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- where quality and ethics matter

65
YEARS
1957-2022
Celebrating
Academic Excellence

Fish-detection in marine environment using deep-learning approach

Thanush A A
Research Project

Research area identified

- Research Area: Applied Deep Learning and Computer Vision

- Specific Research Area: Marine Analytics using Computer Vision

Problem Statement

- Due to the highly dynamic nature of marine environment, it is challenging to monitor and study ecological process

- Although comprehensive image and video data can be collected, the processing of image data in ecological context is mostly manual and therefore very labor-intensive

- As a result, only a portion of the available recordings can be analyzed which is greatly limiting the potential advances that can be made from these data streams.

Objectives

- To develop a system which is capable of automating the process of monitoring in marine ecosystem
- To enhance the computational efficiency and accuracy of object tracking model in marine environment
- To explore the various models and propose a deep learning model with higher accuracy

Expected Outcomes

- A program that is able to analyse the image/video input of marine ecosystem with a good accuracy and present some useful inferences

- A highly accurate and computationally efficient object detection algorithm

- A fine-tuned fish detection model with higher accuracy

Tools and Technologies proposed to be used

- Deep Learning
- Object Detection
- Computer Vision
- Image processing
- Pytorch/TFLite Framework

Literature survey (5 Recent Papers)

Title of the paper	Journal name and year of publication	Inference of the paper (bulleted points)	Q1/Q2/Q3/Q4
Temperate fish detection and classification: a deep learning based approach	Applied Intelligence, 2022	• 2 step deep learning approach a) Yolov3 with cnn architecture for detection b) CNN – SENet Architecture for classification • Fish4knowledge dataset (of temperate region fishes) • Metrics used for accuracy – IOU, MaP value • accuracies after training for the proposed model – 87.74% (without augmentataion) • 83% (with augmentation)	Q2
YOLO fish detection with Euclidean tracking in fish farms	Journal of Ambient Intelligence and Humanized Computing, 2021	• Proposed model – MSR YOLOv3 • Dataset – collected from their own setup (farm fishes) • Addition of MSR algorithm increased the performance of the yolov3 model	Q1

		Bream • Models proposed – SiamMask, Seq-NMS, and MOSSE • Metrics used – precision, recall, f1 score, mAP5.0 • Results mAp5.0: SiamMask, MOSSE – 78% Seq-NMS – 84%	
Accurate Fish Detection under Marine Background Noise Based on the Retinex Enhancement Algorithm and CNN	Journal of Marine Science and Engineering, 2022	• Dataset used – LIFEClef dataset • Proposed model – MSR-CNN model • Performs significantly better than other baseline models like RCNN, Fast-RCNN, Yolov3 • mAp of proposed model – 78.31	Q2
Deep neural network-based real time fish detection method in the scene of marine fishing supervision	Journal of Intelligent and Fuzzy systems, 2021	• Proposed model – Yolov3-tiny-mobileNET • To increase the speed of the algorithm in real-time object detection • Dataset – NCFM dataset • Missing detection or false detection can be	Q2

Tools and Dataset details

- Object detection model – Yolov5

- Computer Vision and Image Processing – Opencv module

- Dataset – Brackish water dataset (v4)
  - Publicly available
  - 6 classes – fish, small_fish, crab, shrimp, jellyfish, and starfish
  - Link: https://www.kaggle.com/aalborguniversity/brackish-dataset

Block Diagram

Department of Computer Science and Business Systems