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Autofish Monitoring System

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Abstract— The proposed work is a system for automatic control of fish farming using sensors. Aqua-culture, also called as aqua farming, is the farming of aquatic organisms like fish, crustaceans and crabs and many other acquatic organisms by using the various sensors to detect the condition of the aquatic environment and reduce the the risks by detection. The proposed system assists remote monitoring of the fish farming system based on Internet of Things (IOT) for real-time monitor and control of a fish farming environment. The main objective of this manuscript is to provide an automatic monitoring system that helps us in saving time, money & power of the farmers. IOT technologies have revolutionized farm production in the country recently. In this fish farming process we use different sensors like pH value, temperature and water level sensors. By using these sensors we automate the work and it will also be easy to monitor the fish farming remotely from other location.

***Keywords*:** Aqua-culture, Fish Farming, Internet of Things (IOT), Level Sensor, pH Sensor.

I. INTRODUCTION

Research in aquaculture is an input to increase stabilized production in fish farming. In last decade various scientists have made sustained efforts that resulted in development of modern production technologies that have revolutionized farm production in the country. The main aim of the project is remote monitoring of the fish farming system by using the various sensors to reduce the risks for the same. In this process we use different sensors as pH value, temperature and water level sensors. By using these sensors all the work is automated and it will also be easy to detect and control the fish farming remotely from other locations far away from the site. Fish farming have been used for more than three decades and forms an important part in providing employment and fulfilling various other needs. Research in aquaculture is an input to increase and stabilize production. Fish farming refers to farming variety of marine species and fishes such as shellfish, sport fish, bait fish, ornamental fish, crustaceans, mollusks, algae, sea vegetables,etc. It also includes fish eggs to breed, rear and harvest in different water environments such as ponds, rivers, lakes, artificial tanks and ocean. Fish are cold-blooded animals, that regulate their body temperature directly by the water environment. Changes in water temperature affects the amount of dissolved oxygen in the water and oxygen consumption of the fish. Although the fish can withstand a broad temperature range of water, any sudden, extreme changes in temperature will have a significant impact on fish. The lower temperature will cause the fish to rush into, paralysis with a loss of balance, leading to death.As the water temperature increases the fish suffer respiratory arrest that may lead to their death. Fish World magazine found that the amount of dissolved oxygen in water changes with the seasons and temperature. When the water temperature rises, fish metabolic rate increases and results in less dissolved oxygen in the water. On the other hand low water temperature will decrease fish metabolic rate and increases amount of dissolved oxygen in the water. In case the amount of dissolved oxygen in water is reduced to below a certain limit fish growth will be affected. When the amount of dissolved oxygen becomes lower than the fish survival conditions the fish will die and the population of the fish will decrease. In general fish farming the acidity and alkalinity of the water should be maintained between 6 to 8 as per the universal pH value scale. Too acidic or alkaline will cause adverse effects, acid erosion of the gill tissue tissue coagulation necrosis, increased mucus secretion, abdominal congestion and inflammation.

II. RELATED WORK

Pacheco.O fish are cold-blooded animals, they regulate their body temperature directly by the water environment. Changing the water temperature affects the amount of dissolved oxygen in the water and thereby affects the fish oxygen consumption directly. Although the fish can withstand a broad water temperature range, any sudden, extreme changes in the water temperature will have a considerable impact on fish. A chilling injury will cause the fish to rush into, paralysis with a loss of balance, leading to death of the fish. The reason may be the respiration, or

osmotic regulation is affected at high temperatures in the water. As the water temperature increases, the amount of dissolved oxygen decreases and the fish suffer respiratory arrest.

Prof. Wen-Tsai Sung, found that the amount of dissolved oxygen in water increases/decreases based on seasons and the environment. When the amount of dissolved oxygen in water is reduced below certain limit then fish growth will be affected. If amount of dissolved oxygen becomes lower than the fish survival conditions then it will result in the death of the fish.

P. Bartolome in general fish farming the acidity and alkaline of the water should be maintained between 6 to 8. Too acidic or alkaline will cause adverse effects, acid erosion of the gill tissue, tissue coagulation necrosis, increased mucus secretion, abdominal congestion and inflammation. If the PH value is less than 4.5, the fish will die.

