Revolutionizing Fish Detection with Ultraviolet Light and Ultrasonic Sensors

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Abstract—This proposal brings up a fresh strategy for upgrading fish gathering by applying ultraviolet light and ultrasonic sensors. This system would use ultrasonic sensors to quantify the size and number of fish and ultraviolet light to identify their presence. An enhanced method of acquiring fish for both commercial and leisure usage would be made possible by this technology, allowing for the more productive and accurate detection of fish. This technique may also be used to monitor fish population health and lessen the danger of overfishing. The suggested system provides a practical and environmentally friendly method for harvesting fish, assisting in preserving fish populations for future generation

Keywords - 1. Harvesting 2. Fish 3. Ultraviolet 4. Ultrasonic 5. Sensors 6. Revolutionizing 7. Efficiency 8. Accurate 9. Sustainable 10. Eco-Friendly

I. Introduction

Fish harvesting is an old technique that has played a significant role in modern existence. It is a process that is very reliant on the environment and needs effort and time to succeed. Several ground-breaking techniques have been created as a result of technological innovation, improving the fish collecting process. The employment of ultrasonic sensors and ultraviolet light is one of the most promising of these. This system is becoming more and more popular as a result of its potential to lessen labor expenses while also increasing the efficiency and accuracy of fish harvesting.

Together, ultraviolet light and ultrasonic sensors increase the effectiveness of fish harvesting. The wavelength of ultraviolet light is shorter than that of visible light, making it undetectable to the human eye. To distinguish between various fish species, this light is used. The UV light assists in identifying the various sizes, shapes, and colors of fish.The harvester can then rapidly and precisely determine which species of fish are present by using ultrasonic sensors to detect their existence.

Fishing is more productive and precise thanks to the combination of the two technologies. As a result, labor costs and time are saved by not needing to hand inspect and identify fish. As a result, both the quantity and quality of the catch can be increased throughout the course of a particular period of time. In addition, it has been demonstrated that the employment of ultraviolet light and ultrasonic sensors decreases the amount of bycatch, which is a significant concern for the fishing industry. Fish populations in specific locations decline as a result of bycatch, which is the unintended capture of fish or other creatures during the course of fishing.

It has also been demonstrated that the use of ultrasonic sensors and ultraviolet light increases fishing safety. It lowers the possibility of accidents and injuries due to manual inspection by offering a more precise and effective method of fish harvesting. Also, it eliminates the necessity for handling fish manually, lowering the possibility of contamination.

An underwater detection and avoidance system that uses geometric analysis of the angle the fish is at with respect to the observer to find fish. The system's integration with a smartphone allows for the determination of fish location coordinates. The prototype is a system made to detect fish and the depth of the ocean. The system makes use of waterproof ultrasonic transducer sensors, which have been built specifically to function underwater at a frequency of 200 kHz.

An innovative technique for catching fish uses ultrasonic sensors and UV light. It improves the process accuracy and efficiency while lowering labor expenses, including bycatch. Also, it improves security for individuals working in the fishing business. The effectiveness and precision of the fish harvesting process might be greatly increased by using this technique, with the potential to transform the industry.

We also analyze water quality in this paper. Environmental monitoring involves a substantial amount of water quality testing. Bad water quality also has an impact on the ecosystem around it and aquatic life. Water typically contains a certain amount of oxygen in free ($O2$) and non-compound forms. The amount of free oxygen in water is referred to as dissolved oxygen (DO). It is an important aspect in determining the quality of the water because it is essential to the survival of aquatic species. Dissolved oxygen is recognized as an important criterion that follows after the water itself in the study of lakes, known as limnology. If the dissolved oxygen level is out of balance, it can harm aquatic life and affect water quality.

II. MATERIALS AND METHODS

EXISTING SYSTEM

Design Phase: The design phase for this concept involves researching and designing the best way to upcycle emperor fish scales for use in piezoelectric energy harvesting. This involves studying the size and shape of the scales the type of piezoelectric material to be used, and the best method for binding the piezoelectric material to the scale.

Testing Phase: Once the design phase is complete, the next step is to test the concept. This involves testing the concept in a lab setting to determine how well it works and if it is effective for harvesting energy.

Production Phase: After testing is complete, the concept can be further refined, if needed, and then it can move into the production phase. This involves creating the industrial machinery for mass production of the upcycled emperor fish scales for piezoelectric energy harvesting.

Marketing Phase: Once the production phase is complete, the concept can be marketed to potential customers. This includes advertising, creating promotional materials, and finding distributors who will be able to sell the product.

