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Smart Automated Fish Nourishing Set-Up

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***Abstract*: A machine built to give out aquatic animal sustenance at set periods, a device which guarantees steady, managed nourishment for living fish within their tanks or outdoor ponds. It minimizes manual effort while maintaining optimal nutrition for fish, promoting healthy growth and behavior. The system typically incorporates a programmable timer, a food storage chamber, and a dispensing mechanism that releases accurate food portions. Modern designs may include sensors to prevent overfeeding and detect food levels. Some advanced feeders integrate wireless connectivity for remote monitoring and adjustments. The device enhances feeding accuracy, reduces human error, and supports fish care during the owner's absence. Its reliability and ease of use make it ideal for hobbyists and aquaculture environments. Overall, the automatic fish feeder contributes to efficient, stress-free, and sustainable fish management.**

***Keywords*: IoT, automatic fish feeder, aquaculture, microcontroller (ESP8266), automation, precision feeding, sustainability, cloud platform, Wi-Fi.**

1. Introduction

Conventional aquaculture practices usually rely on hand-feeding fish. approach presents multiple disadvantages: human work is required, precise timing is often missed, and the process risks improper feed amounts, leading to either too much food being given or too little nourishment provided [1].

Beyond simply automating meal delivery, the device also features live tracking of aquatic conditions (for example, water warmth) using IoT linking. This capability makes it possible to supervise operations and manage settings from afar using a mobile phone or internet portal [2].

Intelligent software procedures inside this framework evaluate gathered statistics for refining meal timetables. This minimizes giving excess food, consequently cutting down on wasted rations and lessening ecological consequences [4].

Users can monitor the aquarium/pond conditions and control feeding schedules from anywhere in the world using a smartphone application or web interface. The system utilizes microcontrollers and actuators (like servo motors) to dispense exact amounts of feed at precise, pre-programmed times, ensuring consistent and appropriate nutrition. Reduced waste and better resource management contribute to a smaller environmental footprint in aquaculture operations.

In essence, the IoT-based automatic fish feeder is a practical example of how smart technology can enhance efficiency, productivity, and sustainability in the aquaculture industry, making fish farming more manageable and resilient

2. Methodology and Working

The methodology and working of the IOT based automatic fish feeder uses the following components:

- Microcontroller/Microprocessor
- Motor (Servo or Stepper Motor)
- Feed Container/Hopper
- IoT/Connectivity Module
- ESP32 (built-in), ESP8266, Wi-Fi shield
- Power Supply

3. Components Details

A. Microcontroller / Microprocessor

- Acts as the brain of the system.
- Controls the motor, reads sensor data, and communicates with the IoT platform.
- ESP32 is preferred because it has built-in Wi-Fi and Bluetooth, which makes IoT integration easier.

B. Motor (Servo or Stepper Motor)

- A motor is used to rotate a flap or wheel to dispense a precise amount of fish food.
- Servo motors are precise for fixed rotation angles, while stepper motors allow more flexible quantity control.

C. Feed Container/Hopper

- A storage container for fish feed.
- Usually attached to the motor mechanism to allow controlled dispensing.

D. IoT/Connectivity Module

1) ESP32 (built-in), ESP8266, Wi-Fi shield

- Enables the device to send data to the cloud and receive commands remotely.
- Can connect to platforms like Blynk, Thingspeak, or custom dashboards.

2) Power Supply

- Supplies electricity to the motor, microcontroller, and sensors.
- Can be battery-powered for portability or mains-powered for continuous operation.

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4. Circuit Operation

An IoT-powered, automated fish-feeding machine functions through the use of a small, integrated microcontroller unit. dispense food based on a set schedule, while sensors monitor water quality and a web-connected device allows for remote control and monitoring.

The microcontroller receives data from sensors like temperature and pH sensors, which can trigger or adjust feeding. A mobile app or web interface allows users to remotely view conditions, manually feed the fish, or set custom feeding schedules.

Sensors (e.g., temperature, pH, turbidity) gather data on water co conditions. An ultrasonic sensor can check the food level.

