คณะวิศวกรรมศาสตร์
Faculty of Engineering

PROJECT DAY 2025
FACULTY OF ENGINEERING

INC24

FISH COUNTER AND WATER MANAGEMENT SYSTEM

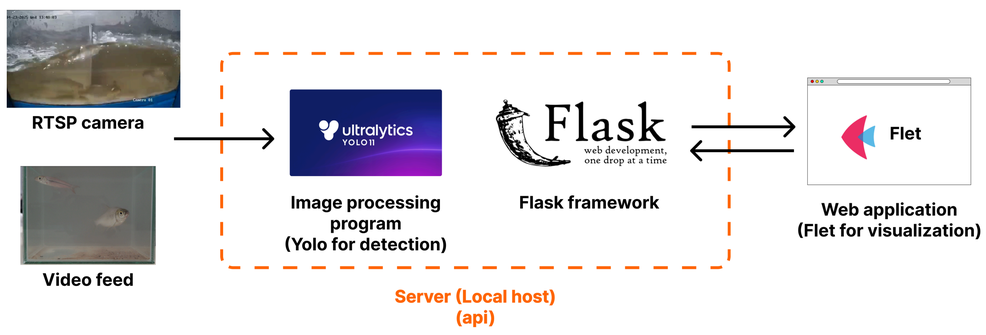
AUTOMATION ENGINEERING PROGRAM

Ronnakorn Auesoontornpanich, Supakorn Charamat, Vareenit Phongviroj
Advisor: Asst. Prof. Dr. Santi Nuratch

ABSTRACT

The Fish Counter and Water Management System aims to enhance aquatic ecosystem monitoring by providing accurate fish detection, classification, and environmental condition tracking. The project focuses on distinguishing visually similar species, namely Mad Carp and Thai Carp, using advanced deep learning models such as YOLOv11. An integrated system architecture involving an IP camera, Flask server, and web application was developed to process real-time video streams, detect fish, collect environmental data, and display the information through an intuitive dashboard. A Kalman Filter was employed to improve tracking accuracy and ensure reliable fish counting. Experimental results demonstrated promising accuracy, particularly for Thai Carp detection, though challenges remain for Mad Carp under certain conditions. This system contributes to sustainable water resource management by offering actionable insights for dam control, aiding in biodiversity conservation and enhancing resilience against environmental changes.

SYSTEM ARCHITECTURE



RTSP camera
Captures real-time video feed of the fish tank. The camera streams footage over RTSP (Real Time Streaming Protocol) directly to the server.

YOLOv11 (Ultralytics)
Identifies and localizes fish by drawing bounding boxes around them.

Flask API Server
Sends processed data to the frontend. Hosts RESTful endpoints that transmit:
- Fish count
- Fish types
- Timestamp
- Image/frame for review

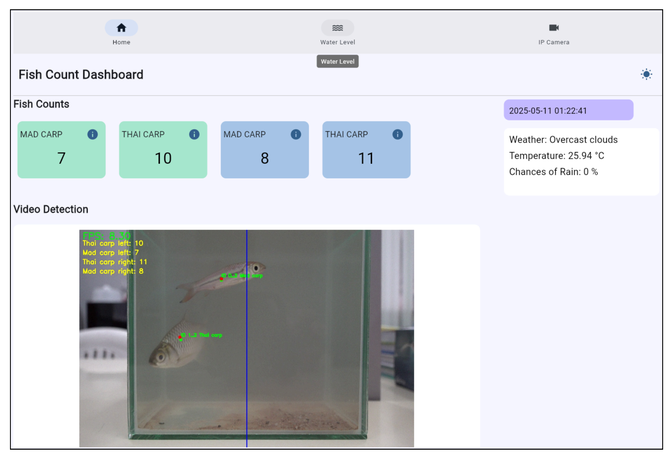
Flet Frontend App
Visualizes results in real time.
- Displays live count of each fish species
- Shows video preview
- Includes date, time, and system status
- Designed for operators to easily monitor the system

INTERFACE DESIGNED

Web application (built with Flet)

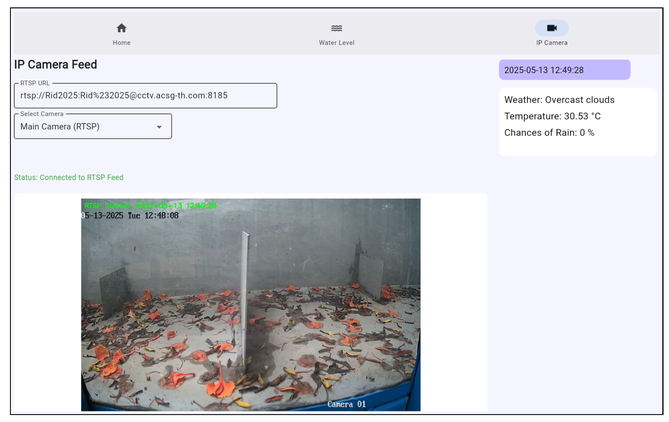
Home page:

- Real-Time Counter and fish distinguish.
- Live Video Stream with Bounding Boxes.
- Timestamping for Syncing Events.



IP camera page:

- Switch between video feed and main camera (real-time streaming protocol).



FISH TRACKING

Fish types

Thai Carp (Barbus gonionotus)



Mad Carp (Leptobarbus hoevenii)



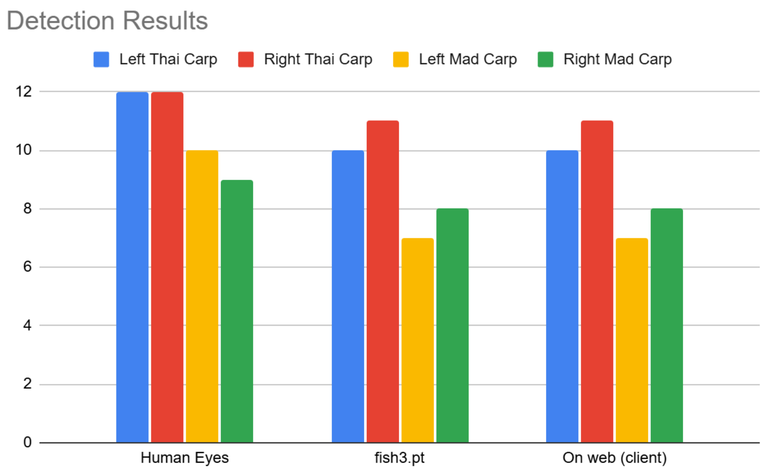
Kalman Filter

The Kalman Filter predicts each fish's next position based on its current location and movement, then updates that prediction using new detections. The Hungarian Algorithm matches these detections to existing tracks. Lost tracks are removed over time, ensuring smooth motion tracking and accurate counting.

DETECTION RESULT

Fish Counting Result From Main Video

Validation the result comparing with 3 method :
- Human eyes
- AI Detection (fisht3.pt)
- Web Output



Error Rate:

- Thai Carp: 8–16%
- Mad Carp: 11–30%

REFERENCES

Ultralytics. (2024). YOLOv8 & YOLOv11 Documentation; Welch, G., & Bishop, G. (1995). An Introduction to the Kalman Filter, University of North Carolina at Chapel Hill; RTSP Protocol. (2023). Real Time Streaming Protocol Overview; Flet. (2024). Flet Framework Documentation.