Jayavardhana G the buzzwords in Information Technology are Internet of Things (IoT). Internet of Things will transform real world objects into intelligent virtual objects. Aim of IoT is to unify world under a common infrastructure, giving control of things around us.

Paraguas M M wireless networks have different security issues regarding the wireless communication. Wi-Fi Protected Access 2 (WPA2) uses Advanced Encryption Standard (AES) encryption. Ithas more security compared to Wi-Fi Protected Access (WPA).

Gigli, M the pH measurement is potentiometric that is, it explains the relationship of the electrode potential and the solution. The meter truthfully responds to the potential and indirectly, mathematically converts the potential to the pH scale according to the questionable linear Nernst slope.

PROBLEM STATEMENT

The problem of the decreased fish growth and production rate decreses the overall fish farming industry throughput. The effects of this ultimately reduces the gross net income of fish industry business and ultimately the country. So our basic focus in the project is the reduction in the fish mortality rate.

III. METHODOLOGY

Our project approaches to speculate on those issues, which represent an obstacle toward the deployment of fish farming systems. Fish farming system can be monitored using internet connectivity and cloud. The major obstacles towards the deployment of Fish farming based on IOT for the automation of the system where the sensors will be interfaced and work automatically with the system and can be used in everyday life in the near future have been presented and some challenging research lines for the interested researchers have been suggested. The main advantage of the system is to provide the automated interface of the sensors where the system can be monitored remotely from a different location with the use of an internet. This possesses quality like collectability of data remotely from another location.

ARCHITECTURE

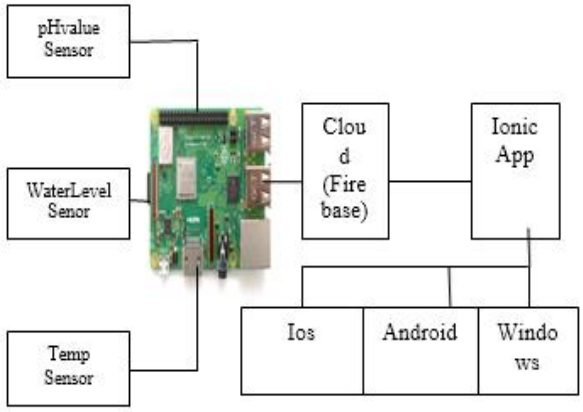

Figure 1: System Architecture Diagram

As we can see in the above figure the three sensors are connected to the raspberry pi using connecting wire and the data from the sensors is uploaded on the cloud (firebase) and this data can be accessed through an ionic application that lets us create hybrid applications i.e. application running on various platforms such as IOS, android and windows.

Our project proposes a methodology which aims to resolve the issues related to the mortality rates of fishes by using the concept of iot and cloud computing

Module Description

1) Raspberry pi 3
2) Battery
3) Relay board
4) PH Sensor
5)Temperature Sensor
6)Water Sensor

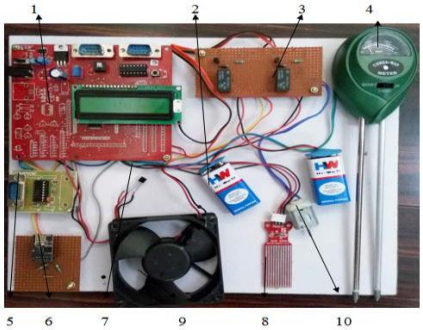

Figure 2: Module Description

Raspberry Pi 3 Model B

The Raspberry Pi 3 device looks like a motherboard, with the mounted chips and ports exposed (similar to the chips and boards when you open electronic equipment like computer or laptop), but it has all the components you just need to connect input, output, and storage devices and start computing on the same.

