

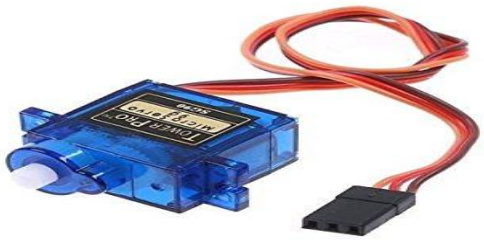

Fig. 5 : Servo motor

G.WEB CAM:

A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and emailed as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

The term "webcam" (a clipped compound) may also be used in its original sense of a video camera connected to the Web continuously for an indefinite time, rather than for a particular session, generally supplying a view for anyone who visits its web page over the Internet.

Webcams are known for their low manufacturing cost and their high flexibility, making them the lowest-cost form of video telephony. Despite the low cost, the resolution offered at present (2015) is rather impressive, with low-end webcams offering resolutions of 320×240, medium webcams offering 640×480 resolution, and high-end webcams offering 1280×720 (aka 720p) or even 1920×1080 (aka 1080p) resolution.

They have also become a source of security and privacy issues, as some built-in webcams can be remotely activated by spyware.

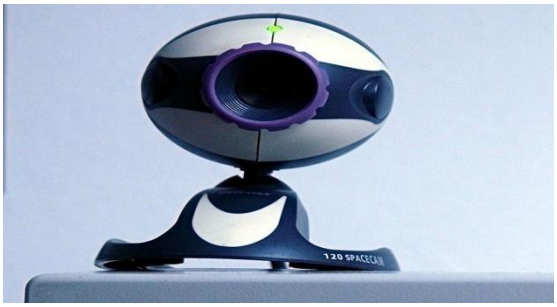

Fig. 6: Prototype of a WebCam

H.BLYNK CLOUD:

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.

Blynk is a platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets. It's really simple to set everything up and you'll start tinkering in less than 5mins. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet of your Things.

Fig. 7: Blynk app Overview

IV. ALGORITHM

1. Start the program.
2. Connect all modules to NODE-MCU.
3. Give power supply to the kit.
4. Give proper Wi-Fi connection to the kit.
5. Measure the values from pH sensor.
6. Measure the values from DS18B20.
7. Measure the values from DHT-11.
8. Update values from all the above sensors to Blynk App.
9. Repeat from step5 to step 8.
10. Stop.

V. RESULTS

External temperature (in Celsius) and humidity (in percentage) are sensed through DHT-11 Sensor and outputs are displayed on gauges on Blynk App as shown below.

Fig. 8: DHT-11 Sensor Output on Blynk

Water temperature and pH value .Upper row of LCD on Blynk shows temperature value whereas lower row shows pH value.

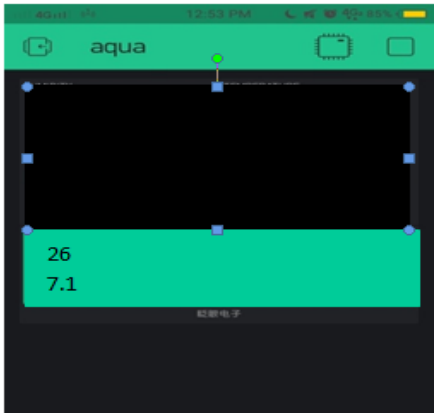

Fig. 9: DS18B20 Sensor and pH Sensor values on Blynk

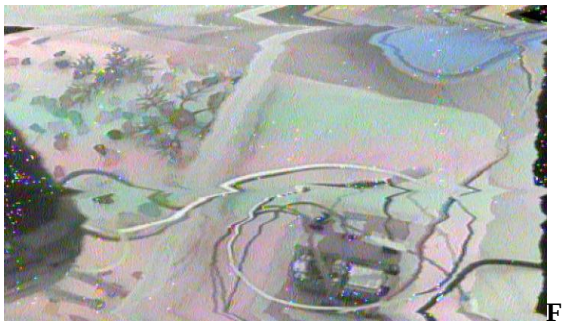

Fig. 10: Surveillance of aqua cultured site using webcam

VI. CONCLUSION

The data, for example, temperature, pH estimation of water in water refined locales, temperature and dampness of outside condition and the sustaining status can be checked from anyplace on the planet on the Blynk App since, this framework is

an IoT based. The gathered information gives an exact investigation of fruitful activity of the framework. With the assistance of webcam reconnaissance of the water refined webpage should be possible. The proposed work can be used in different fields as nursery monitoring and control, hydrological water protection and homestead arrive irrigation.

VII. FUTURE SCOPE

Future development efforts should involve dissolved oxygen content and water level monitoring. They should also involve controlling of water temperature through IoT by using fans inside the pond, which can be turned on when there is undesirable increase in temperature.

REFERENCES

[1] https://en.wikipedia.org/wiki/Internet_of_things

[2] https://www.tandfonline.com/doi/abs/10.1080/00036840500427379

[3] https://www.yokogawa.com/library/resources/application-notes/ph-in-fish farming/

[4] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4093190/

[5] S. Kayalvizhi Reddy G Koushik P Vivek Kumar N VenkataPrasanth "Cyber Aqua Culture Monitoring System Using ArdunioAnd Raspberry Pi" International Journal of Advanced Research in Electrical Electronics and Instrumentation Engineering vol. 4 no. 5 pp. 2320-3765 May 2015.

[6] Suresh Babu Chandanapalli E Sreenivasa Reddy D Rajya Lakshmi "Design and Deployment of Aqua Monitoring System Using Wireless Sensor Networks and IAR-Kick" Journal of Aquaculture Research & Development vol. 5 no. 7 pp. 1000283.

[7] Akanksha Purohit UlhasKumar Gokhale "Real Time Water Quality Measurement System based on GSM" IOSR Journal of Electronics and Communication Engineering vol. 9 no. 3 pp. 63-67 May 2014.

[8] Building Internet of Things with the Arduino **(**Volume 1**),** by Charalampos Doukas.

[9] Adams, S.M. (Ed.) 1990. Biological indicators of stress in fish. Symposium 8. American Fisheries Society. 191 pp. ISBN 0-913235-62-8. ISSN 0892-2284. LC 90-83452.

[10] Laws, E.A. 1981. Aquatic pollution: an introductory text.