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Disease Detection and Water Quality Monitoring System for Aquaculture Using KERA's Algorithm

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***Abstract*— In this project we are designed and presented a wireless sensor network monitoring and control system for aquaculture. Water quality monitoring system and disease detection are the main factor in aquaculture field. The most important parameters to be monitored and controlled in an aquaculture system include temperature, dissolved oxygen, pH, ammonia, nitrates, salinity, and alkalinity, since they directly affect animal health, feed utilization, growth rates and carrying capacities. Here we are concentrating the parameter to be monitored that pH of water and temperature. The system can detect the disease and pH value through a sensing node, and the host computer that analyze the data's. The water quality parameters like pH will be sent to owners through short messages from the base station via the GSM module for notification.**

***Index Terms* — EUS (Epizootical Ulcerative Syndrome), KERA's algorithm, PYTHON and Image processing.**

I. INTRODUCTION

In the present world aquaculture is very important in economic development. . The automation of aquaculture systems will allow the industry to improve environmental control, reduce catastrophic losses, reduce production cost, and improve product quality. The most important parameters to be monitored and controlled in an aquaculture system include temperature, dissolved oxygen, pH, ammonia, nitrates, salinity, and alkalinity, since they directly affect animal health, feed utilization, growth rates and carrying capacities.

The acceptable rang the acceptable range of pH for fish culture is usually between pH 6.5 to pH 9.0. When water is very alkaline (> pH 9), ammonium in water is converted to toxic ammonia, which can kill fish. On the other hand, acidic water (< pH 5) leaches metals from rocks and sediments [1]

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II. PROPOSED WORK

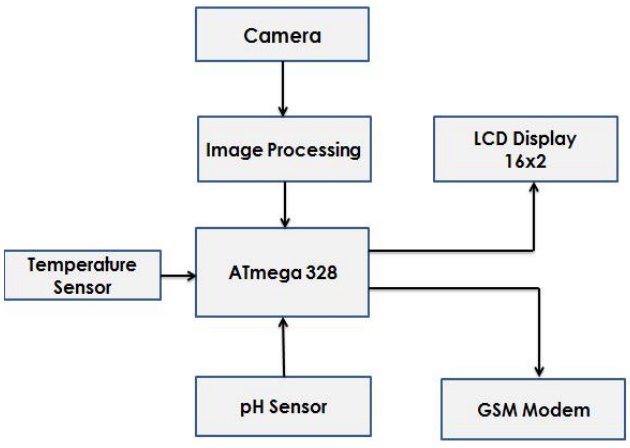
This project aim to design a wireless sensor network monitoring system for aquaculture. So will reduce the continues manual monitoring and can be used to operate in real world environment for optimum control of aquaculture environment.

III. SYSTEM MODEL

This system consist of a software section is designed by using the PYTHON language. It's also having a GSM part that the environmental parameters of the fishpond will be sent to owners through short messages from the host computer via the global system for mobile (GSM) module. The overall block diagram for the system as shown in figure 1

The working of the system can be explained on the basis of the block diagram as follows:

The modules were installed in an aquaculture recirculating system to transmit sensor values to the network coordinator. A monitoring program was created in order to display and store sensor values and to compare them with reference limits. E-mail and an SMS message alert can also be sent to the cellular phone of the system administrator so that immediate action can be taken.



(figure 1)

IV. HARDWARE AND SOFTWARE DETAILS

For disease detection and water quality monitoring system, here we having a hardware section and a software section. For software section we are using the KERA's algorithm for PYTHON language.

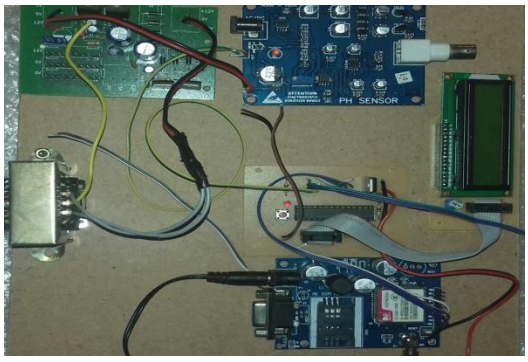
This project aims to wireless sensor networking system for aquaculture using KERA algorithm. So we will reduce the continues manual monitoring and can be used to operate in real world environment for optimum control for aquaculture environment. The idea used here artificial neural networking.

In this system we having two sections embedded system part and artificial intelligence for image processing. Uses At mega 238 microcontroller Adruino IDE programming software is used by programming microcontroller. At mega 328 is a single chip microcontroller by Atmel in the mega AVR family shown in figure 2. It has a modified hard ward architecture 8 bit RISC processor core.

For disease detection and water quality monitoring system, here we have a hardware section and a software section. For software section we are using the KERA's algorithm for PYTHON language This project aims to wireless sensor networking system for aquaculture using KERA algorithm. So we will reduce the continues manual monitoring and can be used to operate in real world environment for optimum control for Artificial Intelligence is providing to machinery, they having two part that is training and testing .training is providing machinery for sense, here set of images collected one by one. the collected images are given to the machine code algorithm with attaching each images are classified like effected ,normal or unaffected based on disease of fishes. the each case will iterate an training model called artificial intelligence model(AI model).

Testing is another part of artificial intelligence. the testing part providing machine can predict the thing from the training. The AI model is used for testing. the captured image are applied to the algorithm and it will predict the status of fish either effected or unaffected by using AI model.

The hardware section of this system as shown in figure 2. The software part are in python language.



