

# IFish Farm: Monitoring and analysis of fish anomaly behavior in ubiquitous environment

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# Introduction 1/2

❑ Fish farming is very tedious and is of high **labor** cost. [1]

❑ Different tasks in fish farms:

- Disease control.
- **Water quality monitoring. (Ammonia)**
- Fish feeding.
- **Anomalies insides pond (Size, speed, color..etc)**

❑ We visited Fish Research Center “ مركز بحوث الاسماك ” at Suez Canal university in Ismailia governorate.

<i>Semi-intensive culture system</i>	<i>Common carp (Poland)</i>	<i>Indian carp (India)</i>	<i>Tilapia (C. Africa)</i>	<i>Monosex tilapia (Jamaica)</i>
Juveniles for stocking	2.0	44.2	8.0	27.3
Fertilizers	4.7	5.5	1.0	1.3
Supplementary feeds	43.8	0.3	17.7	55.9
Labour	30.0	32.9	67.1	9.1
Maintenance/repairs	8.2	0.3	1.2	1.5
Others	11.3	16.8	5.0	4.9
Total	100.0	100.0	100.0	100.0

Management cost of fish farms

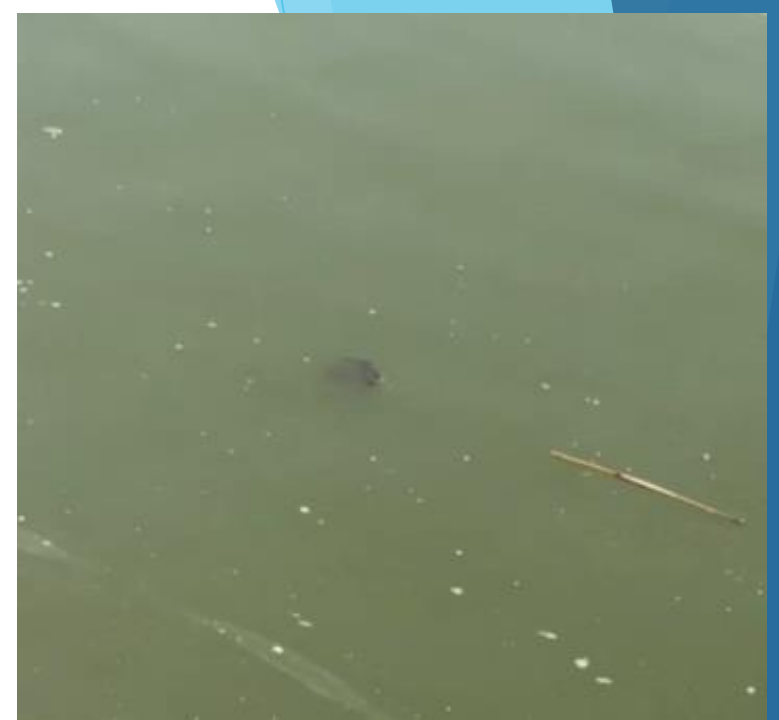


Our team at the fish farm

[1] <https://sciencing.com/list-7229120-disadvantages-fish-farming.html>

# Introduction 2/2

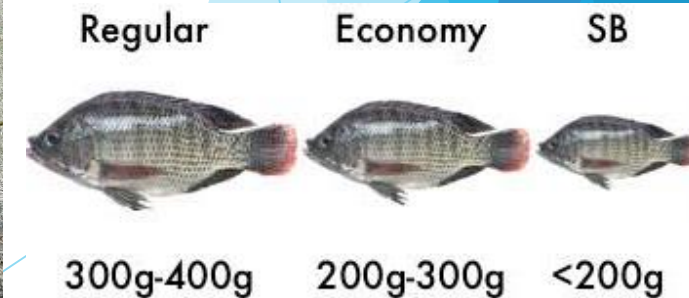
- ▶ Fish health is connected to the percentage of **ammonia** inside the pond.
- ▶ Frequent follow up of **fish sizes** in the same pond by the farmer.
- ▶ Change fish movement indicates :
  - ❑ Lack of oxygen.
  - ❑ Change of water temperature.
  - ❑ Unidentified causes.



