iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** XI **Month of publication:** November 2023

DOI: https://doi.org/10.22214/ijraset.2023.56604

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue XI Nov 2023- Available at www.ijraset.com

Design of Automated Fish Feeder Using IoT

Mr. Palash Gade[1], Mr. Mayur Vaidya[2], Mr. Devashish Jaiswal[3], Mr. Akhilesh Titarmare[4], Prof. Rahul Bambodkar[5]
[1, 2, 3, 4, 5]*Department of Computer Science and Engineering, J D College of Engineering & Management, Nagpur*

Abstract: ***The world's need for seafood is largely met by aquaculture, which calls for improvements in farming practises. In this paper, an Internet of Things (IoT)-powered Automatic Fish Feeder (AFF) system is presented. To collect data in real time, the AFF system makes use of a variety of sensors, such as those that measure ambient factors, fish activity, and water quality. Fish farmers are able to remotely monitor the conditions of the aquatic environment thanks to the processing and wireless transmission of this data by microcontrollers. Farmers may plan and modify feeding schedules, amounts, and feed mixes according to the individual requirements of the fish species using an easy-to-use mobile application. By analysing the gathered data, the system's clever algorithms optimise feeding schedules, guaranteeing that fish get the right nutrition while reducing feed waste. Moreover, by minimising overfeeding—which can result in water contamination and ecological imbalances—the AFF system fosters sustainability. This study shows how IoT technology may be successfully incorporated into aquaculture operations to improve production, save operating costs, and encourage environmental stewardship. The results of this study offer significant insights for the aquaculture sector, opening the door for the global adoption of IoT-based technologies to enhance fish farming methods.***

Keywords: IoT, Relay, Arduino Uno, WiFi Module, Water Level Sensor, Temperature Sensor, Oxygen Sensor

I. INTRODUCTION

The blending of technology and aquaculture has produced ground-breaking solutions in the age of IoT innovation. Through the creation of an automated fish feeder using IoT, this research investigates the field of smart fish farming. This device transforms conventional feeding practices by utilizing the strength of internet connectivity and sophisticated sensors. It makes sure that feeding plans are exact, on time, and flexible, enhancing aquatic health and encouraging sustainable practices This design serves as an example of how IoT may alter fish farming by providing effective solutions and fostering a future that is more interconnected and environmentally conscientious.

The IoT-based Automatic Fish Feeder offers an inventive and effective way to handle the difficulties associated with fish feeding, as hobbyists, aquarium enthusiasts, and even commercial fish farms work to give their aquatic friends the finest care and nourishment possible. Create a simple user interface that allows for simple setting and monitoring. This will ensure user-friendly interaction and seamless integration into current fish farming setups.

II. LITERATURE REVIEW

The literature here shows how IoT technology is becoming more and more significant when it comes to automated fish feeders in aquaculture. The productivity and sustainability of fish farming operations are improved by IoT-based systems' remote monitoring and control, data-driven decision-making capabilities, and integration with environmental sensors. However, in order for adoption and acceptance within the industry to be more widespread, issues pertaining to data security and system stability must be resolved. IoT-enabled automatic fish feeders are expected to become more and more essential to contemporary aquaculture techniques as the technology develops.

It is anticipated that additional study and advancement in this field will produce even more creative approaches to sustainable fish farming. IoT-based automatic fish feeders have drawbacks despite their apparent advantages. These include worries about data security, system dependability, and implementation costs up front. It is crucial to protect the security and privacy of the data that is gathered because a breach might have serious repercussions for the aquaculture sector as well as fish farmers. The aquaculture sector is expanding quickly, yet it still has issues with resource optimization, feed management, and water quality monitoring. The incorporation of IoT technology in aquaculture presents encouraging resolutions to these obstacles. Real-time data is collected and transmitted via Internet of Things (IoT) devices, such as actuators and sensors, to allow for remote control and monitoring of aquaculture systems, including automatic fish feeders.

III.RESEARCH GAP

When it comes to real-time behaviour analysis, energy-efficient solutions, user-centric interfaces, environmental effect assessment, affordability, long-term reliability, and comprehensive investigations, there are a lot of unanswered questions in the field of automatic fish feeders employing IoT technology.

