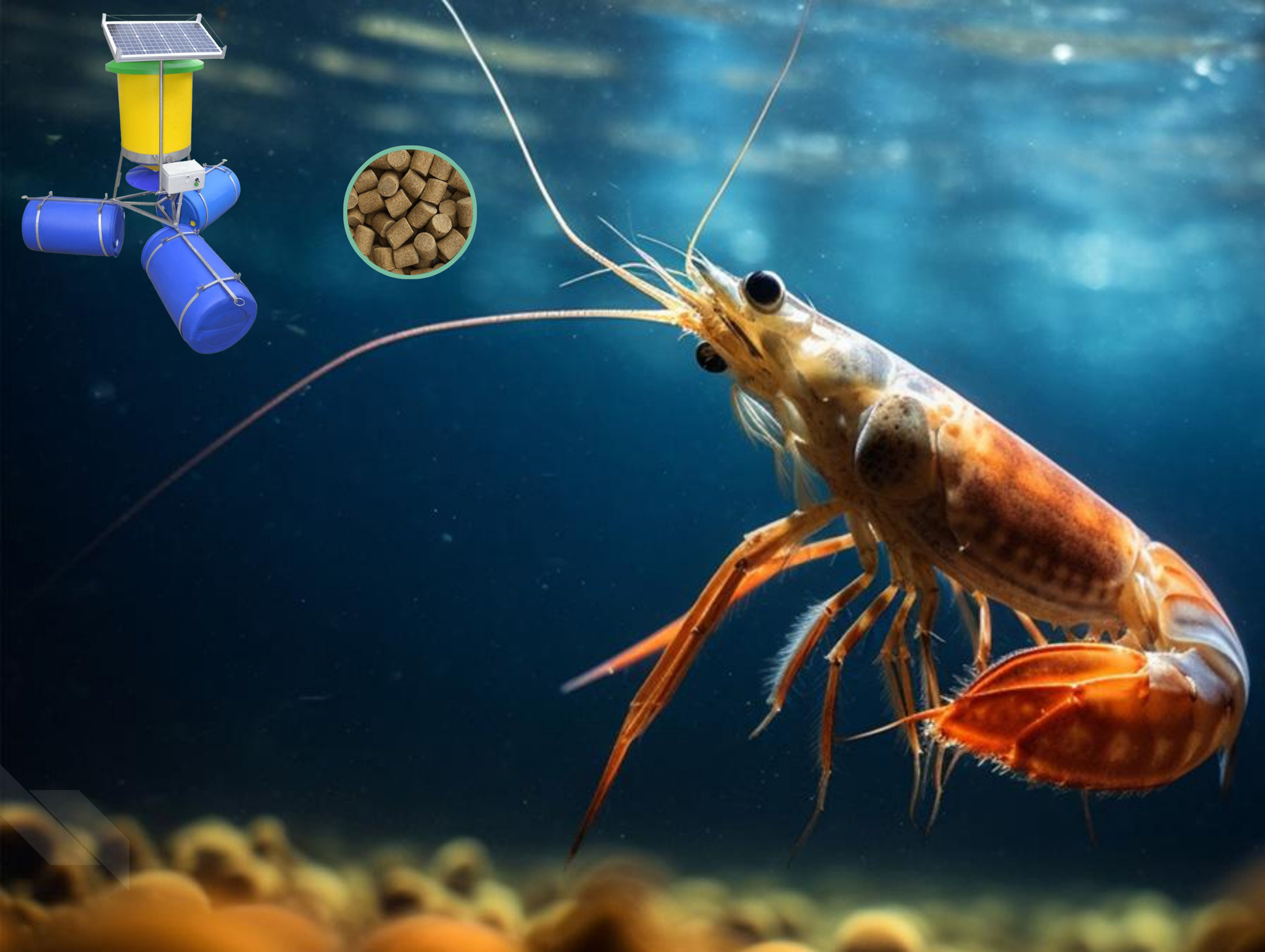


Automatic shrimp feeder based on object recognition and IoT sensing

Who we are

We are a dedicated team of entrepreneurs specializing in software, IoT, and technology for tuna fishing. Our focus lies in devising innovative solutions tailored to address specific requirements within the shrimp industry. Based in Ecuador and Canada, we are committed to provide innovative solutions on a global scale for shrimp farming.

The opportunity

The most sophisticated feeders, already used in Ecuador, Mexico, India, and some countries of Asia, are fully depending on hydrophone sensors, detecting a specific feature of the sound signal when the shrimp is eating the feed. These feeders come with two disadvantages.