-Video showing fish behavior



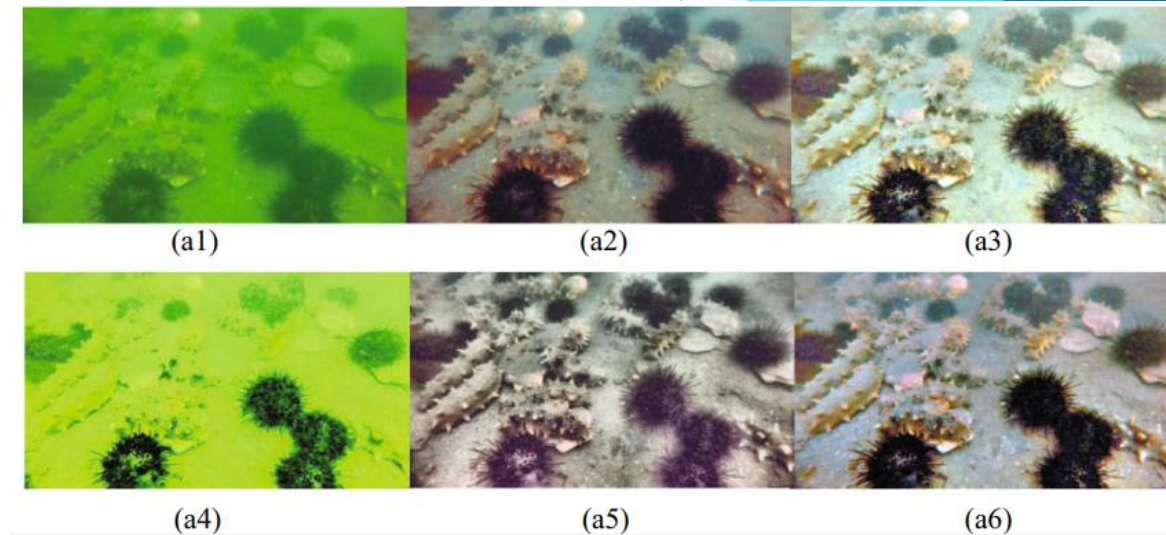
- Fish death due to ammonia



- Different Fish Sizes.

## Related Work (1/3): Enhancing images of unclear water.

- ❑ **Enhancing images** to remove water turbidity.
- ❑ Images is poor due to low contrast, color degradation and non-uniform illumination
- ❑ Proposed an enhancement method “IMSRCP”.
- ❑ IMSRCP gives faster results compared to other 4 algorithms (ACE , MSRCR, MSRCP, IGD).
- ❑ Processing speed needs to be improved in the future.

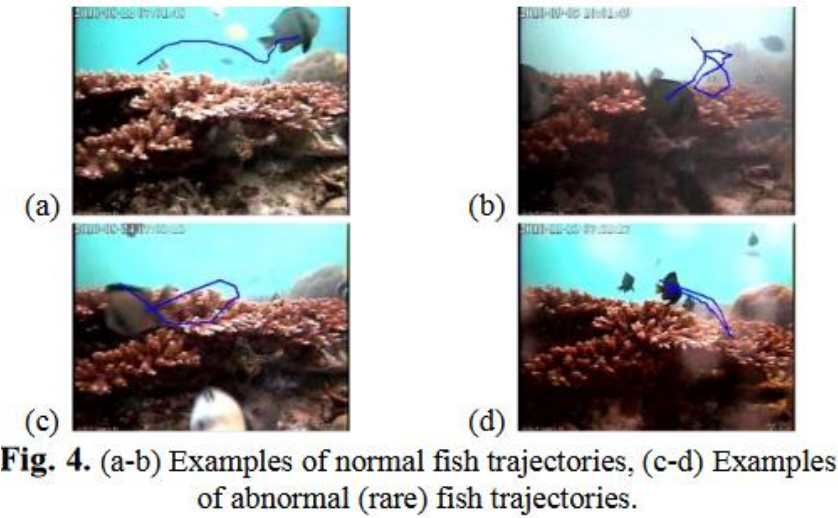


(a1) original image. (a2-a6) are the images enhanced by the ACE, MSRCR, MSRCP, IGD, and IMSRCP, respectively



## Related Work (2/3): Detecting abnormal fish trajectories.

- ❑ Video based detection of **abnormal trajectory**.
- ❑ Outlier detection on each cluster was applied.
- ❑ Gaps between trajectories cause difficulty in tracking fish which is needed in the feature extraction phase.
- ❑ The proposed method showed 13% false positive rate while other method in related studies achieved 91% false positive rate[2]
- ❑ As a future work ,hierarchical classification methods can be used.



[1] Beyan, C., & Fisher, R. B. (2013). *Detecting abnormal fish trajectories using clustered and labeled data*. 2013 IEEE International Conference on Image Processing.