Evaluation Phase: Once the product is in the market, it is important to evaluate how well it is doing. This includes gathering customer feedback and data on sales, as well as any other metrics that are relevant to the product. This helps to identify any areas where the product can be improved or any areas

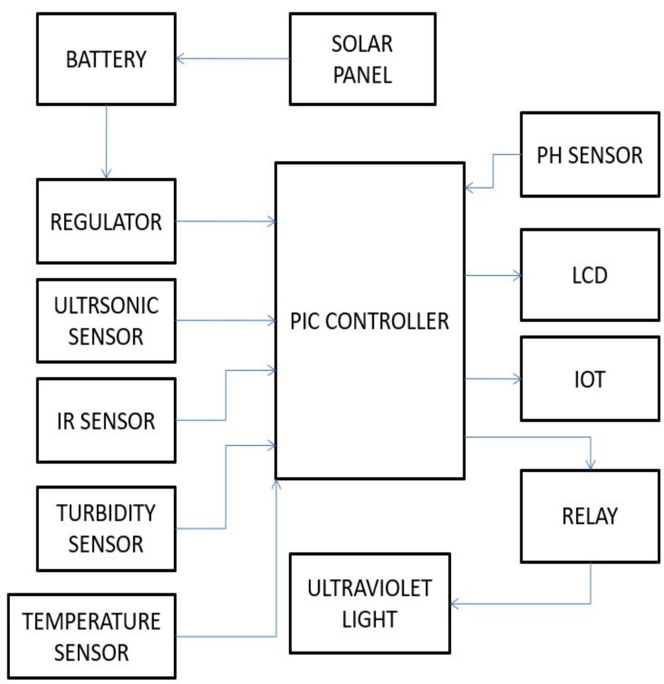
III. PROSPECTIVE SYSTEM

The goal of this study is to examine how using ultraviolet (UV) light and ultrasonic sensors could completely change how fish are harvested.Everything could become "smart" thanks to the internet of things (IOT), a ground-breaking new idea. A network of actual items, or IOT. The Internet of Things (IOT) aims to make it possible for devices to connect with anyone, anywhere, at any time, and with anything, utilizing any services. Machine-to-machine communication, wireless sensor networks, Wi-Fi, GPS, microcontrollers, and processors are only a small portion of the Internet of Things (IOT). The Internet of Things (IOT) is not a single technology; rather, it is a collection of many hardware and software tools used for data archiving, retrieval, processing, and communications that utilize electronic devices. Via the current network, it enables remote monitoring and control of any object from anywhere in the world.

A PIC microcontroller, turbidity sensors, infrared sensors, temperature sensors, pH sensors, an LCD, the Internet of Things, a relay, and UV light will all be used in this investigation.

The process begins with the sensors (ultrasonic, pH, IR, turbidity and temperature) which are shown in figure 1 this, in a certain order, detect the presence of fish, estimate the concentration of hydrogen in the water, and measure the water's current temperature. The sight of fish that move underwater will be picked up by the ultrasonic sensor. Depending on the depth of the fish, the field of view is between 0 and 400 cm. The pH sensor analyzes if the water is acidic or alkaline. Fish prefer a pH range of 6.5 to 8.5. The temperature sensor measures the water's temperature and uses various LED lights to signal each temperature level. The yellow LED will turn on if the water is cooler than 29 °C. The green LED will turn on when the water is between 29 and 35 °C. This value means the ideal temperature for fish growth. The red LED will light up on if the water has a temperature greater than 35 °C.

A distance measurement module with an ultrasonic sensor that has a 20 cm to 600 cm non-contact range and a 2 mm precision. This water-resistant ultrasonic sensor is used to find fish. Depending on the depth of the fish, the detection distance range was set from 0 cm to 400 cm.In pH sensor, it analyzes if the water is acidic or alkaline. The pH scale is a logarithmic scale with a neutral point of 7, and its range is 0 to 14. Values below 7 would indicate an acidic solution, while values above 7 would indicate an alkaline solution.



1. *Figure 1.block diagram of prospective system*

The turbidity sensor that is being used has the SKU of SEN0189 and is made up of a turbidity probe and a turbidity circuitprovide the microcontroller with data.
Turbidity, a quality that governs water visibility, is a measure of the total amount of particles in the water. As a reason, turbidity is regarded as an optical characteristic of water and is measured using optical

equipment. The turbidity level of the water (and cloudiness or haziness) increases as the amount of suspended solid increases. When a value is sensed that is outside the desired range, the microcontroller triggers a filter through some kind of relay.