Here are the various components on the Raspberry Pi 3 board:

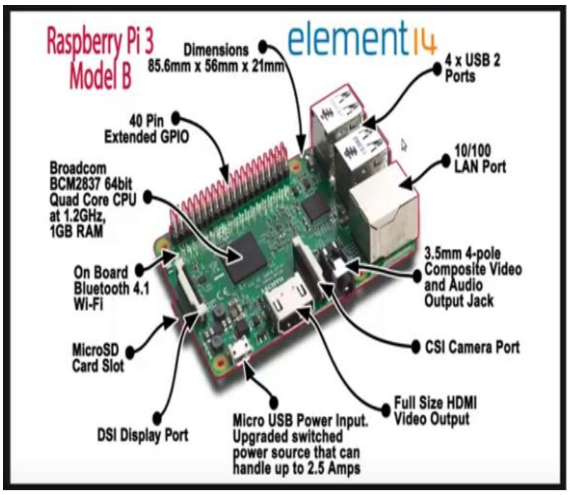

Figure 4: raspberry pi Processor

Board Connectors

Name	Description
Ethernet	Base T Ethernet Socket
USB	2.0 (Four sockets)
Audio Output	3.5mm Jack and HDMI
Video output	HDMI
Camera Connector	15-pin MIPI Camera Serial Interface (CSI-2)
Display Connector	Display Serial Interface (DSI) 15 way flat flex cable connector with two data lanes and a clock lane.
Memory Card Slot	Push/Pull Micro SDIO

Similar Boards

RASPBERRY PI – 2, RASPBERRY PI – 1, RASPBERRY PI – ZERO, RASPBERRY PI – 2 B+

Other Development Boards

INTEL GALILEO, INTEL EDISON, ESP32, ARDUINO DUE.

Raspberry Pi 3 Technical Specifications

Microprocessor	Broadcom BCM2837 64bit Quad Core Processor
Processor Operating Voltage	3.3V
Raw Voltage input	5V, 2A power source
Maximum current through each I/O pin	16mA
Maximum total current drawn from all I/O pins	54mA
Flash Memory (Operating System)	16Gbytes SSD memory card
Internal RAM	1Gbytes DDR2
Clock Frequency	1.2GHz
GPU	Dual Core Video Core IV® Multimedia Co-Processor. Provides Open GLES 2.0, hardware-accelerated Open VG, and 1080p30 H.264 high- profile decode. Capable of 1Gpixel/s, 1.5Gtexel/s or 24GFLOPs with texture filtering and DMA infrastructure.
Ethernet	10/100 Ethernet
Wireless Connectivity	BCM43143 (802.11 b/g/n Wireless LAN and Bluetooth 4.1)
Operating Temperature	-40°C to +85°C

Raspberry Pi-3 Pin Configuration

Pin group	Pin name	Description
Power source	+5v, +3.3v, gnd and vin	+5v -power output +3.3v -power output Gnd – ground pin
Communication interface	Uart interface(rxd, txd) [(gpio15,gpio14)]	Uart (universal asynchronous receiver transmitter) used for interfacing sensors and other devices.
	SPI Interface(MOSI, MISO, CLK,CE) x 2 [SPI0-(GPIO10 ,GPIO9, GPIO11 ,GPIO8)] [SPI1--(GPIO20 ,GPIO19, GPIO21 ,GPIO7)]	SPI (Serial Peripheral Interface) used for communicating with other boards or peripherals.
	TWI Interface(SDA, SCL) x 2 [(GPIO2, GPIO3)] [(ID_SD,ID_SC)]	TWI (Two Wire Interface) Interface can be used to connect peripherals.
Input output pins	26 i/o	Although these some pins have multiple functions they can be considered as i/o pins.
Pwm	Hardware pwm available on gpio12, gpio13, gpio18, gpio19	These 4 channels can provide pwm (pulse width modulation) outputs. *software pwm available on all pins
External interrupts	All i/o	In the board all i/o pins can be used as interrupts.

Temperature Sensor

The LM 35 temperature sensor is integrated-circuit (IC board), whose output voltage is proportional to Celsius temperature directly hence measures temperature. LM35 has advantage over linear temperature sensors because user can obtain convenient degree Celsius scaling without a large constant voltage from its output.