1) Indah Sulistiyowati of the Department of Electrical Engineering published a review paper on February 14, 2023, titled "Automatic Fish Feeder and Telegram Based Aquarium Water Level Monitoring." One of the study's highlights is "Creating an innovative Automatic Fish Feeding System controlled through a Telegram bot, focusing on seamless communication and remote operation for enhanced user experience and aquatic ecosystem management.[1]

2) The development of a comprehensive Internet of Things system for freshwater fish aquarium monitoring and automation, utilizing the iterative waterfall approach, is one of the article's highlights. It was published in February 2022 and was titled "Internet of Things System for Freshwater Fish Aquarium Monitoring and Automation Using Iterative Waterfall" by T. E. Suherman, M. H. Widianto, and Z. Athalia. This approach ensures seamless real-time data analysis and improves overall aquatic habitat management.[2]

3) Integration of Multiple Sensors: We concentrate on sensors like temperature, water level, and oxygen sensors before effortlessly combining a number of them investigate the best sensor combinations and how they affect the precision and dependability of the system as a whole.

4) Energy-Efficient IoT Solutions: Many of the automatic fish feeders currently in use a lot of energy, increasing operating expenses and having an adverse effect on the environment. Consequently, our effort results in an energy-efficient Internet of Things device that makes use of low-power sensors and cutting-edge power management technology.

5) User-Centric Interface and Experience: IoT interfaces suffer from a lack of awareness of user preferences and behaviour which makes for less than ideal user experiences. Therefore, we create the interfaces for managing and operating automatic fish feeders

6) Overall, our project represents a novel and innovative approach to improving the Fish Management process. By combining IOT applications and real-time data to provide the ideal environment for fishes.

IV.PROBLEM STATEMENT

When a fish owner is away from home or has a hectic schedule, it can be difficult to manage the feeding and care of their fish.The outdated and uneven ways that fish are traditionally fed result in waste, overfeeding, and damaged aquatic health.Manual feeding plans are susceptible to mistakes made by humans and changes in the environment. There is no original strategy that can guarantee accurate, adaptable, and long-lasting feeding operations. The lack of real-time data limits the industry's capacity to make informed judgments on feeding techniques, environmental adjustments, and overall aquaculture management

V. METHODOLOGY

A. Steps

1) Identify Needs:- Determine the precise specifications needed for the automatic fish feeder, such as the feeding schedule, size of the portions, accuracy of the sensor, and range of connectivity

2) Component Selection:- Select the right Internet of Things (IoT) components, like a water level sensor, motor, Arduino Uno microcontroller, temperature and oxygen sensors, Wi-Fi modules, and motors.

3) Setup of Hardware

- To measure the environmental conditions, connect the oxygen and temperature sensors.
- Use the water level sensor interface to find the fish tank's water level.
- Attach the motor to the fish food dispenser.
- Ensure that all parts are integrated with the Arduino Uno and that the wiring is compatible.

4) Programming

- Create the Arduino Uno code necessary to read sensor data and operate the motor.
- Include a Wi-Fi module so that the feeder may be remotely monitored and controlled.
- Include safety and error-handling features in the code.

5) Internet of Things Connectivity

- Establish a Wi-Fi link between the Arduino Uno and a nearby network.
- Put the MQTT (Message Queuing Telemetry Transport) protocol into practice to ensure effective communication between the user interface and the fish feeder.

6) Testing and Optimization

- To guarantee the feeder functions dependably, carry out comprehensive testing in a range of environmental circumstances.
- Reduce power usage and reaction time by optimizing the code for efficiency.
- Take care of any errors, problems, or performance snags found throughout testing.