This sensor system works as an ultrasonic sensor transducer that emits sound waves. When the waves strike an item, they are reflected, and a microcontroller processes the information and converts it into string data. The facts are then shown on an LCD (Liquid Crystal Display*).*

IV. RESULT AND DISCUSSION

Hardware Implementation

After testing and debugging, the project prototype's implementation. It has a pH sensor, temperature sensor, and ultrasonic sensor as input devices. The acoustic underwater fish are found by sensors, which also measure the water's temperature and pH, which have an impact on fish growth. Using a smartphone, the monitoring data will be delivered to the user's email. This prototype is inexpensive to construct and portable.

Software Implementation

The data monitoring will be displayed in two portions of the software, one in the serial monitor on the PC and the other in the think speak view app on the smartphone. The pH value, temperature, and fish distance will all be displayed in the serial monitor as data. "The water temperature is normal" will be shown if the water temperature is between 29 and 35 °C. The serial monitor will alert the user "Warning! The temperature is below 29" if the water temperature is below 29 °C. The serial monitor will display the message "Warning! The temperature is above 35" if the water is warmer than 35 °C. Fish distance is shown on an LCD.

Statistical approaches for descriptive and inferential analysis will be used to examine the data gathered by the PIC microcontroller. Inferential statistics will be used to derive inferences from the data, whereas descriptive statistics will be used to describe the data that has been collected

As the sun hits instantly to penetrate the water's surface at noon, the temperature rises. Photosynthesis, which takes carbon dioxide from the water, causes the PH level to climb from a morning value of 6.5 to an afternoon peak of 7, and in the evening, respiration, which releases carbon dioxide, causes pH to decline continuously until dawn. This circumstance is typical for fish growth and well-being. As a fish seeks out food and oxygen, its distance from the surface of the water changes constantly.

Early in the morning, the light is low and does not reach the water's surface, thus the water is chilly and does not warm up. The pH value doesn't change between 6.5 and 6.9. Underwater photosynthesis typically outpaces respiration during the day, causing pH to rise as carbon dioxide is drawn out of the water. Fish swim more shallow water for food because they become sleepy and less energetic in cold water.

V. CONCLUSION

The goal of this IOT-based clever fishery resources and monitoring of water quality project was to identify the existence of fish while focusing on the water's quality standards. This system will come to the conclusion that preventing water pollution earlier can assist in lowering the number of dead fish.

In order to increase fish production, this research aims to keep fish farms in a healthy state. This has been accomplished by creating and putting into place a low-cost smart technology that allows for remote monitoring and management of the fish farm. The research examined important variables like turbidity, pH, and temperature that have a substantial impact on fish vital signs. There were designated ideal ranges for the aquarium environment parameters. Fishing activity can be discovered using ultrasonic and ultraviolet light sensors. By doing this, fish stocks may be defended against overfishing. Fishing detection can be observed using ultrasonic and ultraviolet (UV) light sensors. When deciding whether to open or close a fishery, these data can be utilized as guidance.

In order to make sure that the fish population remains healthy, ultraviolet light and ultrasonic sensors can be utilized. Decisions about the management of fisheries can be informed by this data. Fish harvesting can be automated using ultraviolet and ultrasonic sensors. This would increase productivity, lower labor costs, and lessen the negative effects of conventional harvesting techniques on the environment. Water quality in fisheries

can be checked using ultrasonic and ultraviolet sensors. This information can be used to help make decisions about whether to release or harvest fisher to find potential causes of water contamination.
IOT-based monitoring systems will make it possible to notify local fishermen or communities in advance of the existence of fish and the condition of the water. With advancements in technology, fishermen will have an easier time spotting fish and determining where the majority of them will land based on the state of the water. Ultraviolet and ultrasonic sensors have the ability to entirely revolutionize fish gathering. These technologies enable fishers to pick fish more skillfully and successfully, which decreases the time and effort required and boosts income. This technology has been shown to be more efficient than conventional fishing techniques and may be used to improve sustainability and lessen the negative effects of fishing on the environment. Because of this, ultraviolet light and ultrasonic sensors may prove to be beneficial systems for the sector, enabling fishers to become more lucrative and efficient while still maintaining environmental protection.

REFERENCES

[1] Suciadi Catur Nugrohoi, Riza Yuliratno Setiawan,Martiwi Diah Setiawati, Djumanto,Susilo Budi Priyono, R.Dwi Susanto, Aninidya Wirasatriya and Rakhma Fitria Larasati, "Estimation of Albacore Tuna Potential Fishing Grounds in the Southeastern Indian Ocean," Digital Object Identifier 10.1109/ACCESS.2022.3233353.

