Sailing Unmanned Vehicle for Marine Monitoring (MMSUV)

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NeuroPSI

CeSigma

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TERRE-MER-VEILLE

Bioacoustics consulting

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Data project

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INTRODUCTION

Project Title

Sailing Unmanned Vehicle for Marine Monitoring

Priority Area

PA3: Automation, sensors, monitoring and observations

Subtopic

PA3: Sensor developments

Project Duration : 24 months
Total Costs: 361.000 €

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INTRODUCTION

CONSORTIUM

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Partners

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Elittoral (Spain) is a marine consultancy company active in characterization, assessment and control of the coastal zone. It offers specialized services of high added value to all the projects whose development is related to the marine, maritime and coastal sector.

Its services include the acquisition of data and/or samples from the marine environment (water, sediment and organisms), their later interpretation in the laboratory and the simulation of processes present in the coastal zone.

In addition, elittoral holds certifications for quality control and environmental systems according to ISO Standards, confirming the good practices when carrying out the wo

The NeuroPSI lab CNRS UMR 9197 (France) was created in 2014, as a multidisciplinary Research Institute, specialized in bioacoustics and underwater monitoring

Developing original physics-based machine learning methods to answer concrete questions from bioacoustic communities, especially dedicated to the observations of cetacean species.

This team works designing innovative technological tools to process ocean big data data associated, including underwater 360 video, hydrophone arrays, different aerial drones in order to provide ponctual observations or line transects

CeSigma Signals & Systems (France) is an electronic engineering company with a long experience in embedded hardware and software product development.

The company has been involved in developing satellite communication products (such as LNB and digital reception head ends), as well as RF and optical instrumentation.

CeSigma is currently developing an autonomous high accuracy data acquisition system, designed for industrial and scientific sensors, enabling ultra low power operation in extreme weather conditions.

CeSigma
Signals & Systems

Specialized in signal processing and acoustic monitoring of marine mammals, Terre-Mer-Veille vocation is to offer expertise in the fields of underwater acoustics, bioacoustics research, marine mammals studies. The company is also consulted on the more general question of data collection in the marine environment and their exploitation.

Backed by a network of varied experts, Terre-Mer-Veille works for researchers, private companies and associations. More details are available on the following url: https://terre-mer-veille.com/

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Abstract

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Context

The environmental impact from maritime traffic is a growing concern of researchers as well as of marine environment managers. Noise in one of the main challenges to be solved regarding marine environment.

Policy and legal regulations are working on this concern:

- EU Marine Strategy Directive (MSFD) identifies marine noise as one of the descriptors of the environmental state of the seas.
- The Report of the Subgroup Commission on Submarine Noise and Other Forms of Energy (2012) cites "a better understanding of the impacts of noise on biota is needed, in order to help Member States better identify the good ecological state of the seas"

Today more attention is paid to the all noise in the marine environment, including regular maritime traffic and other maritime activities.

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Objective

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Objective

MMSUV project aims to develop a technologically advanced sailboat, autonomous by integrating low-cost, efficient and environmentally friendly technologies that provide versatile solutions to surveillance needs regarding maritime traffic, marine and coastal management, industrial or military activities and for scientific purposes

The **main task** of the project is to **develop** an unmanned surface vehicle (**USV**), **equipped with** a series of **sensors**, in particular **hydrophones**, and **to** test / demonstrate its use for marine **noise monitoring**. The possibility of placing hydrophones in a place of interest without sending a manned vessel allows a low-cost response to the problems or needs of the scientific community and managers of marine areas, especially those far from the coast.

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Results

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Results

Result 1

Developed design of an unsinkable, self-erecting SUV, capable of standing harsh conditions during long duration autonomous mission at sea.

Result 2

Application of the acoustic data processing to identify, classify and quantify the sources of noise in underwater environment (descriptor 11 of MSFD).

Result 3

Combining acoustic data with visual data from cameras on board of SUV and the multiparametric probe to allow multimodal detection of processes and phenomena observed in the surveyed area.

