



STAMAR

ICT & Maritime innovation

ICT Capabilities for maritime applications in the Algarve

1. TECHNOLOGICAL CENTERS

1.1 CCMAR– CENTRE OF MARINE SCIENCES



Description:

CCMAR is a non-profit organization of the University of Algarve and dedicated to R&D in the Marine Sciences.

CCMAR fields of expertise cover molecular biology, genetics, endocrinology, biophysics, organic chemistry and ecology of marine organisms. R&D and training activities have been applied to the development of aquaculture, biotechnology and environmental technologies for the study and management of marine resources and ecosystems.

CCMAR serves as infrastructure for students and scientists from universities and institutes throughout Europe and is part of European initiatives providing user access to special facilities and biological models. CCMAR serves as a technological platform for innovative companies and has a strong outreach activity with schools and the wider public.

Main research lines:

- Marine biodiversity and ecosystems
- Environmental chemistry and toxicology • Aquaculture

Research groups:

- Aquaculture Research Group (Aquagroup) Biogeographical Ecology and Evolution (BEE) Biophysics (B)
- Marine Biotechnology (MarBiotech)
- Cellular and Inorganic Biochemistry (CIB)
- Comparative Molecular Endocrinology (CME)
- Ecology and Restoration of Estuarine and Coastal Habitats (ECOREACH) Environmental Technologies
- Functional Biochemistry and Proteomics Group
- Group of Synthesis and Organic Reactivity
- Fisheries, Biodiversity and Conservation (FBC)
- Fisheries Biology and Hydroecology Research Group (FBHRG)
- Marine Plant Ecology Research Group (ALGAE)
- Metallomics and Cellular Biochemistry (MCB)
- Microbial Ecology and Evolution
- Molecular Biology of Marine Organisms (MBMO)

Contacts:

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1.2 CEOT-CENTRE OF ELECTRONICS, OPTOELECTRONICS AND TELECOMMUNICATIONS



Description:

The CEOT research group is a multidisciplinary research unit acting mainly within the information and communications technology areas; specifically in optical communication networks, and organic electronics subfields. The research has also links with biosensing and optical bio/medical devices.

Main research lines:

- Non-linear Electronics and Optoelectronics
- Bio-inspired methods in wireless sensor networks
- Intelligent sensing in biology
- Diffuse Optical Tomography and Spectroscopy
- Near Infrared Diffuse Reflectance Spectroscopy
- Light Scattering analysis
- Optical and Impedance Multimodal Spectroscopy
- Development of novel optoelectronic devices with the integration of lasers, modulators and detectors with negative resistance components based on the tunneling quantum effect for telecommunication and information processing applications.

ICT offer for the maritime sector:

- Communications (including data acquisition and transmission)
- Data management (including storage and processing) and visualisation data analysis and modelling (including geoinformatics)
- Materials/fabrication/assembly
- Sensors/instrumentation/electronics
- Software engineering/development

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1.3 CIMA- CENTRE FOR MARINE AND ENVIRONMENTAL RESEARCH



Description:

The CIMA is a multi-disciplinary unit that explores the connections between environments, processes and human populations using scientific methods coupled with state-of-the-art modelling techniques. Apart from research, CIMA places a strong emphasis on training and education, as well as providing consultation services, digital applications and scientific information to the scientific and public domains.

Main research lines:

- Marine and transitional aquatic processes
 - Chemical and physical system connectivity
 - Microbial dynamics and food webs
 - Models and measurements of transfer phenomena
 - Ecohydrology in transitional zones
- System management and integrative activities
 - Integrative system modelling
 - Catastrophic events - forecasting and mitigation
 - Governance strategies for coastal and marine areas
- Multiscale geological processes across the ocean margins (Geo)
 - Integrative system modelling
 - Catastrophic events - forecasting and mitigation
 - Governance strategies for coastal and marine areas
- Hazards assessment and technology for a changing environment
 - Stressors - old and new threats
 - Biomarkers and environmental quality indices
 - Triggers of algal blooms
 - Technology for energy harvesting

ICT offer for the maritime sector:

- Autonomous system for water quality and current monitoring
- Exploring data tools
- MATLAB- based framework tool for display and manipulation of a large number of grid/images formats.
- SIMPATICO- system for real-time continuous water-quality and current velocity monitoring

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1.4 CINTAL - CENTER OF TECHNOLOGICAL RESEARCH



Description:

Cintal associates are the Universidade do Algarve, a public University, Rolar a local company acting in the area of automatic control and energy and INETI, a government research laboratory located in Lisbon.