[2] Lukasz J. Nowak and Martin Lankheet "Fish Detection Using Electrical Impedance Spectroscopy",IEEE Sensors Journal,vol…22,no. 21,1 November 2022.

[3] Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- *Iranian Journal of Electrical & Electronic Engineering*, Vol.8 (3), pp.259-267, September 2012.

[4] Swati Chopade, Hari Prabhat Gupta, Rahul Mishra, Preti Kumari and Tanima Dutta,"An Energy-Efficient River Water Pollution Monitoring System in Internet of Things",IEEE Transactions on green communication and networking, vol… 5, no. 2, June 2021.

[5] Marc A B A, Lukey M J and Cerione R A, "The State of World Fisheries and Aquaculture, Meeting the sustainable development goals",2018.

[6] Merna B, "A Waterproof Ultrasonic Sensing System for Locating Fish in Underwater Area",November 2016.

[7] Bakar S, Ong N, Aziz H, Alcain J, Haimi W and Sauli Z,"Underwater detection by using ultrasonic sensor"AIP Conf. Proc. 1885.

[8] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- *Springer, Electrical Engineering*, Vol.93 (3), pp.167-178, September 2011.

[9] Kiruthika U, Raja S and Jaichandran R 2017 IoT based automation of fish farming J. Adv. Res. Dyn. Control. Syst. 9(1) 50–7.

[10] Mohammed A and Al-Mejibli I 2018 Smart monitoring and controlling system to enhance fish production with minimum cost J. Theor. Appl. Inf. Technol. 96(10) 2872–84.

[11] Prasad N, Mamun K, Islam R and Haqva H 2015 Smart water quality monitoring system (2nd Asia-Pacific World Congr. Comput. Sci. Eng. APWC CSE) no. December 2016.

[12] Parra L, Sendra S, García L and Lloret J 2018 Design and deployment of low-cost sensors for monitoring the water quality and fish behavior in aquaculture tanks during the feeding process, Sensors (Switzerland).

[13] Sinduningrum, E. (2008). Rancang Bangun Perangkat Lunak Simulasi Pendeteksi Ikan dengan Voice Recognition. Skripsi. Fakultas Teknik, Program Sarjana, Universitas Indonesia.

[14] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - *Journal of ELECTRICAL ENGINEERING,* Vol.63 (6), pp.365-372, Dec.2012.

[15] Haryono, Setiawan A., & Trihandaru S.S. (2012). Pendeteksi Keberadaan Ikan Menggunakan Sensor Ultrasonik. Skripsi. Fakultas Sains dan Matematika. Universitas Kristen Satya Wacana.

[16] Siswanto, Praditia A., Susanto A., & Yunus A. (2007). Analisis dan Perancangan Sistem Terpusat Penentuan Lokasi Keberadaan Ikan dan Penentuan Kapal. Skripsi. Fakultas Teknik, Program Sarjana, Universitas Bina Nusantara.

[17] Shrivastava, A. K., Verma A., & Singh, S. P. (2010). Distance Measurement of an Object or Obstacle by Ultrasound Sensors using P89C51RD2. International Journal of Computer Theory and Engineering, Vol. 2, No. 1.

[18] Daniel K. F. & Ruixiu S. (2013). An inexpensive open-source ultrasonic sensing system for monitoring liquid levels. Agricultural Engineering International : CIGR Journal. Vol. 15, No.4.

[19] Murad Z, Harun A, Mohyar N, Sapawi R and Ten S Y 2017 Design of aquaponics water monitoring system using Arduino microcontroller AIP Conf. Proc 1885.

[20] Chuang C M, Hwang N J, Ye H J, Huang C S and Williams K 2017 Underwater Fish Tracking for Moving Cameras Based on Deformable Multiple Kernels IEEE Trans. Syst. Man, Cybern. Syst. 47(9) 2467–77.

[21] Dr.C.Nagarajan, G. Neelakrishnan, V.Sundarajan, and D.Vinoth, "Simplified Reactive Power Control for Single-Phase Grid-Connected Photovoltaic Inverters" International Journal of Innovative Research in Science, Engineering and Technology, May 2015; 4(6): 2098-2104

[22] Niswar M et al 2019 IoT-based water quality monitoring system for soft-shell crab farming Proc. - 2018 IEEE Int. Conf. Internet Things Intell. Syst. IOTAIS 2018 6–9.

[23] Logic Controller Using State Space Techniques'- *Taylor & Francis, Electric Power Components and Systems*, Vol.39 C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy (8), pp.780-793, May 2011.