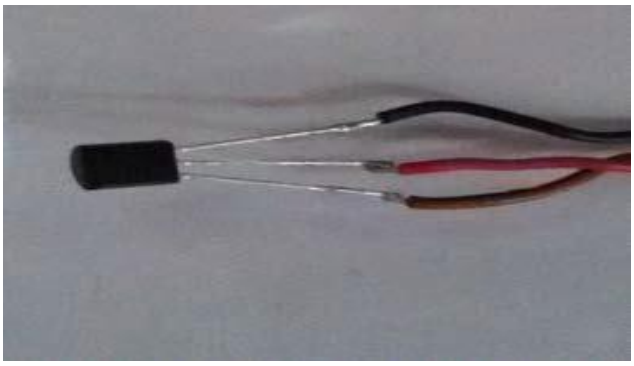

Figure 5: LM35 Sensor

PH Sensor

PH sensor senses electro-chemical potential between a known liquid inside and outside the glass. Glass bulb allows agile and hydrogen ions to interact with glass and the glass electrode senses electro-chemical potential of hydrogen ions. To complete electrical circuit a reference electrode is needed. A pH sensor not be used in moving liquids of low conductivity.

Figure 6: pH Sensor

Water Level Sensor

Water level sensor brick is used in sensing rainfall water level, and liquate leakage. Three primary components in water level sensors are: Electronic brick connector, 1 MΩ resistor, and bare conducting wires. The sensors use series of parallel wire stitches to measure water level and converts it into analog value. The output analog values are used by LPC 2148 to generate water level alarm.

Figure 7: Water level Sensor

Relay

A relay is electrically operated switch that creates a magnetic field to attract a lever and changes switch contacts. Relay has two switch positions (on/off) and the coil current double throw switches.

Figure 8: Relay unit

IMPLEMENTATION

OrCAD - circuit design

OrCAD is designed for efficient management of components to reduce delays and cost over runs. It reduces the time spent on searching based on the electrical characteristics retrieves the associated part automatically. OrCAD collaborate across multiple locations and ideal for multi-site teams.

Flash programmer

ISP Programming can in-system programming compatible to STK200 ISP programmer hardware. User of STK200 can program both the 8051 and AVR series devices and power to interface is provided by the target system.