Result 4

Developed and integrated protocol for collision avoidance.

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Work Packages

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Workpackages

WP 1

SUV development and manufacturing.

- 1.1 Definition of list of sensors
- 1.2 SUV design, adaptations for integration of selected sensors
- 1.3 SUV manufacturing
- 1.4 Control system integration and SUV testing

WP 2

Robotics and Artificial Intelligence of the system.

- 2.1 Defining a protocol for obstacle avoidance
- 2.2 Provision of programs and software to respond to the processing of the applied technologies and sensors
- 2.3 Necessary adaptation to the final prototype form
- 2.4 Test of the protocols and sensors on a G2 prototype

WP 3

Equipping the SUV.

- 3.1 Sensing of the anthropogenic impacts
- 3.2 Adaptation and integration of the selected sensorsTema 3
- 3.3 Energy introduction (acoustics) and sound level
- 3.4 Monitoring of the biodiversity

WP 4

Development of software solutions .

- 4.1 Development of software solutions for analysis of acquired results. Writing the scientific and technical reports
- 4.2 Development of software solutions for signal processing. Writing the scientific and technical reports
- 4.3 Development of software solutions dedicated to the market

WP 5

Test at sea

- 5.1 At the Marine Reserve of Archipielago Chinijo, North of Lanzarote (Canary Islands, Spain)
- .5.2 In the marine area El Confital y La Isleta. Zona ZEC Red Natura 2000, Gran Canaria.

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Workpackages

WP1

SUV development and manufacturing .

Objective: Development and building of SUV of 3rd generation A - TIRMA series: A -TIRMA G3.

- Activity 1.1: Confirmation of the list of sensors to be included and its requirement for the SUV design.
- Activity 1.2: SUV design. Adaptations for integration of selected sensors. For example, integration of two hydrophones on the hull of the SUV, such that stereo PASSIVE acoustics can be used to compute azimuth of the targets.
- Activity 1.3: SUV building.
- Activity 1.4: Control system integration and SUV testing.

WP2

Robotics and Artificial Intelligence of the system.

Objective: The objective of WP2 is to provide and manage the internal electronic instrumentation and the computing systems necessary to get a vehicle autonomic and safe.

. Activity 2.1: Defining a protocol for obstacle avoidance.
Activity 2.2: Provision of programs and software to respond to the processing of the applied technologies and sensors.
Activity 2.3.: Necessary adaptation to the final prototype form.
Activity 2.4: Test of the protocols and sensors on a G2 prototype.

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Workpackages

WP3

Equipping the SUV with sensors and on board instruments. .

Objective: Equipping the SUV with sensors and tools required for data and sample collection.

- Activity 3.1: Sensing of the anthropogenic impacts. Measurements in situ and sample collection for further laboratory analysis of MSFD descriptors
- Activity 3.2: Adaptation and integration of the sensors selected in WP 1 activity 1.1.
- Activity 3.3: Energy introduction (acoustics). Sound level measurements.
- Activity 3.4: Monitoring of the biodiversity. Embedded analysis of bioacoustics activity. Acoustics and photographic data collecting for further analysis.

WP4

Development of software solutions..

Objective: Development of software solutions and analysis .

Activity 4.1: Development of software solutions for analysis of acquired data. Presentation of current results through production of a scientific and technical reports.
Activity 4.2: Development of software solutions for signal processing. Presentation of the results of analysis of collected data.
Activity 4.3: Development of software solutions dedicated to the market.

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Workpackages

WP5

Test at sea (Spain).

Objective: Tests at sea in cooperation with private and public entities and stakeholders.

- Activity 5.1: Sea trials at the Marine Reserve of Archipielago Chinijo , North of Lanzarote (Canary Islands, Spain) in collaboration with the
- regional government's Environment Protection Agency.
- Activity 5.2: Sea trials in the marine area El Confital y La Isleta. Zona ZEC Red Natura 2000. Gran Canaria .

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