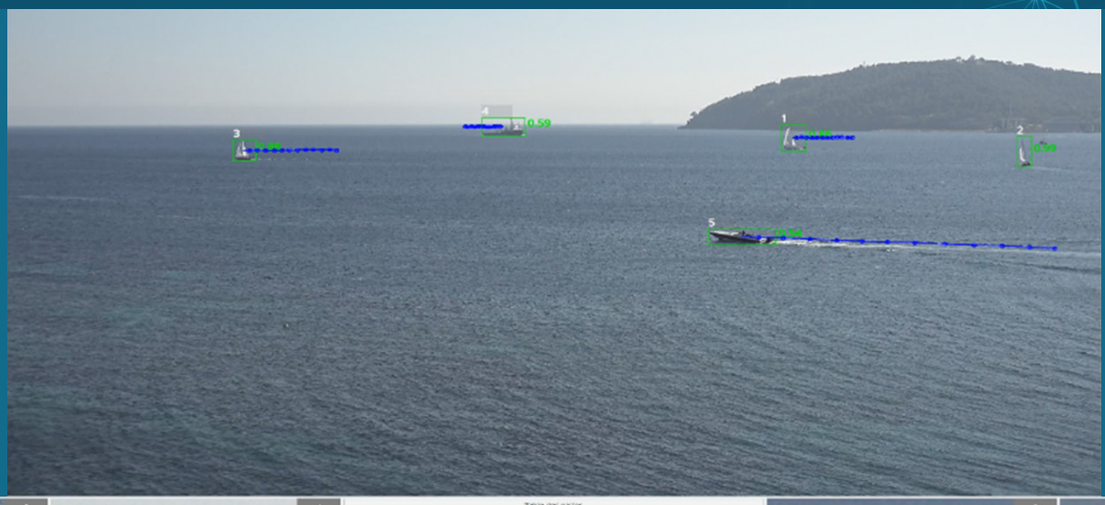
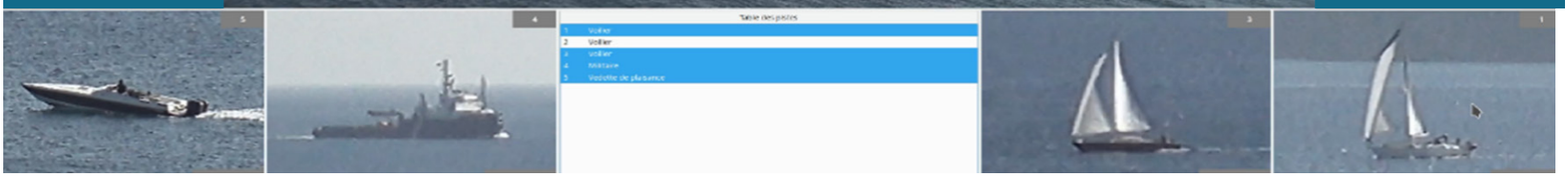
TIAMAT

Image processing for aerial and maritime surface object detection, track and automatic recognition





OBJECTIVES

Provide algorithmic solutions based on artificial intelligence for aera surveillance in order to:

- **Improve the performance of threat detection systems to:**
  - Combat systems (military use)
  - Security systems for industrial and port sites (civilian use)
- **Automatically detect, recognize and track:**
  - Ships classes such as asymmetric threats (go-fast, speed-boats, etc.)
  - UAV classes
- **Determine kinematic and class information for tracking**
- **Provide decision support** by providing a table of georeferenced/recognized tracks for a C2 (Command&Control) system

DEVELOPED INNOVATIONS

- Development of an image processing chain for all image resolutions (up to 4K)
- Development of an automatic detection module based on spatio-temporal processing of image information and selection of plots according to their belonging to an object class
- Automatic recognition processing based on a convolutional neural network approach and temporal analysis
- Innovative algorithm for analyzing and processing track crossings/occlusions
- Optimization of performance by contextualization of processing depending on the location of deployment (weather and environmental conditions, classes of objects to be monitored, ranges of surveillance zones, etc.)
- Development of an analysis and results display model integrating the possibility of selecting tracks for thumbnail, digital zoom and history

RESULTS

- Capacity of image processing up to 4K resolution (allowing in particular the increase of recognition ranges)
- Detection of boats of various sizes and UAV types (detection rate close to 100%)
- Table of georeferenced tracks, for sharing with a C2. Automatic recognition of maritime and aerial objects according to the chosen classes (configurable, recognition rate greater than 90%)
- Processing of 2 types of video streams: real-time streams and pre-recorded sequences (for performance analysis)
- Configuration of algorithms according to the location of deployment (in particular training of the AI according to the needs and types of object specific to the area considered)
- Added statistical information for intuitive understanding of the veracity of class recognition information
- Validation using measurements along the coast and in port areas (for maritime surveillance), in Brittany and the Mediterranean (France)

Work in progress

- Multispectral analysis from visible and infrared images
- Integration of adaptive tracking processing for optimization of track tracking based on their movement dynamics
- Processing of large detection/recognition ranges taking into account atmospheric attenuation
- Embedded processing

APPLICATIONS

DEFENSE :

- Maritime and coastal surveillance of sensitive sites : defense bases, isolated installations, ...
- Fight against asymmetric threats for surface vessels (in port, at anchor, in navigation near the coast, etc.)
- Decision support tool for the fight against asymmetric threats
- Semaphore
- UAV

CIVIL :

- Protection of coastal infrastructure (oil terminals, freight or passenger embarkation areas, etc.),
- International piracy
- Contribution to sea rescue
- Customs surveillance: recognition of wanted vessels, display of suspicious behavior
- Monitoring, research in fresh waters: rivers,lakes, lacustrine or lagoon areas
- UAV

DGA MARINE NATIONALE
avec le soutien de la DGA et de l'EMM

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