International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 08, 2020
ISSN: 1475-7192

Monitoring of Water Quality in Aquaculture Using IoT

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Abstract--*Water is indeed a critical aspect of daily existence. Owing to the ecological crisis, water protection and recycling are essential to human life. In recent years, there has been a tremendous need for user-based development projects that could be quickly built through Internet of Things (IoT) technology. In this paper, we suggest a water monitoring device centered on IoT that monitors water levels and PH rates in real time. Our project is based on the principle that the water quality degree may be a very critical factor.This includes of a temperature sensor, a turbidity sensor, a pH sensor and a water level sensor which have been constantly tracked and a standard level is set. When the measurements go above the fixed value then the automated monitoring is carried out, i.e. the temperature is regulated by coolant engine, the filter motor is being used for turbidity, the water motor is used for the water pressure. Throughout this device, the detectors are linked to the IoT portal and are linked to the central server. The cloud server manages the information and the values should be reflected in the Smartphone application.*

Key words--*Monitoring, Ecological modernization, Fish farming, detectors, PH sensor*

I. INTRODUCTION

Nowadays, fish farming has been one of the rising market prospects, with desire for seafood rising amongst people throughout the world. Among a variety of seafood dishes, fish is one of most sought-after foods by humans because of their nutritional benefits. When competition for fish rises significantly, fish farming often develops and has a major effect on the economy of the world. Fishery provides various varieties of fish, such as nutrition fish, decorative fish, sporting fish, etc.

Fish cultivation can be achieved in various circumstances such as (i) fishes can be cultivated in the oceans (ii) fishes can be cultivated in marine waterways such as wetlands and rivers (iii) fishes can be cultivated in large containers. Of these products, more focus is given to fishes that are raised in larger tanks, because this can be achieved in a location in which the shore, rivers and wetlands are not open. Water is a critical necessity for fish, and so the consistency of the liquid in the tank should be constantly regulated and recorded. Because fish breeding in a larger reservoir can be achieved in a managed ecosystem to optimize yield, more consideration is given to it.

It is very challenging to obtain the consistency of water in rivers and wetlands. Important metrics such as pH, heat, nitrogen content, dissolved oxygen and groundwater volume in the tank must be constantly tracked to prevent harmful conditions for fish farming. Such metrics can be tracked and regulated in water by sensors. Advances in sensor technologies, wireless networking and the Internet of Things (IoT) have laid the groundwork for efficient tracking and regulation of water management in fish farming.

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DOI: 10.37200/IJPR/V24I8/PR280261
Received: 21 Jan 2020 | Revised: 08 Feb 2020 | Accepted: 14 Mar 2020

II. LITERATURE SURVEY

Abinaya et al proposed Internet of Thing (IoT) system that relies on surveilling and regulating water metrics in fish farming. The process can trace and regulate metrics such as heat, pH impact, vaporized oxygen, water level, noxious odor detector and nitrogen in the water. The modules of the sensors collect information from the liquid in real time and bring it to the aurdino processor for extraction [1].Zhen et al proposed Program-based collaborative screening methodology was coupled with Network using mining to produce advice. Net usage processing technologies collected site logs on the host server and evaluated consumer interaction behaviour to create consumer preference models. The fish farming program suggests, according to user preference, Web and Internet of Things (IoT), knowledge sharing, farming technologies, government decisions and the Internet of Things results [2].Gopi Krishna et al proposed Creation of a minimal-cost water control device in remote locations incorporating IoT technology. Pollution has been one of the big environmental problems. Where water contamination is induced by human excrement and by other methods. If the water is contaminated, which can not be used for bathing, fishery, irrigation and several other uses? In order to use the water first, we need to test the consistency of the liquid by taking into account the TURBIDITY factor for the particular reason [3].