As a contract research organization CINTAL provides a link within the innovation chain between fundamental research as a source of knowledge and practical application as the use of knowledge which can be commercially exploited.

ICT offer for the maritime sector:

- Ocean Acoustic Exploration
- Vector Sensor System for Ocean Exploration
- Cooperative Glider Navigation and Acoustic Tomography
- Acoustic-Oceanographic Buoy (AOB - system)
- Management of scientific projects
- Consultancy in underwater acoustics
- Advanced courses in underwater acoustic

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Table 1- Sectorial targets

	Aquaculture	Coastal tourism	Environmental monitoring	Fisheries	Marine renewable energy	Maritime services	Oil & gas	Security	Shipbuilding	Transport & shipping	Water management	Other market areas
UNIVERSIDADE DO ALGARVE												
CCMAR	X		X	X							X	X
CEOT		X	X	X		X		X		X		X
CIMA			X	X		X					X	X
CINTAL			X			X	X			X	X	X

2.COMPANIES

2.1 MARSENSING LDA - MARINE SENSING AND UNDERWATER ACOUSTIC TECHNOLOGIES



Description:

MarSensing has as primary objectives the development of technology, performance of services and consulting in underwater acoustics. The development of technology comes from the experience which the team has gained through the development of various specialized equipments like the Acoustic Oceanographic Buoy (AOB). The services include field acquisition of underwater acoustic signals in scientific sea-trials, ocean noise measurements and develop solutions in underwater acoustics.

Products:

- Self-recording Digital Hydrophone
- High and Low Frequency Transducers
- Underwater Speakers

Services:

- Monitoring of marine noise
- Environmental Impact Assessment
- Characterization of propagation media
- Acoustics Modelling
- R&D in marine acoustics

ICT offer for the maritime sector:

- Communications (including data acquisition and transmission)
- Data management (including storage and processing) and visualisation data analysis and modelling (including geoinformatics)
- Sensors/instrumentation/electronics
- Software engineering/development

Contacts:

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2.2 EASYSENSING



Products/Services:

- Create and manage Wireless Sensor Networks (WSNs) to transmit data and sensor information, without communication costs, therefore benefiting decision making and process control applications
- Create and/or upgrade electronic instrumentation, by using WSNs, granting data transmission capacity without communication costs
- Store, manage, and allow real-time access to data and sensor information received via WSNs
- Adequately employ computational intelligence techniques to provide forecasting services related to data or sensor information received via WSNs or other means and perform intensive data processing and/or mining as required by specific applications or to solve complex problems
- Establish partnerships with Universities and other relevant R&D institutions in order to promote and execute research and technological development required to the advancement of fields of interest

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3. TECHNOLOGIES

- **DIGITALHYD SR-1 - A SELF-RECORDING DIGITAL HYDROPHONE (MARSENSING)**
- **DIGITALHYD TP-1 -DIGITAL ETHERNET HYDROPHONE (MARSENSING)**



Description:

DIGITALHYD SR-1 – A SELF-RECORDING DIGITAL HYDROPHONE

The digitalHyd SR-1 is an autonomous recording device designed for user-friendly operation in underwater acoustic signal acquisition activities. Its compact construction and functionality allows for the implementation of efficient measurement strategies, thus, avoiding the requirement of larger operational human and material resources for deployment and recovery. The configuration of all parameters is performed through a USB interface with access compatibility from various types of operating systems.

DIGITALHYD TP-1 -DIGITAL ETHERNET HYDROPHONE

The digitalHyd TP-1 is an acoustic acquisition device designed for real-time streaming of digital data for remote storage, processing and/or visualization. This device has internal processing capabilities allowing, alternatively to stream results such as spectral analysis. The TP-1 hydrophone is ideal for integration into monitoring buoys or readily existing systems, or it can be connected directly to a computer.

Applications in marine sector:

Underwater Noise Monitoring; Bio acoustic of Marine Mammals; Underwater Acoustics Research; Underwater vehicle payload.

More Info:

www.marsensing.com

● ACOUSTIC OCEANOGRAPHIC BUOY (AOB) (CINTAL)



Description:

The AOB addresses the requirements of a drifting acoustic recording platform with surface expression. This surface expression allows for online data transmission to shore. The acoustic and non-acoustic sensors are vertically positioned in the water column which is preferred set up for sea bottom (geophysical surveying) and water column (oceanography) observation. This observation may be active using purpose operated sound sources (fixed or mobile) or using ocean noise (surface noise or shipping).