1) These sensors are designed to detect only the sound of the shrimp while it is chewing food, serving as the sole criterion for determining the appropriate dosage

2) Noise disturbances in the ponds including paddlewheel aerators, pumps, motors, and rain can make it difficult to distinguish the shrimps' sound

The uneaten feeds will become a source of nutrients for microorganisms or bacteria and produce substances unfavorable for the growth of shrimp

Objective

By employing feeders outfitted with IoT sensors and object recognition algorithms, we aim to reduce uneaten feed by 10% and decrease mortality rates. This automation of the feeding process is designed not only to enhance efficiency but also to substantially reduce costs associated with pelletized shrimp feed, which currently represents around 50% of the total production cost.

Our proposal

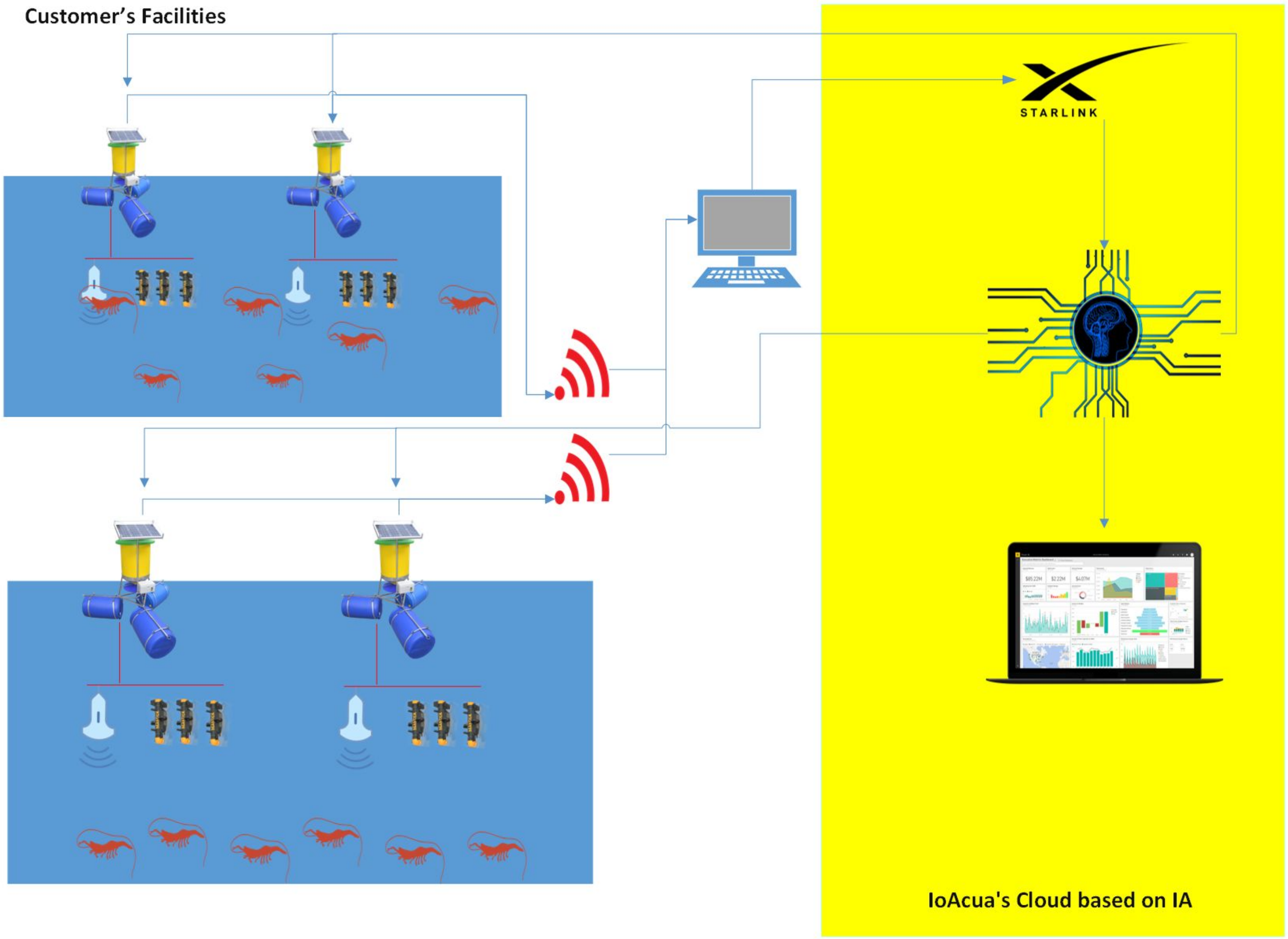
Develop an innovative shrimp automatic feeder based on the following components:

- A deep-learning algorithms trained detection model based on YOLOv4
- Spectral clustering algorithm
  - Both, used to recognize the profiles of the shrimps from the ultrasound images and mark their locations and quantity, will allow identifying:
    - Shrimp size
    - Locations
    - Quantity
    - Swim behavior
    - Residual shrimp feed pellets
    - Deceased specimens
- Ultrasound imaging technology
  - used to capture ultrasound images of the shrimps.
- IoT censoring system for measure:
  - Water temperature
  - Alkalinity or acidity (pH)
  - Salinity (TDS)
  - Water turbidity
  - Dissolved Oxygen (DO)

Diagramam

Data is harvested from shrimp ponds utilizing ultrasound imaging and a variety of sensors. This information is initially gathered and pre-processed at the customer's facilities.

