



# Connect Tech

## OSCAR - Smart Vision Safe Navigation



CASE STUDY

## Automated Marine Collision Avoidance System

### OVERVIEW

BSB Artificial Intelligence has created an intelligent vision system that utilizes AI to continuously monitor a boat's surroundings and determine the risk of colliding with floating objects or marine life. With either solo or limited crew on-board, sailing at nighttime or in rough conditions makes spotting objects in the boat's path very difficult. OSCAR uses AI to correctly identify objects in the water and determine the risk level of collision before alerting the crew.



# Connect Tech

## Eliminate collisions in open waters with vision AI based object detection system.

CASE STUDY  
EMPOWERING AI VISION



### Even small collisions while at sea can have disastrous consequences. A continuous monitoring system for collision avoidance preserves all lives at sea.

Since the Age of Discovery, ships have been travelling the world in search of undiscovered treasure and the promise of greater opportunity. With unpredictable weather patterns, limited visibility and lack of situational awareness, travelling by sea has historically been a dangerous endeavor. In modern times, sea travel has become significantly safer with the invent of radar, AIS, and sonar. Fleets of small vessels and racing boats take to the water and travel extensive distances every year, and many of those watercrafts rely on the crew to monitor for potential hazards in the water. While radar and thermal cameras have greatly increased a crew's ability to provide pre-emptive warnings to danger, these systems require constant vigilance and experience to determine the threat of obstacles - and smaller vessels simply do not have all of the above systems. Advancements in Artificial Intelligence has made boat and object detection a viable option for even small vessels and can be utilized in conjunction with onboard radar or AIS systems, or independently as a collision avoidance system.



#### The Perils of the Sea

The open water is filled with any number of potential hazards that can have deadly consequences to human and marine life. Thousands of lost shipping containers float on the ocean surface, providing a dangerous obstacle if a boat were to strike one - with the added excitement of whales, trees, and other debris that hide between the constant rolling waves of the ocean landscape. While significantly less important than the preservation of crew and marine life, with the average 60-70 foot boat coming with a price tag of \$1.5M, there is also a large financial impact to damages caused by sea collision.

Until recent years, no thermal or camera technology for collision avoidance existed. While thermal cameras have existed for years, the technology required constant human intervention to interpret if there was a risk of impact. Since a significant number of smaller vessels were manned by either a skipper alone or a small crew, nighttime travel proved to be a dangerous occupation. Crews would survive on extremely limited sleep, and manually scan the pitch-black waters for the proverbial iceberg ahead.

For sailors, the thrill of navigating open waters on a small vessel is exhilarating, but it does present a danger to both yourself and marine life. Collisions happen every day at sea, and you typically do not see the danger until you're on top of it. OSCAR provides an ever-present watchful eye to ensure the safety of the crew, the boat, and all living creatures you share the ocean with.

- Raphaël Biancale, CEO & CTO, BSB Artificial Intelligence

#### The Crew Member Who Doesn't Sleep

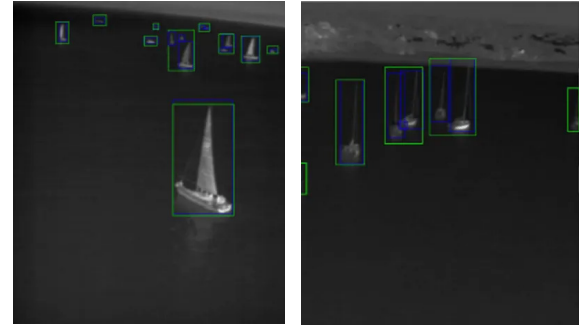
Raphaël Biancale, an automotive engineer and sailing enthusiast, decided to utilize his expertise gained in developing intelligent car systems and transfer the knowledge to a collision detection system geared towards smaller vessels. BSB Artificial Intelligence (BSB-AI) was formed and developed OSCAR – the world's first real-time collision avoidance system powered by AI.



## Deep Learning in the Deep Sea

The system continuously monitors the boat's surroundings, correctly identifies the objects around it, and tracks the object's movements in real-time. If there is a true risk of collision, the OSCAR system alerts the crew to the potential danger. Without the risk of false or nuisance alarms, the crew can be confident in OSCAR's ability to escalate real threats for immediate intervention.

The Artificial Vision and Intelligence program is where OSCAR's benefits are fully realized. Similar to the challenges facing autonomous vehicle navigation software, there are many extraordinary factors that play into calculating actual threats in real-time while travelling on water. With the constant rolling pitch of waves, both the position of the boat and movement of debris needed to be synchronized for true collision threats. For that purpose, OSCAR has an on-board inertial measuring unit (IMU) that allows the system to synchronize the image feeds and compensate for the movements of waves.



## System Description

OSCAR uses sophisticated deep learning and neural networks that have been trained with thousands of images in order to recognize the horizon, distinguish waves, and water reflections. OSCAR can correctly identify and distinguish between mammals, boats, and floating objects in order to correctly identify the objects behavior so they can be tracked.

### OSCAR is comprised of three main components:



#### Vision Unit

Houses two on-board FLIR BOSON thermal cameras (320 or 640) and an RGB camera, and is mounted on the boats mast for full horizon visibility

#### Calculation Unit

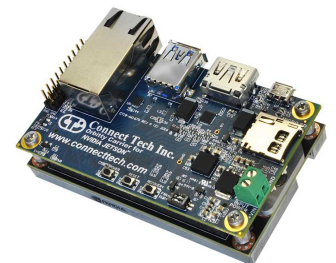
Powered by the NVIDIA Jetson TX2 housed in Connect Tech's Orbitty carrier, this unit processes the images provided by the Vision Unit in real-time, and alerts crews to potential collision threats

#### Visual Display

Provides a real-time view of what the vision unit is seeing and the threats the system has identified

Thermal cameras are critical for correct identification of objects in a boat's path, especially during the night. OSCAR uses thermal imagery for automatic object detection up to 1.5km in the distance, and captures three frames per second. With a digital zoom of up to 4x, sailors can manually review footage in real-time with stunning clarity.

When the BSB-AI team was developing OSCAR, they recognized the need for a high powered image processing compute system that could withstand weather extremes. After selecting the NVIDIA Jetson TX2 GPU to power the calculation unit, BSB-AI chose the Connect Tech Orbitty carrier to facilitate the camera inputs in a rugged, extremely small foot print unit. With off-the-shelf electronics, BSB-AI was able to house everything in a weather proof enclosure and deploy for sea voyage rapidly.



## ABOUT CONNECT TECH INC.

Connect Tech Inc. is NVIDIA's largest global embedded hardware partner offering a wide array of NVIDIA® Jetson™ solutions, as well as embedded solutions for a variety of industry standards including COM Express, SMARC, and more. With over 35 years of embedded computing experience, Connect Tech's range of proven technology includes complete embedded systems, carrier boards, thermal solutions, and more. With in-house design and manufacturing services, Connect Tech can provide fast turn-around of custom design services, taking you from development to deployment in record time.



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