[2] Automatic Fish Classification for Underwater Species Behavior Understanding, First ACM ARTEMIS, 45-50, 2010.

## Related Work (3/3): Real-time abnormal event detection.

- ❑ The aim is to develop an unsupervised method to **detect anomalous** events in crowded scenes.
- ❑ They used:
  1. Spatio-temporal descriptor (STACOG)
  2. K-medoids clustering algorithm
- ❑ the proposed method processing time is faster than the best competing method by 26%.
- ❑ The future work is to investigate how to detect and localize the anomalous regions of a scene.

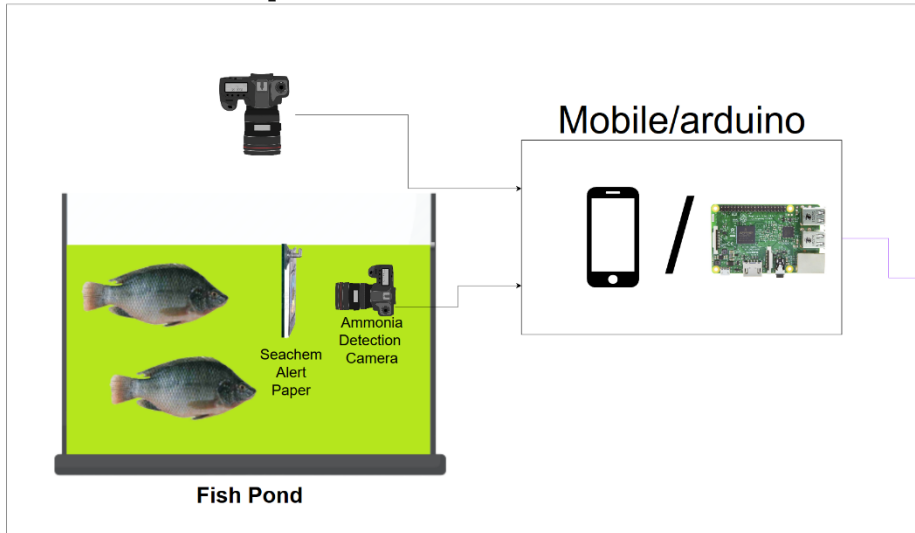


# Problem Statement

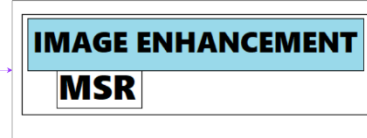
- **Reducing the time and costs needed to maintain a fish farm by offering real-time feedback on **water quality**, while predicting various causes of **fish behavior** in the pond at a decent **accuracy**.**