Subsequently, the most pertinent data is transmitted to the cloud-based IoAcua platform. Here, it undergoes analysis through AI algorithms before being displayed on a cloud-based dashboard for easy viewing and interpretation



The challenge

- The quality of the images is still poor in shrimp ponds due to the shrimps' benthic behaviors and translucent bodies

- Significant accumulation of Total Suspended Solids (TSS) and organic matter, including plankton, leading to pronounced turbidity that diminishes water clarity by inducing light scattering and absorption (refer to images below).

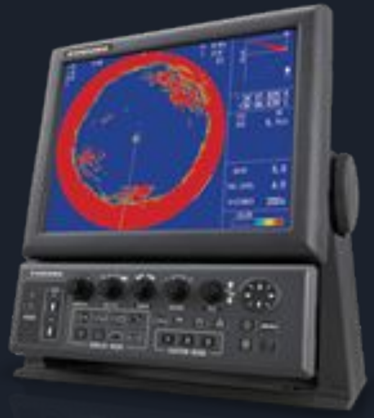
- Distinguishing feed pellets and deceased shrimps atop clay soils

What’s been done

Diverse tests have been conducted on-site to explore alternative methods of obtaining images from the ponds; however, the consistently high levels of turbidity have always posed a limitation.

Vertical fishing echo sounders were employed to identify locations with excellent outcomes in terms of live shrimps, but yielded unsatisfactory results when detecting leftover feed pellets and deceased shrimps. The following models were utilized:

- Echo Sounder OVA model ES-6000 with a 200Khz transducer
- Furuno model FCV-628 Echo Sounder with an advanced frequency transducer rated at 600 watts.



Underwater cameras equipped with infrared and LED reflectors were employed, but yielded unsatisfactory results due to the elevated levels of turbidity. The following models were utilized.

- Underwater professional camera SeaLife DC2000
- Handmade infrared cameras

Conducting on-site testing within a shrimp pond environment.

An illustrative image depicting a standard shrimp farm.

Testing on field

Turbidity on water

Turbidity on water

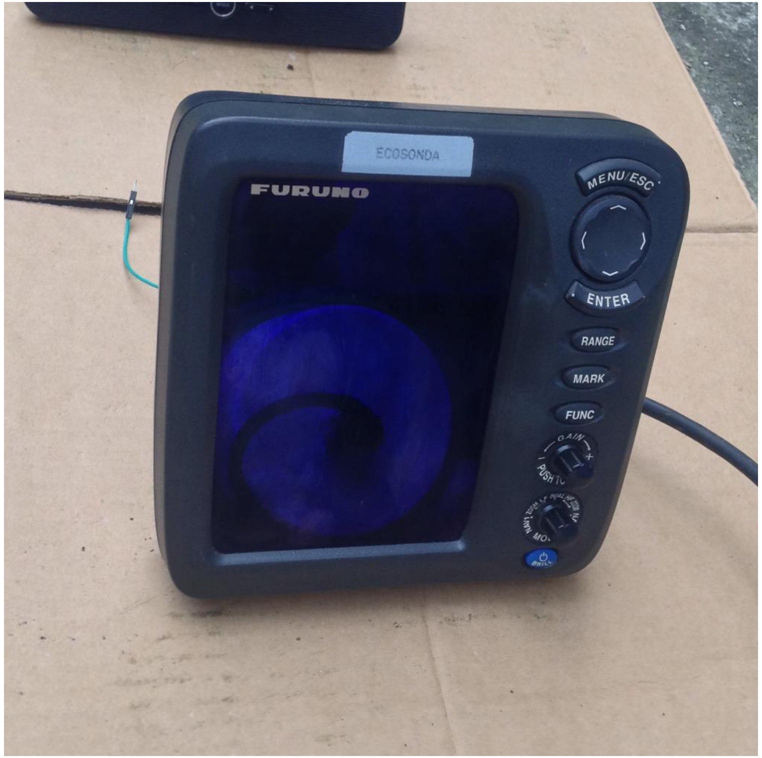
Turbidity on water

Equipment used

200Khz transducer

Echo Sounder OVA model ES-6000

Echo Sounder Furuno model FCV-628



Infrared cameras

Referential picture for camera sealife DC2000 with led reflectors

What’s next

We are open to forming a partnership with a provider that has already developed a proven technology capable of enhancing images underwater in environments with extremely high levels of turbidity. It is a key requirement to have access to the image/video data.

Once the imaging source technology was selected, we will commence the development of the object detection algorithm, along with the IoT platform.

The goal is to create our first prototype, which aims to secure scientific mentorship and financial backing from investors.

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