

ABSTRACT

Ornamental fish farming is an activity with high economic value and is popular among various groups. However, this activity requires extra attention, especially in terms of feeding and monitoring threats such as theft or predator attacks. Manual activities in ornamental fish farming can be inefficient and difficult, especially for farmers with limited time.

This study developed an Internet of Things (IoT)-based ornamental fish farming management system that includes an automatic feeding system and pond security monitoring. The system integrates various technologies such as ESP32, PIR sensors, ultrasonic sensors, cameras, and a user interface via the Telegram app. The use of the YOLO algorithm for visual detection was also applied to enhance monitoring accuracy.

Test results show that the system is capable of automatically feeding fish according to a schedule, detecting leftover feed in the pond using the YOLOv11 model, and sending real-time security notifications via Telegram if movement is detected around the pond. This solution has successfully improved the efficiency and effectiveness of ornamental fish pond management, as well as providing additional protection against potential losses due to theft or predators. Quantitatively, the system generates approximately 45–55 photos per day. Additionally, the system successfully detects fish feed objects with an average accuracy of 80%, identifies feed objects with a precision rate of 81.44% and a recall rate of 79.07%, and performs automatic feeding twice daily for each pond. Going forward, this system can be further developed by adding water quality monitoring features and integrating individual recognition technology for specific detection of threats or fish conditions.

Keywords: IoT, ornamental fish farming, automatic feeding, pond safety, object detection