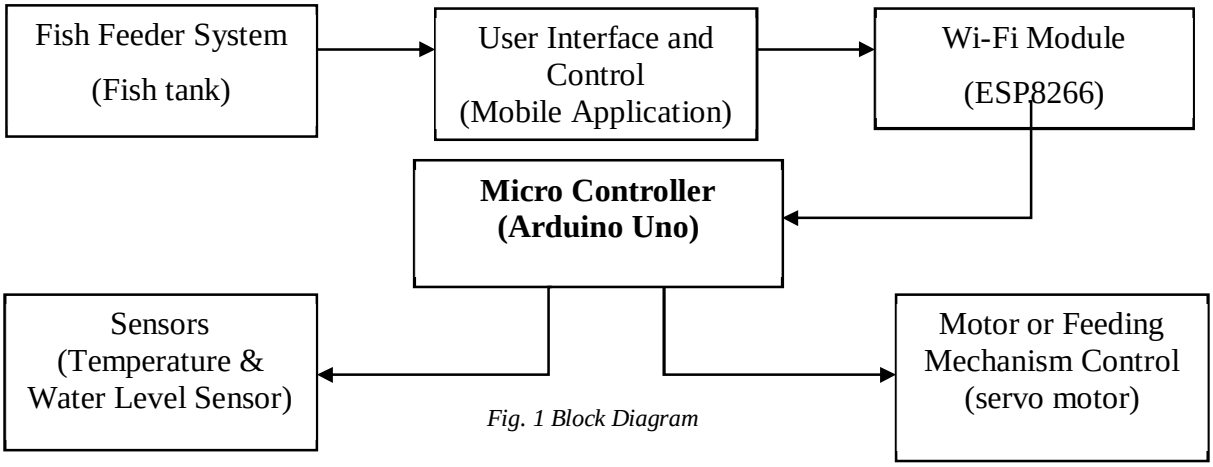


Fig. 1 Block Diagram

7) Benefits

- Precision feeding: Assures precise and regular feeding schedules, avoiding overfeeding, and fostering aquatic species' optimum growth.
- Data-driven decisions: By using sensors to gather information on water quality, temperature, and feeding habits, a healthy aquatic environment may be maintained.
- Automation of the feeding process saves fish farmers time and labor, allowing them to concentrate on other crucial facets of aquaculture management.
- Ensures consistent feeding even when caregivers are not present, which is useful in circumstances when routine supervision might not be available.
- Cost effectiveness: Although there are early setup expenses, long-term savings are realized through better feed utilization and decreased fish mortality rates, making it financially advantageous over time.

8) Drawback

- Dependency on Technology: Because of the system's reliance on technology, it is susceptible to network outages, software problems, and other issues that could interfere with the feeding cycle and endanger aquatic life.
- Maintenance Obstacles: It's crucial to maintain connectivity, motors, and sensors on a regular basis. Any problem or wear and tear could cause inaccurate feeding, necessitating ongoing care and expert Initial Setup.
- Difficulty: The system must be designed and set up, which demands technical expertise. It can be difficult, especially for beginners, to configure sensors, program the microcontrollers, and ensure flawless integration.
- Power Dependency: A reliable power source is necessary for the automatic feeder. If power outages or breakdowns are not immediately rectified, the feeding process could be halted and could have an effect on the fish's health.

9) Future Scope

- AI and machine learning integration: By integrating artificial intelligence and machine learning algorithms, the system can learn about and adjust to the distinct feeding habits and behaviors of various fish species. This adaptive intelligence can improve feeding schedules even more and boost productivity as a whole.