Abraham et al proposed Research that emphasizes on the usage of Internet of Things (IoT) technologies to customize and implement smart water quality detectors that offer interactive, ongoing and real-time details on water quality measures on a graphical user interface (GUI). A monitoring network composed of the Raspberry Pi and the industrial detector circuits [4].Valiente et al proposed automatically generated aquaponics device including Nile Tilapia and Romaine Lettuce with pH grade and temperature sensor exposure and monitor via the Internet of Things (IoT)[5]

.Saha et al proposed Enhanced tracking of aquaculture water availability using Raspberry Pi, Arduino, different cameras, Smartphone Microphone and Android apps. The water quality variables used in this research are humidity, alkalinity, conductivity and colour. Sensor retrieval is carried out by Arduino and Raspberry Pi is used both as an information collection tool and as a server. The processing of images is also carried out by Raspberry Pi with the aid of a mobile camera to sense the color of the surface. Mobile phone is often used as a mobile computer [6].Manju et al proposed the machine will be used to generate sustainable food to satisfy the ever-increasing demand for food in the country. Since the machine continually regurgitates the water used, the consistency of the water will be regularly checked at daily periods. Manually performing this work can be quite exhausting. The Internet of Things (IoT) should also be seen as an important technology for this reason [7].Ruan et al proposed Implementation of IoT procedures to agriculture in four subsections: managed environmental cultivation, open field harvesting, livestock farming and fisheries and water recycling. It is proposed that the emphasis on the introduction of agriculture IoT systems could be extended from the development period to the life cycle of agri-products[8].Raju et al proposed The IOT industry is spreading its scope in all fields such as biomedical, industrial, travel, schooling, manufacturing, etc. Now - a-days with the development of embedded chip processors such as Arduino, Raspberry Pi software has hit ground level with its use of farming and fisheries [9].

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III. PROPOSED SYSTEM

The proposed water management device is being used to assess quality of water by means of a water table meter, a temperature controller (LM35) and a pH sensor. The importance of the sensor nodes is calculated each moment and the level differs (i.e. suspicious behavior may be transmitted to the controller directly after the Ethernet firewall is activated and the instant-resolve action takes place. If the temperature rises higher than 30 degrees and the coolant system turned on for creatures to live. When the turbidity level is greater than 30 NTU, the filter engine is powered on.

If the pH valve goes anywhere near the capacity of the water generator, it would be powered on. The water level shall also be tested using the water level monitoring device.The water temperature indicator, the humidity monitor, the pH are connected to the Arduino.

The wi-fi communication is used for the serial terminal controller. The detectors networked with the Iot Firewall and issued to the cloud service, and the variables are shown in the smartphone. Tracking is carried out on a regular basis whenever any suspicious activity takes place that is required to take essential steps automatically. The program saves the details in a repository and encrypts the details to the internet through a web server. The software platform asks the cloud server to view the details. The device being used is Arduino

IV. METHODOLOGY

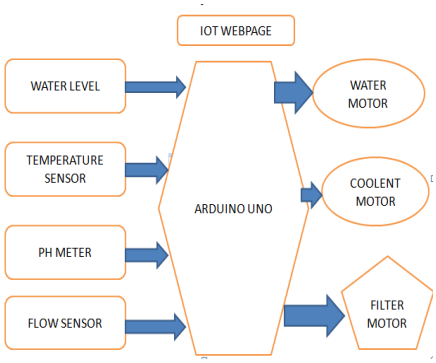

Figure 4.1 Square graph explains Monitoring of Water Quality in Aquaculture using IOT.

Modules

Below mentioned modules play a key role in Monitoring of Water Quality in Aquaculture:

A) ARDUINO (atmega328) microcontroller
B) Pump motor
C) Relay
D) Ultrasonic sensor
E) Temperature sensor
F) Ph sensor
G) Flow sensor

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Arduino(ATMEGA328) Microcontroller

Arduino has 20 optical input / output points with half a dozen analog inputs, a 16 rate quartz oscillator, a USB interface, a control port, an ICSP toolbar, and a drive. Microcontroller ATmega328 5 V Input Voltage (recommended) 7-12 V ARDUINO UNO Voltage (limits) 6-20 V Virtual I / O Pin 14 (in which half a dozen give PWM throughput) Analog Input Pin 6 DC Current per I / O Pin 40 mA DC Current for three. 3V Pin 50 Ma Flash Storage 32 megabyte of the zero.5 megabyte provided by boot loader.

Arduino may be a code-creating device that will render the real environment more responsive and accessible than the ordinary machine. This is an ASCII text file interactive computing device provided by an simple microcontroller board and a programming interface for the composition of a computer software program. Arduino is acquainted to creating digital artifacts, collecting inputs from a variety of switches or sensors, and manipulating a number of displays, engines, and alternate physical outlets.