# System Overview

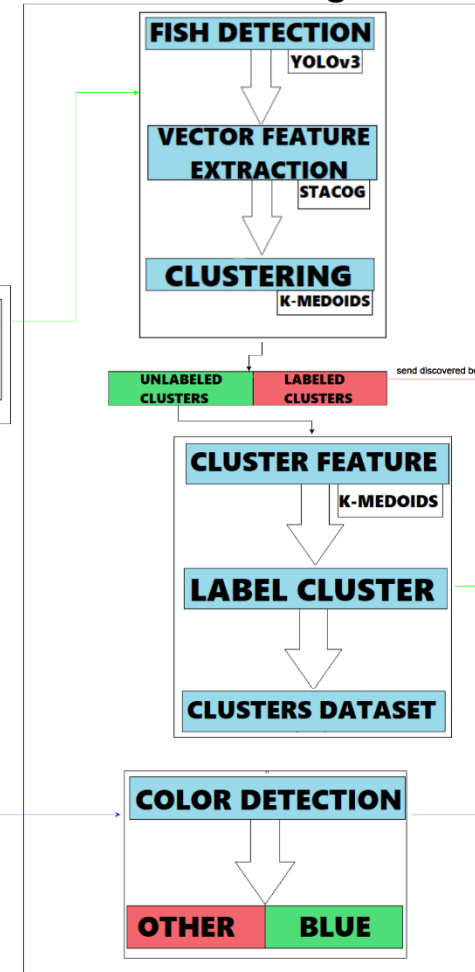
## Data Acquisition



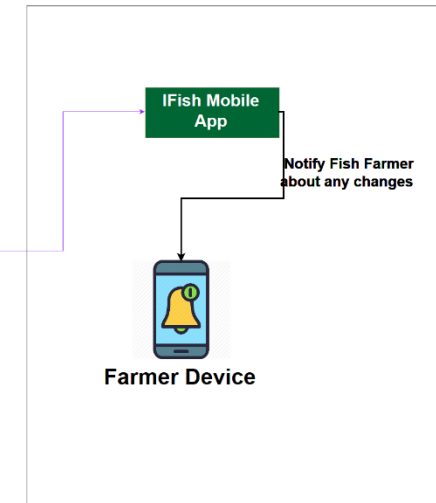
## Pre-processing



## Processing



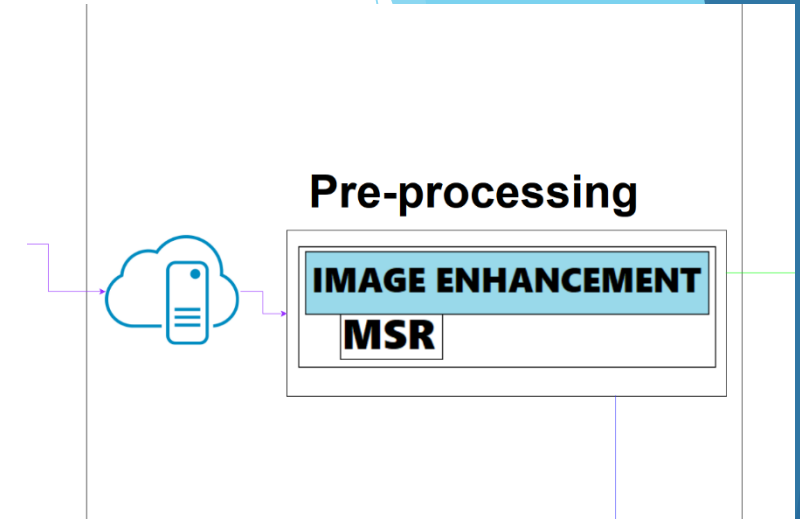
## Output





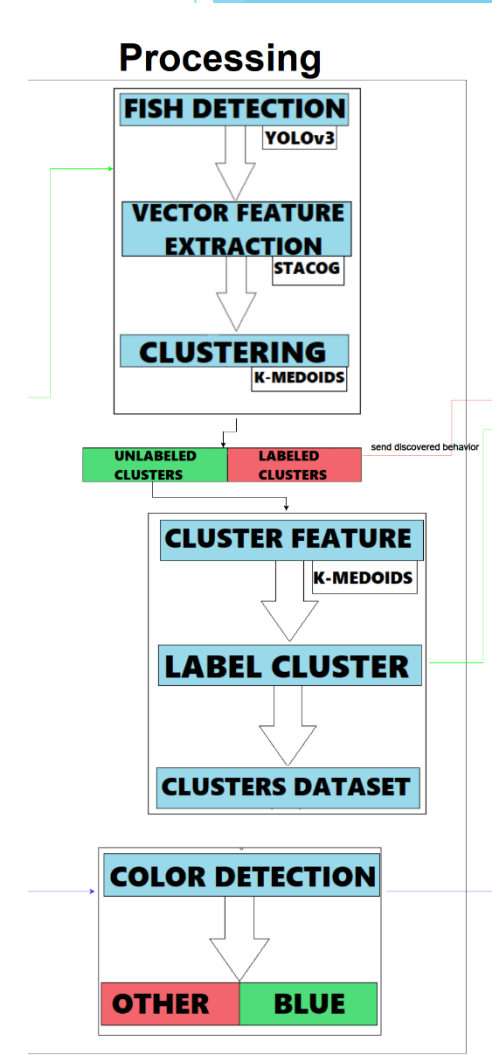
# Preprocessing

- ❑ Image/Video Preparation:
  - Proposed technique:
    - ✓ **Multi-Scale Retinex** algorithm is applied to enhance colors in the images.
    - ✓ **STACOG** descriptors for feature extraction.(Acceleration, velocity, etc..)



# Processing:

- ❑ Object Detection , speed and count calculation:
  - Proposed Technique:
    - ✓ YOLOv3
    - ✓ Optical Flow
- ❑ Clustering:
  - Proposed Technique:
    - ✓ K-Medoids



# Expected Results

- ❑ Enhanced color detection **accuracy** to reduce fish poisoning because of **toxic ammonia**.
- ❑ **Predicting** the causes of fish movement in the pond at a decent accuracy.
- ❑ **Fish transition** between ponds becomes more **easier** due to early **detection** of size change.

# Demo 1/2



-Our Setup for experiments



-Our model used in fish farm.

# Demo 2/2





**Any Questions?**

**THANK YOU**