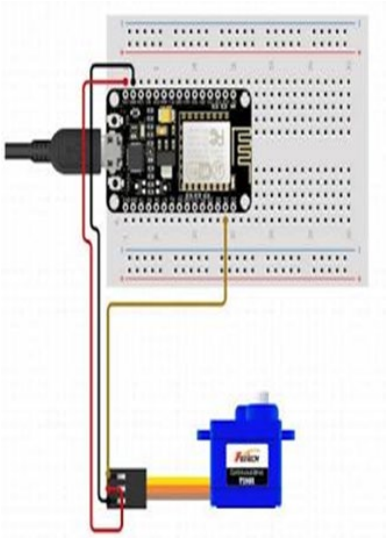

Fig. 1. Circuit diagram

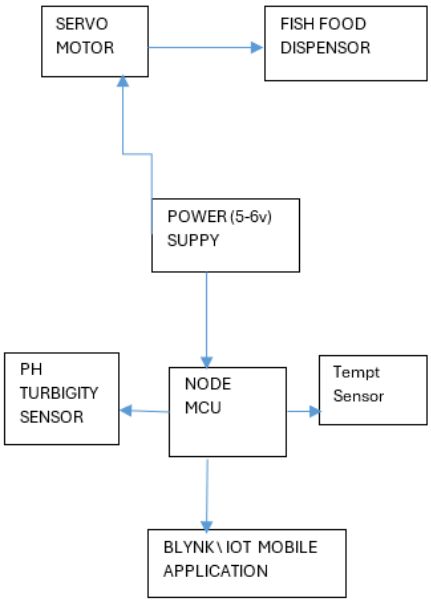

Fig. 2. Block diagram

- The microcontroller reads data from the water quality and food level sensors.
- This data is transmitted over Wi-Fi to an IoT platform or server.
- The user can view the sensor data and remotely control the system through a mobile app or web interface.
- Based on the pre-programmed schedule or manual command, the microcontroller activates the servo motor.
- The motor dispenses a measured amount of fish food from the storage container.

5. Result

The IoT-based automatic fish feeder system delivers significant, measurable improvements in aquaculture management compared to manual methods. Specific project results from studies show the system can reduce feed waste and improve feed efficiency, with one report indicating feed usage decreased from 200 grams (manual) to 180 grams daily. The system also enhances fish growth; the average weight gain with the automated method reached 85 grams over 90 days, 15 grams more than the manual method.

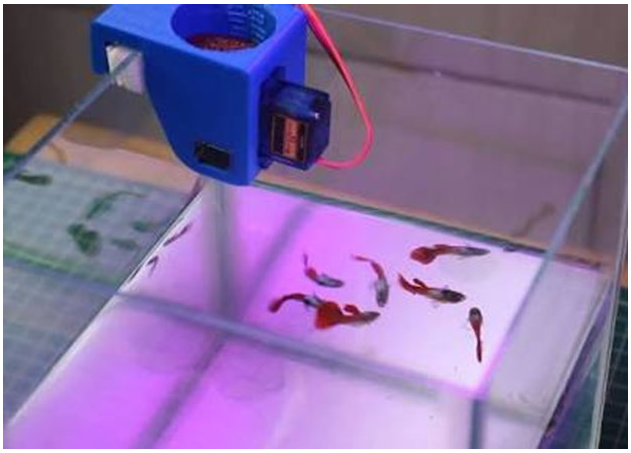

Fig. 3. Experimental setup and Result

Quantitatively, the Feed Conversion Ratio (FCR) improved substantially from 2.57 (manual) to a more efficient 1.91, while overall feed efficiency increased from 75% to 85%. Operationally, the system provides reliable remote monitoring of conditions like water temperature and pH via a smartphone application, ensuring consistent, data-driven management and minimizing labor dependency.

6. Conclusion

This paper explains how developed IoT-based automatic fish feeder offers an innovative solution for efficient feed control. This technology integrates sensors and connectivity to ensure precise, scheduled nourishment. Users can remotely monitor and adjust settings, minimizing manual labor. This reliable design reduces waste, promotes robust aquatic health, and boosts overall productivity in modern aquaculture operations. This paper successfully delivers a scalable, smart system for enhanced fish care.

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