ERF 2024 Workshop: Marine Robotics for Environmental Monitoring and Preservation

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14:30-15:50 CET, March 14

ERF 2024, Rimini, Room Tempio 1

Schedule ERF workshop: Marine Robotics for Environmental Monitoring and Preservation

Opportunities and challenges of marine robotics in the energy sector (14 March, 14:30 CET)

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15:10-15:50 Round Table and final conclusions:

- Gabriele Ferri (NATO STO CMRE) and Enrico Simetti (University of Genova, Italy) – chairs
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- Alfredo Martins, INESC, Portugal
- Massimo Caccia, CNR, Italy
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euRobotics Marine Robotics TG

TG members: 138 @8/3/2024

TG Coordinators Gabriele Ferri, CMRE, and Enrico Simetti, Univ. of Genova

Marine Robotics TG vision and scope

The Marine Robotics TG vision is **to be the meeting place for scientists, engineers, decision makers and stakeholders** for shaping Marine Robotics in Europe. The TG aims **at collecting ideas, requirements, trends from a large community interested in marine robotics topics**, and acting as **a link between the community itself and the European Commission**.

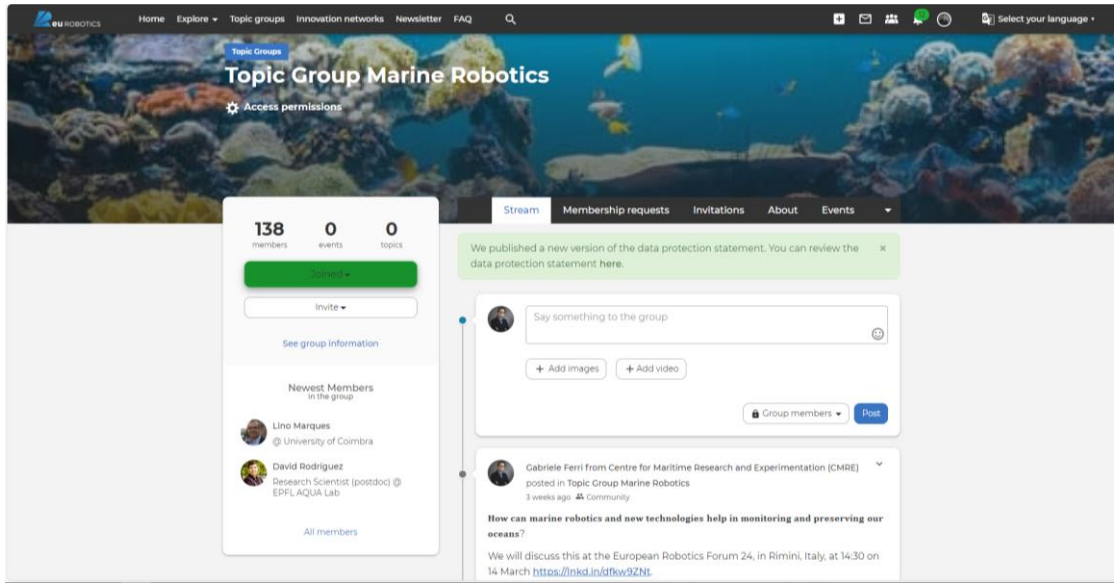
A large and heterogeneous community for fostering marine robotics

The TG **not only targets marine robotics scientists and engineers from research and industry, but also all the people whose activity can be of interest and complementary for the marine domain**. AI and autonomy experts, sensor developers, decision and regulation makers and, more in general, stakeholders with interested in the marine robotics domain are invited to participate in the TG activities.

Be part of the upcoming revolution in marine science and engineering!

The TG will support participants **in finding synergies for new ideas and projects** and **will facilitate meetings and collaborations** through the mailing list and the website, and through meetings in person, such as at the annual workshop at ERF.
The Marine Robotics TG aims at **supporting, in synergy with the EU Commission, the shift** of marine robotics from lab solutions **to more and more robust real applications**.