Figure 4.2 represents arduino ATmega328

Pump Motor

Pump motor is Good for tiny pool, reef, diy games, solar heating, operating voltage range: 3v-4.5v, lift: 0. It's 4m-1.1 m. Metallic construction, no clear contact of the engine and the crank shaft, no water leaking from the generator to the submersible engine mount, pump can work under a liquid surface or extreme temperatures, and resistance creates considerable excessive noise and harm to the pump itself.

Figure 4.3 Pump Motor

Relay

The relay is a switch that is hydraulically controlled. Current moving via the relay coils produces a wave that draws the trigger and shifts the connection to the turn. The coil current is on or off so the circuits have 2 switch places and the squares calculate a double chuck (changeover) flips.Relays enables one loop to modify the second loop, which could split the main entirely.

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For example the coffee voltage batteries circuit uses a magnetic connection and a relay to modify the 230V AC high voltage circuit. There is no electromagnetic link inside the relay between both the two circuits; hydraulic.

Figure 4.4 Relay

Ultrasonic Sensor

Ultrasonic sensor is a device which can calculate the length to an entity by mistreatment with waves. This calculates distance by allowing the acoustic wave to collect at the chosen intensity and by listening to the audible wave. This must be acknowledged that certain artifacts will not be identified by ultrasonic detectors. Ultrasonic square detectors test devices that utilize electrical-mechanical energy transfer, the electricity being inside the category of unbearable sounds, to reside a distance from the measuring unit to the target point. Unbearable square waves calculate longitudinal electromagnetic waves which propagate as a series of contractions and rarefactions in the direction of evanescent waves across the media. Every seismic wave at the tip of the human nervous system ranging from twenty thousand cycles per second is labeled ultrasound.

Figure 4.5 Ultrasonic sensor

Temperature Sensor

A weather monitoring feature may be a tool, usually a thermocouple junction or RTD, which has an electronic signal for temperature measurement. A thermocouple junction (T / C) is made from 2 separate materials that produce electrical voltage in direct relation to temperature fluctuations. AN RTD (Temperature Resistance Detector) may be a regulator capable of altering the electrical behavior in direct relation to temperature fluctuations in an incredibly sensitive, reproducible and almost sequential fashion. A temperature detecting system that utilizes an external diode-connected junction transformer as a live temperature tool outside the detecting element.

Figure 4.6 Temperature sensor

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PH Sensor

PH detectors calculate PH by calculating the voltage or electrical behavior of the reaction through which it is inappropriate. Through calculation of electrical phenomena, the amount of the proton is determined as a mistreatment of the Walther Hermann Nernst method, which offers a relation between both the composition of the proton and the amplitude or capacity.

Figure 4.7 PH sensor

Flow Sensor

The water flow system is made up of a silicone valve frame, a liquid turbine and a hall-effects monitor. As the water passes into the piston, the propeller moves. Its intensity varies for a subtly different water flow. The Hall Effect detector emits the resulting pulse message.

Figure 4.8 Flow sensor

V. WORKING MODEL

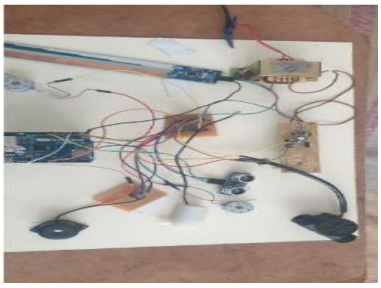

Figure 5.1 shows the hardware connection like arduino ,ph sensor , flow sensor , temperature sensor, ultrasonic sensor, relay and pump motor used.Q

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VI. CONCLUSION

This article suggests an IoT-based framework for monitoring and regulating the efficiency of groundwater in fish farming. It is essential to have a better quality of the water in fisheries for the development of good fish returns. If the consistency of the groundwater is not adequately preserved, the fish may perish. The Aurdino processor and multiple detectors such as humidity sensor, water level detector, ammonia detector, pH detector, soluble oxygen sensor and odor detector have been equipped for this article. Such sensors calculate the associated value in the fluid and being sent to the machine for processing.

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DOI: 10.37200/IJPR/V24I8/PR280261
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