Application on Marine Sector:

Underwater communications, marine mammals monitoring, fisheries, shipping, management, ocean tomography, bottom estimation, and others.

More info:

www.siplab.fct.ualg.pt

● SUBSURFACE TELEMETRY UNIT (STU) (CINTAL)



Description:

STU is a bottom moored acoustic recording unit via a fiber optic bottom real time data link and power supply. It can be equipped with a transmit modem for full underwater network integration.

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it can also be used suspended from a surface platform (like a ship) serving as relay for data exchange and supply.

In those configurations the system can be operated for long periods of time.

Alternatively the STU could be used as a stand alone self-recording system in which case it should have surface expression for data link and battery exchange.

In that regard the STU is one of the most versatile systems for ocean exploration and networking.

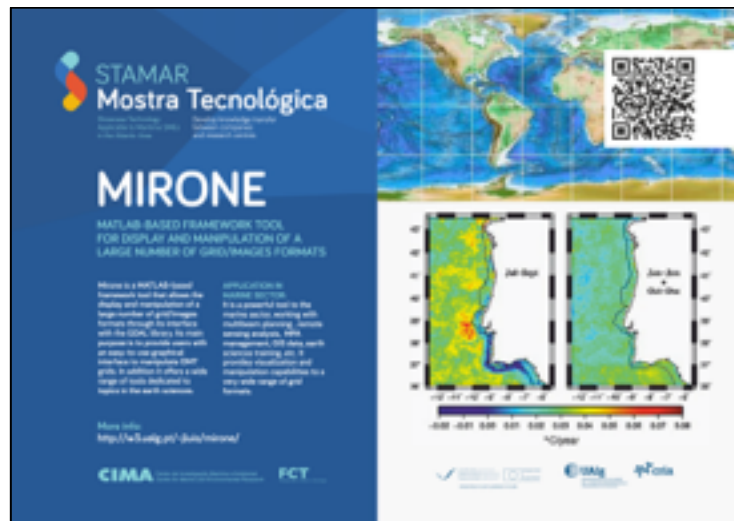
Application in Marine Sector:

Underwater communication gateway node between and underwater network and terrestrial network.

More info:

www.siplab.fct.ualg.pt

● MIRONE (CIMA)



Description:

Mirone is a Matlab-based framework tool that allows the display and manipulation of large number of grid/images formats through its interface with the GDAL library. Its main purpose is to provide users with an easy-to-use graphical interface to manipulate GMT grids. In addition it offers a wide range of tools dedicated to topics in the earth sciences.

Application in Marine Sector:

It is a powerful tool to the marine sector, working with multibeam planning , remote sensing analysis, MPA management, GIS data , earth sciences training, etc. It provides vizualization and manipulation capabilities to a very wide range of grid formats.

More info:

<http://w3.ualg.pt/~jluiz/mirone>

● OPERATIONAL OCEANOGRAPHIC MODELLING (CIMA)



Description:

The modelling tool to support such integrated system should allow the simulation of coastal hydrodynamic processes coupled with biogeochemical processes. It must also provide a way of answering to different scale predictions , complex geometries and to efficiently incorporate different data sources to define boundary and surface conditions.

● EASYAQUA MONITOR (EASYSENSING)



Description:

EasyAquaMonitor is a data acquisition and alert platform. This platform is a easy to use, scalable and very easy to adapt to environments where data acquisition already exists. This platform is a very little version of EasyMonitor application, an application with more functionalities, directed to aquaculture application.

To save data it is possible to connect to the most common databases:

- Postgresql
- Mysql
- Microsoft SQL
- Oracle

The web application can run in any Apache web server or other Web Server ready to run python language. The EasyAqua Monitor use little device that acts like a gateway and a data safe device between data acquisition point and the central database, where this web application is normally deployed.

This gateway acts like:

- Fail-Tolerant device saving the data when communications is lost
- Alarm system sending messages by SMS and emails. Policies are applied to avoid higher SMS spend.

This gateway can receive data from :

- 802.15.4/Zigbee in 2.4GHZ band
- 802.15.4 in 8GB MHz
- Modbus/IP
- RS-232

Next is presented possible schema of application integration.

This Platform will be evolve to join prediction and intelligent data analysis to give decision support to the end user.

More info:

www.easysensing.pt