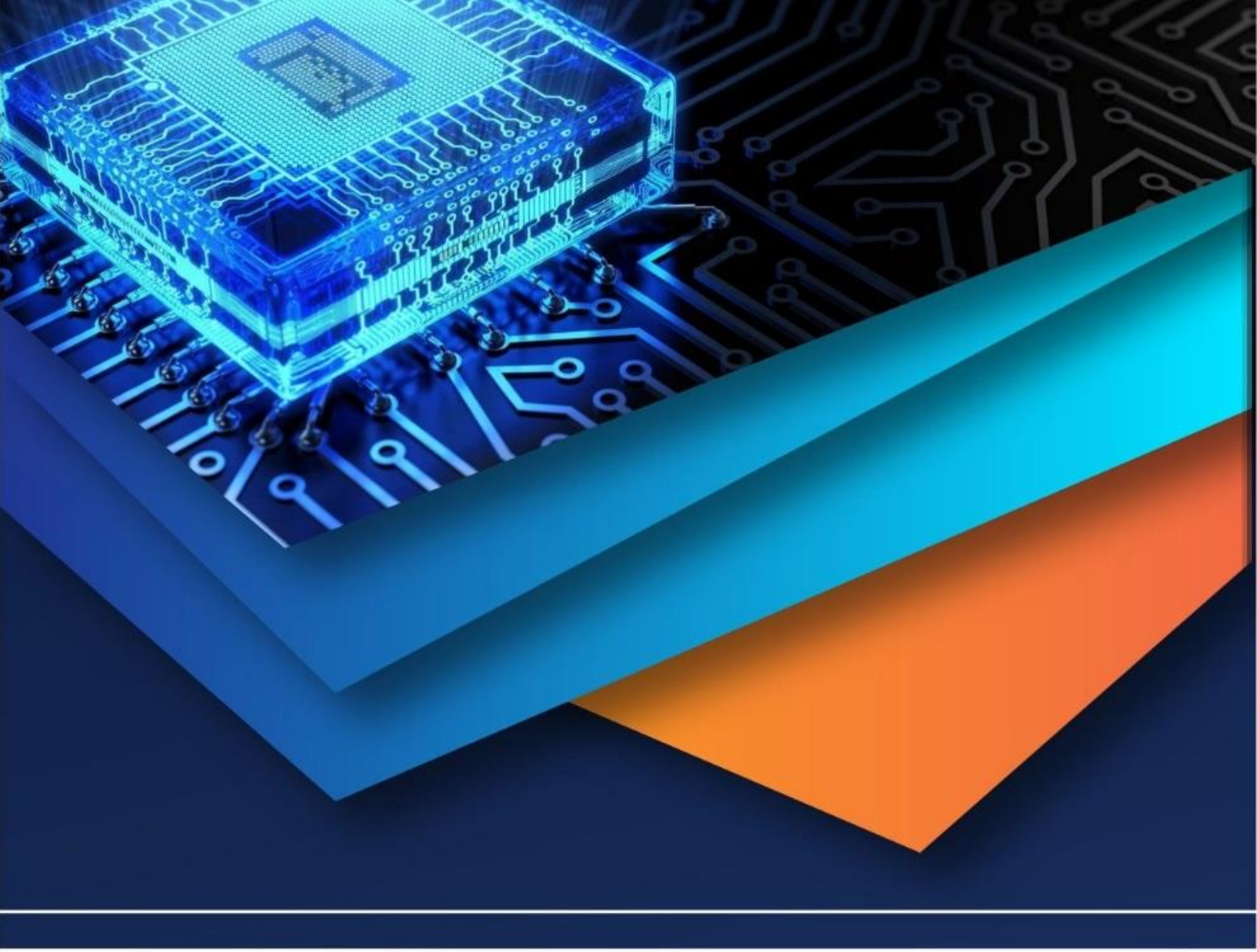
- Enhanced Environmental Monitoring: Subsequent generations could include cutting-edge sensors to keep track of additional environmental factors like pH levels, ammonia concentrations, and light levels. This thorough data gathering can offer a comprehensive view of the aquatic ecology, enabling better informed choices for fish development and health.
- Automated fish feeders can be integrated with aquaponics systems, a sustainable farming technique that combines fish farming and plant growing, to produce a closed-loop ecosystem. Future research might focus on how IoT-enabled feeders might promote plant and fish growth while maximizing resource efficiency and nutrient cycle efficiency.

VI. CONCLUSION

In conclusion, The Automated Fish Feeder, which applies IoT technology to fish farming, is a shining example of aquaculture innovation.It converts conventional techniques into effective, long-lasting, and flexible solutions by ensuring exact feeding schedules, remote monitoring, and data-driven decision-making. this design not only improves the wellbeing of aquatic life, but it also lays the way for a time when intelligent technology works in harmony with nature, changing the way that fish farming is done.

REFERENCES

[1] T. E. Suherman, M. H. Widianto and Z. Athalia, “Internet of Things System for Freshwater Fish Aquarium Monitoring and Automation Using Iterative Waterfall,” 2022 4th International Conference on Cybernetics and Intelligent System (ICORIS), pp. 1-6, 2022.
[2] R. Mahkeswaran and A. K. Ng, “Smart and Sustainable Home Aquaponics System with Feature-Rich Internet of Things Mobile Application,” in 2020 6th International Conference on Control, Automation and Robotics, ICCAR 2020, pp. 607–611, 2020.
[3] M. J. M. Autos et al., “Automated aquaponics system and water quality monitoring with SMS notification for tilapia industry,” in IEEE Region 10 Annual International Conference, Proceedings (TENCON), pp. 367–372, 2020.
[4] R. Aisuwarya and E. F. Suhendra, “Development of Automatic Fish Feeding System based on Gasping Behavior,” in 2018 International Conference on Information Technology Systems and Innovation (ICITSI), pp. 470–473, 2018.
[5] H. Kuroki, H. Ikeoka and K. Isawa, “Development of simulator for efficient aquaculture of Sillago japonica using reinforcement learning,” in Proceedings of International Conference on Image Processing and Robotics, ICIPRoB 2020, pp. 1-4, 2020, https://doi.org/10.1109/ICIP48927.2020.9367369



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY