Role of Automation in Pisciculture for Better Yield

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Abstract - The proposed system is role of automation in fish farming which is based on Internet of Things (IoT) for real-time monitoring. The system can be monitored remotely and can control from a different locations with the use of an internet and obtain the time to time alerts for the farmer via SMS using GSM. Due to lack of monitoring pond parameters in real time effects the growth of fishes and it leads loss to the farmers. For avoiding such losses, the embedded system is installed in the farm which can monitor the farm and to control the system based on the threshold conditions which can increases the rate of growth of the fish and decreases the death rate. Objective of this manuscript is to provide an automatic fish farm monitoring and thereby saving time, money & power of the farmer. In the fish farming process we use various sensors like pH sensor, Temperature, GSM, Wi-Fi, Turbidity, PIR sensor and level sensors. With the help of these sensors the system is automated.

Keywords - Aquaculture, Fish Farming, Internet of Things (IoT), Temperature sensor, Level sensor, pH sensor, turbidity, PIR sensor, GSM and Wi-Fi.

I. INTRODUCTION

A fish farmer with success inseminated gathered fish eggs and raised the fish that were hatched for food. Fish farming is extremely important to mankind. Fish is high in important nutrients. Fish might lower your risk of heart attacks and strokes. Fish contains nutrients that are crucial during development. Fish might increase gray substance within the brain and shield it from age-related deterioration. Fish might facilitate stop and treat depression, creating you a happier person. Different types of fishes are available every fish is benefit to human beings in form of nutrients and proteins etc., This is the main reason for farming of fishes and to help the farmers making them risk free with the advancement of new range of technologies and automation innovative solutions we are doing this project which supports in monitoring and automatic controlling on real-time. IoT can also play a significant role in precision farming to enhance the productivity of the farm. The rapid development of aqua cultural IoT has an important role in realizing intensive aquaculture, high yield and high quality providing solid foundation for development with in aqua cultural information technologies in this paper we worked on monitoring and automation of fish farming for better yield.

II. LITERATURE SURVEY

In 475 BC, a Chinese man referred to as Fan Lai wrote a book known as The Classic of Fish Culture to show others a way to raise fish for food. In 1733, cultivation in its trendy kind was initial introduced in European country. A fish farmer with success fertile gathered fish eggs and raised the fish that were hatched for food. Fisheries sector play an important role in the socio-economic development of farmers in the country. The sector has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries, and is a source of cheap and nutritious food besides being a foreign exchange earner. Most importantly, it is the source of livelihood for a large section of economically backward population of the country. The main challenges facing fisheries development within the country includes correct knowledge on assessment of work resources and their potential in terms of fish production, development of sustainable technologies for fin and shell fish culture, yield optimization, harvest and post-harvest operations, landing and berthing facilities for fishing vessels and welfare of fishermen. And it is useful in many aspects like malnutrition and starvation are the two serious problems being faced by millions of rural poor in most of the developing countries. The downside of deficiency disease is actually additional serious and of an even bigger dimension than the starvation problem and is caused chiefly because of animal protein-deficient diets.Animal macromolecule is important for correct growth, repair and maintenance of body organs and tissues. Fish contain about 16-20% protein compared to about 12% in egg, 3.5% in milk and 6-8% in rice and wheat. Moreover, it is wholesome, tasty, highly nutritive and an excellent source of essential minerals, vitamins and essential amino acids. At present concerning thirty first of the overall animal macromolecule provide within the Asian region is within the sort of fish macromolecule. For the poorest segments of the population, fish isn't solely the foremost vital animal macromolecule supply, however typically the sole one.

III. PROPOSED SYSTEM

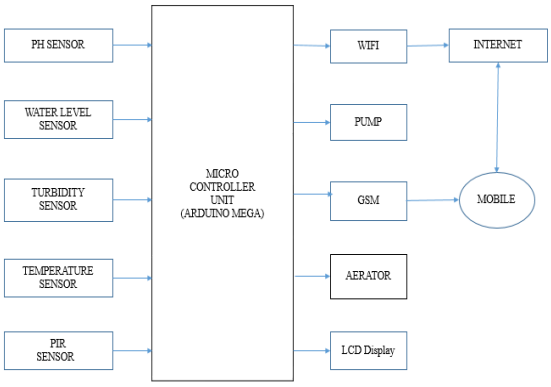

Figure 1: Block diagram of proposed system

The proposed hardware of this system includes Arduino MEGA board, Temperature sensor, pH sensors, Turbidity sensor, Water level sensor, PIR sensor, Wi-Fi, DC motor GSM, Aerator, power supply unit, LCD Display.

IV. HARDWARE COMPONENTS

A. Arduino

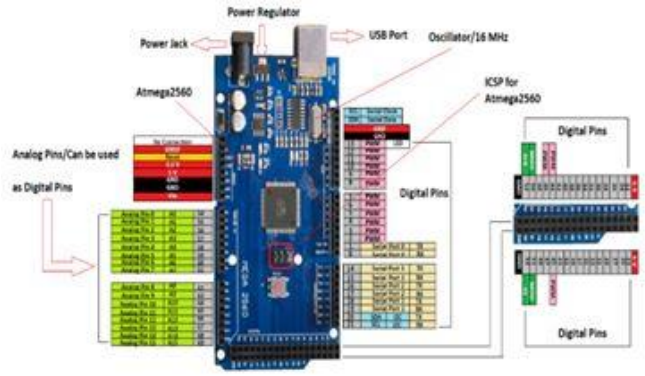

Figure 2: Schematic diagram of Arduino Mega

The Arduino Mega 2560 could be a microcontroller board supported the ATmega2560. It has fifty four digital input/output pins (of that fourteen are often used as PWM outputs), sixteen analog inputs, four UARTs (hardware serial ports), a sixteen megacycle per second quartz oscillator.

B. LCD

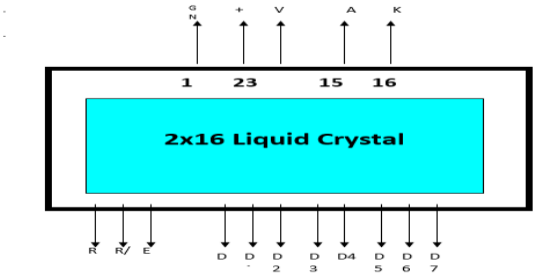

Figure 3: 2x16 LCD display

The LCD display consists of two lines, 20 characters per line that is interfaced with the PIC16F73. The display contains two internal byte-wide registers, one for commands (RS=0) and the second for characters to be displayed (RS=1). It also contains a user-programmed RAM area (the character RAM) that can be programmed to generate any desired character that can be formed using a dot matrix.

C. Temperature Sensor

Figure 4: Temperature sensor with probe

External probe detector for direct dominant and observation of liquid temperature. It consists of three wires - Red connects to 3-5V, Black connects to ground and White is data. DS18B20 Sensor technical specifications are of temperature sensor which has the usable temperature range of 55 to 125°C (-67°F to +257°F). Temperature sensors will share one pin ±0.5°C accuracy from -10°C to +85°C it's temperature-limit alarm system query time is less than 750ms, usable with 3.0V to 5.5V power/data.

D. pH Sensor

Figure 5: pH electrode with probe

A pH meter may be a instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or pH expressed as pH. The pH meter measures the difference in electrical potential between a pH electrode and a reference electrode, and so the pH meter is sometimes referred to as a "potentiometric pH meter".

E. Ultrasonic Sensor

Figure 6: Ultrasonic sensor

Ultrasonic sensor is used to measure the water level of the farm. It is of non-contact type sensor i.e., the sensor doesn't have any direct contact with the water and it analyses the level of the water. It's detection ranges between 2cm to 400cm.

F.PIR Sensor

Figure 7: PIR sensor

Objects with a temperature higher than temperature emit energy within the variety of radiation. Usually this radiation isn't visible to human eye as a result of it radiates infrared wavelength however it may be detected by device designed for such a purpose. The term "passive" means that sensor is not using any energy for detecting purposes, they work entirely by detecting the infrared radiation (radiated heat) emitted by or reflected from object.

G. Turbidity Sensor

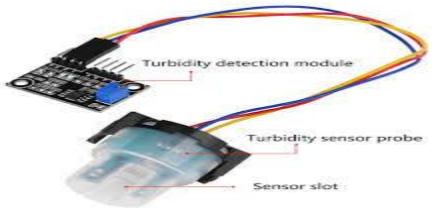

Figure 8: Turbidity sensor

Turbidity sensor is used to monitor the quality of the water based on solid particles present in the water. It works on the principle of emitting of light and the scattering of light. Water flows between the 2 projectionsof the clear plastic wall. The phototransistor emits lightweight rays that square measure alleged to reach the photodiode. These lightweight rays come upon the water flow and lose their path once they meet any suspended particle within the water. The amount of light sent and received is conveyed to the micro controller operating the sensor and decisions are taken in accordance to that.

H. Wi-Fi Module

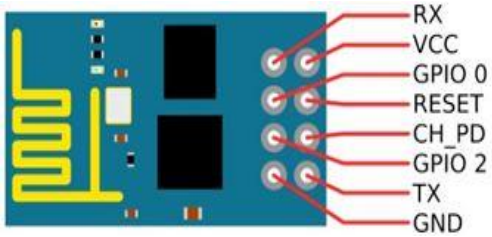

Figure 9: Wi-Fi module

The ESP8266 WI-FI module is basically, a complete solution to access the internet from the long distance, which have self-contained operating system and integrated TCP/IP protocol stack that can be easily connect to the microcontroller for gaining the access to any Wi-Fi network

I. GSM Module

GSM is combination of TDMA (time division multiple access), FDMA (frequency division multiple access) and frequency hopping. Initially, GSM use 2 bands of twenty five MHz dimension : 890 to 915 MHz frequency band for up-link and 935 to 960 MHz frequency for down-link. Later on, two 75 MHz band were added. 1710 to 1785 MHz for up-link and 1805 to 1880 MHz for down-link.