(figure 2)

A. Sensors

The sensor nodes consists of data acquisition, data transformation and transmission, and water quality control components. Data acquisition component collects non electricity signals of the most important environmental factors by using various sensors.

Here we are using two types of sensors such as pH and temperature sensor LM35.

The digital temperature sensor LM35 sensor that sense the temperature of the required environment and the sensed temperature value compared with the threshold value set previously in the system and displaying the varied values on the seven segment display. LM35 is a precision IC temperature sensor with its output proportional to the temperature. The sensor circuitry is sealed and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self-heating and does not cause more than 0.1% temperature rise in still air.

pH, commonly used for water measurements, is a measure of acidity and alkalinity, or the caustic and base present in a given solution. It is generally expressed with a numeric scale ranging from 0-14.

B. GSM Module

(figure 3)

The communication between computer and **GSM-GPRS** system is established by using GSM module. The GSM services are the standard collection of application and features available to mobile phone subscribers all over the world. Here we use GSM Module as an interface to send the captured images of the fishes through continuous monitoring of camera .The captured images reaches the user through the GSM module and the rest of the processing is done according to the parameter changes detected in the fish. In the Water quality monitoring section The pH values and the temperature variations noticed are also send to the user through the GSM module. The GSM module as shown in figure 3.

C. Microcontroller

(figure 4)

The AtMega328 is a high performance Microchip Pico Power 8 bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities,1024B EEPROM,2KB SRAM,23 general purpose I/O lines,32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts ,serial programmable USART ,a byte-oriented 2-wire serial interface, SPI serial port, a 6-wire serial interface ,SPI serial port a 6-channel 10-bit A/D converter(8-channels in TQFP and QFN/MLF packages),programmable watchdog timer with internal oscillator ,and five software selectable power saving modes .The device operates between 1.8-5.5 volts .By executing powerful instructions in a single clock cycle ,the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

D. PYTHON

The programming language PYTHON was invented in1980s, and the implementation started in December 1989 by Guido van Rossum at CWI in the Netherlands as a successor to ABC capable of exception handling and interfacing with the Amoeba operating system. The PYTHON principal author Van Rossum, and his continuing central role in deciding the direction of Python is reflected in the title given to him by the Python community, *Benevolent Dictator for Life* (BDFL) Python was named for the BBC TV show *Monty Python's Flying Circus*.[2]Python 2.5 was released on September 19 2006.Here we used the python 2.5 version of coded language. Python now uses the Build boot tool for continuous testing on a wide range of platforms. this allows us to spot problems faster during development, and resulted in a much more robust release. A number of optimization came out of the Need For Speed sprint in Iceland. Their were major speedups in exception handling and string operations, as well as a number of other changes to improve performance. Internally, the python compiler now converts the source code to an abstract syntax tree(AST) before producing the byte code

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E. Seven segment display

Segment display also called seven segment indicator for displaying digital numerical that is an alternative to the more complex dot matrix displays.

In this project the display that used to displaying the sensed value sensed by the LM 32 and pH sensor. The numerals 6 and 9 may be represented by two different glyphs on seven-segment displays. The seven segments are arranged as a rectangle of two vertical segments. On each sides with one horizontal segment on the top, middle, and bottom. Additionally, the seventh segment bisects the rectangle horizontally. In this work the seven Segment display is used to display the temperature and pH variations which is to be sent to the user and the variations has to be displayed so.

The simulated results are displayed on the seven segmented display as shown in below.

figure 5

figure 6

figure 7

F Camera

In this project, we use a Wireless HD IP Wi-Fi CCTV Night vision security camera . Images of fishes which are being continuously monitored and captured through the camera. The later on process of image is done by getting the preferred captured pictures. The main advantages of the camera is that data would be captured wireless and without the help of the system near it. The camera is the main component to detect the diseases.

V. EXPIRIMENTAL RESULT

In this project we mainly detected the disease affected and the results shows the rate at which the fish is different from the original one. The image processing is done by initially taking the picture of the fish by a camera and the picture is being given to the path where the process is done. The path is provided in the program. The next result is the pH and temperature variations are being noted by the appropriate sensors which is in the setup and the result is displayed in the LCD display and also the result is being sent to the user through the GSM modem to the user's mobile.

VI. FUTURE SCOPE

The paper mainly deals with decreased detection in agriculture which is being a most prominent technique in seen now a days but the project focuses on the aim to design such an idea which is a wireless sensor network monitoring and control system which is also a highlight factor in it. The wireless monitoring agriculture system designed in the paper monitors temperature and pH of fish pond in real time way and automatically controls them. It controls fish growth in full time way by means of image acquisition and impediments real time monitoring of fish health which is a innovative method for the development of fish farmers. The system avoids problems of low efficiency in artificial agriculture untimely and unreliable water quality and fish disease control.

VII. CONCLUSION

"Prevention is better than cure" is an old English adage. Never is this truer than when considering the matter of fish diseases and maintaining the health of farmed fish

Prevention of fish disease is not simply a matter of trying to use modern vaccines to halt disease. Ensuring the water quality is good and planning ahead on how to create an environment with few fish pathogens present in the water.

The paper concludes that the proposed combination gave better accuracy in disease detection and also measuring the status of the water ,pH and temperature in aquaculture .PCA helped in increase the accuracy in disease detection. The Experimentation has been applied on the real images of the infected fish images dataset. The implementation has been done in PYTHON software. It automatically detects or diagnoses the Fish disease. In Future scope Machine learning algorithms can apply on different feature Descriptors.

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