Figure

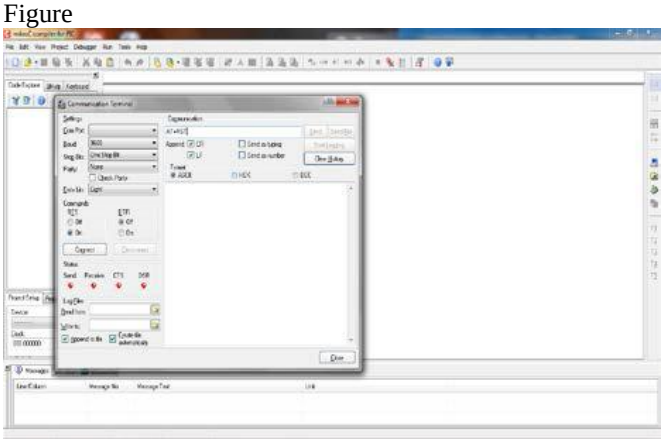

Figure 9: Wi-Fi Configurations Terminal

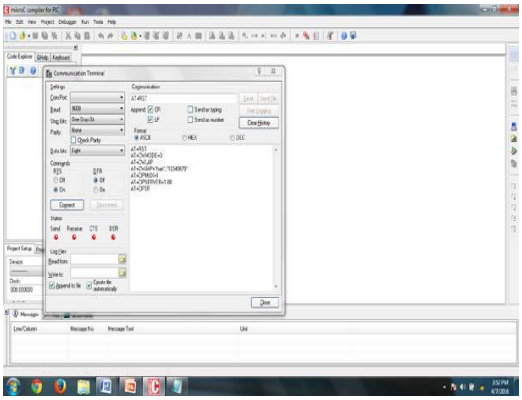

Figure 10: Wi-Fi Configurations Terminal Coding

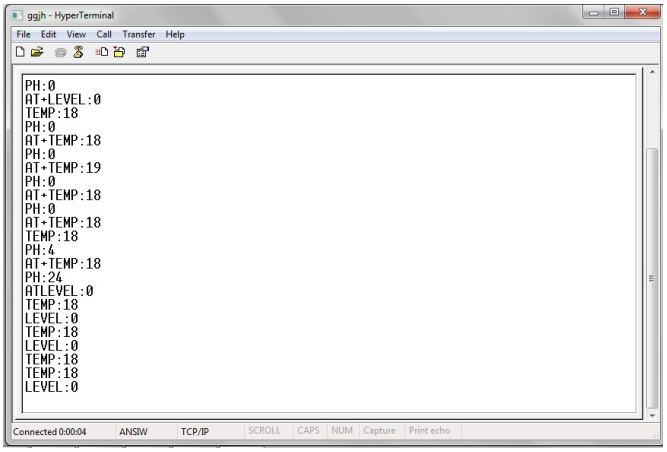

Figure 11: Monitoring Sensor Values

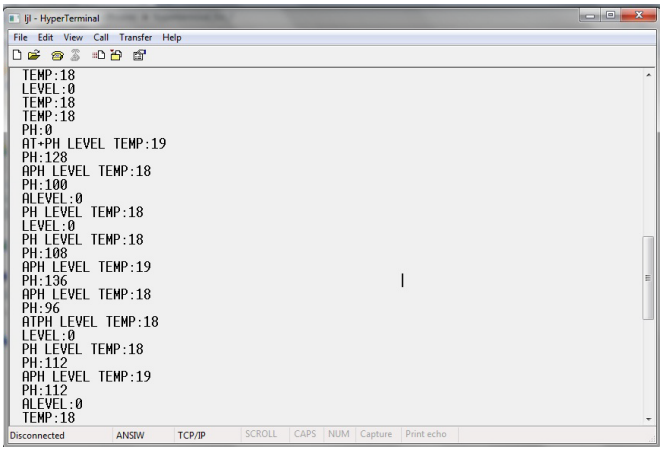

Figure 12: Monitoring pH Sensor Values

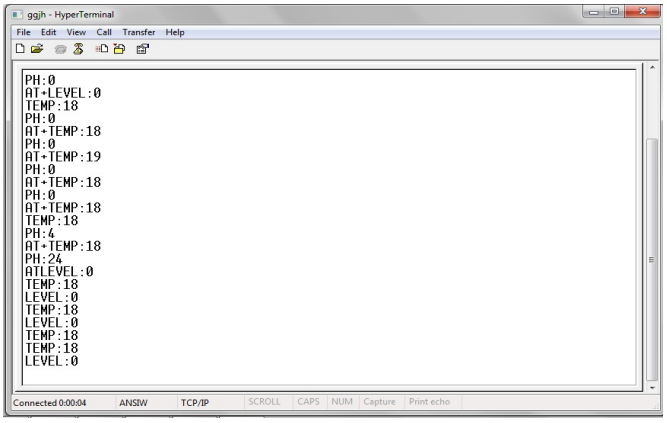

Figure 13: Monitoring Level Sensor Values

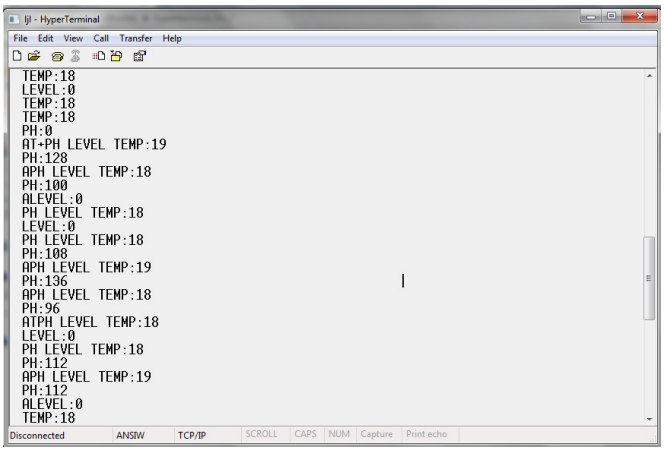

Figure 14: Monitoring Temperature Sensor Values

IV. CONCLUSION AND FUTURE SCOPE

Conclusion

We have done research on various aspects of aquaculture , cloud computing and iot. This project aims at improving the proper montoring and population rate in the domain of fish farming and this will lead to a decrease in the rate of starvation. We have proposed an approach of autofish monitoring system where our main aim is to remotely access temperature, pHvalue and water level of water in fish ponds. In future, this project can be extended by adding cameras in water tanks, providing the same idea for pearl farming, providing the same idea for agricultural farming where pH value of soil can be accessed.

Future work

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