Figure 10: GSM Module

V. CIRCUIT DIAGRAM

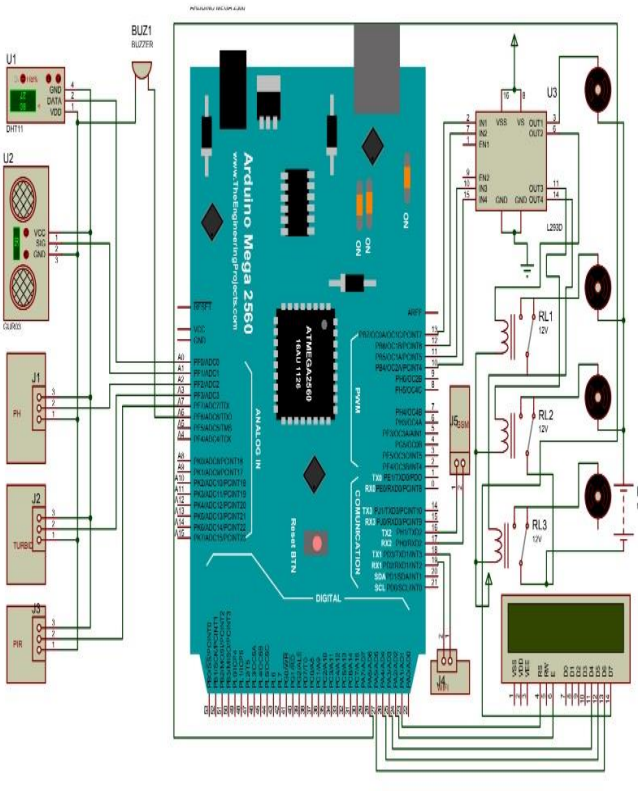

Figure 11: Interfacing diagram of proposed model

VI. RESULTS

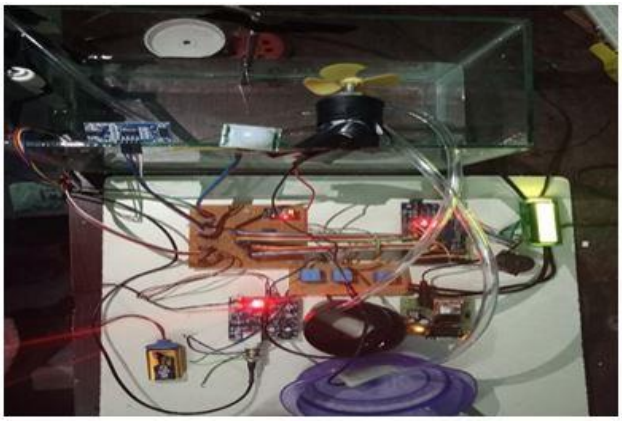

Figure 12: Electronic setup for Pisciculture Monitoring

Figure 13: Output values in LCD

Figure 14: Messages from the kit to mobile

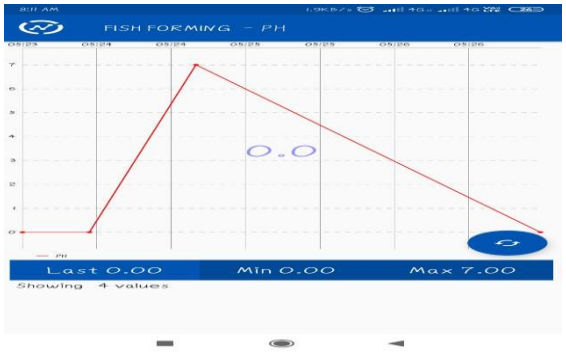

Figure 15: Monitoring pH in ThingView

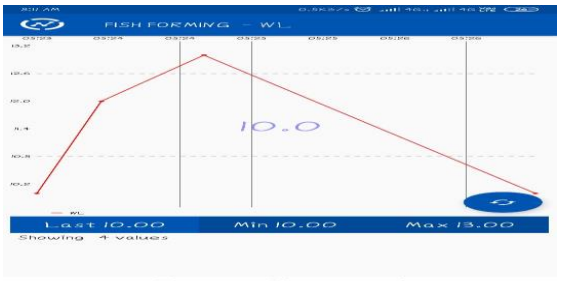

Figure 16: Monitoring Water Level in ThingView

Figure 17: Monitoring Temperature in ThingView

Figure 18: Monitoring PIR in ThingView

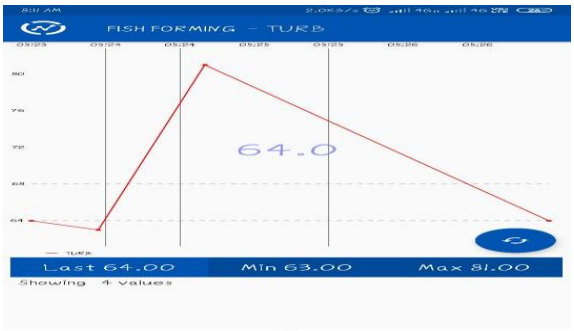

Figure 19: Monitoring Turbidity in ThingView

VII. CONCLUSION

Technological development in Pisciculture can produce more accurate control and higher economic efficiency of the system.The demand from aqua-farming folks for maintaining water quality is satisfactory because of the introduction of the watching technology. This article discussed some physical measures such as level,

temperature, turbidity, pH value and they are analyzed using Arduino mega. The resulted values are updated to the server via Wi-Fi and the time to time alerts are given to the farmer via GSM.

VIII. FUTURE SCOPE

The scope for the future techniques are detailed as follows:
By considering the various parameters like dissolved oxygen, alkalinity, hardness, ammonia, nitrites we can monitor the farm very effectively. It's very difficult to measure the growth in fishes. With the addition of camera and using the Raspberry pi controller the system can upgraded by means of security.

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