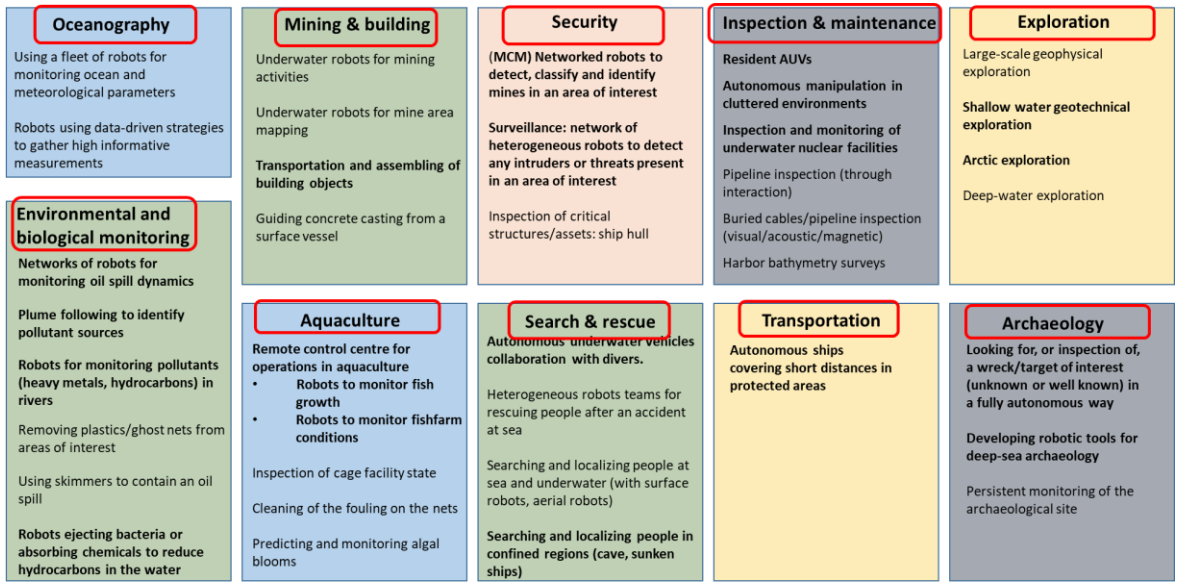
News from the TG



- New euRobotics portal
https://www.robotics-portal.eu/Marine/stream
Go here to register to our TG

- https://sparc-robotics-portal.eu/web/marine-robotics/wiki

Wiki with the collected material so far: enabling technologies, market analysis and use cases divided into 10 thematic areas.



- **Event: Topic Groups Summit** 25/26 October 2023 – Miro boards to identify technologies and future opportunities in the different use cases.
- Meeting of TG Coordinators with euRobotics in November 2023.
- All the collected material is used by euRobotics for the **Roadmap 2030 – first draft approved**.

Material and ideas are more than welcome…

We invite you to register to the TG to be part of our family and to share and add your ideas and material:
new use cases, challenges, technologies, collaboration requests and opportunities…

…also using the TG mailing list

Get in touch with us!

A world at risk

The Decadal State of the Climate 2011-2020 (source World Meteorological Organization, United Nations) provides a summary of the state of climate, extreme events and their socio-economic impacts from 2011-2020.

The wave is going to arrive, whatever we do!

negatively affect sectors such as agriculture, forestry, fisheries and tourism.

A recent study* states that if we can keep to 2.8˚ C, it would cost to the US $300 billions each year.

Martinich, J., Crimmins, A. Climate damages and adaptation potential across diverse sectors of the United States. Nat. Clim. Chang. **9, 397–404 (2019). https://doi.org/10.1038/s41558-019-0444-6*

A world at risk: the centrality of oceans

The monitoring, understanding and preservation of **oceans is crucial**.

The world ocean englobes *99% of the biosphere, the viable space on earth.*
Life not only started in the ocean; the ocean also maintains life on earth. It regulates Earth's temperature, provides us with oxygen, food, drinking water, energy, raw materials medication and even recreation and culture.

Unfortunately, several serious menaces endanger them…

Effects of global warming

(Micro) plastics in the oceans

Water pollution by hydrocarbons or heavy metal

Effects of (micro) plastics and noise on animals (in particular cetaceans)

The need of rules

We need laws and regulations…

On June 19, 2023, after nearly two decades of intense negotiations, the 193 member of the United Nations adopted a landmark, legally binding agreement on marine biodiversity to create a common wave of conservation and sustainability in the **high seas** beyond national boundaries - covering two-thirds of the planet's oceans.

Setting out rules to halt deterioration in the status of EU water bodies and achieve good status for Europe’s rivers, lakes and groundwater.

Directive 2000/60/EC of the European Parliament and of the Council of **23 October 2000** establishing a framework for Community action in the field of water policy

Why? To create an “environment market” driven by rules

- Need **of strict(er) and updated rules** (e.g. for the water framework with low[illegible]owed limits for heavy metals concentration).
- **Convincing law enforcement** efforts.

Decision makers

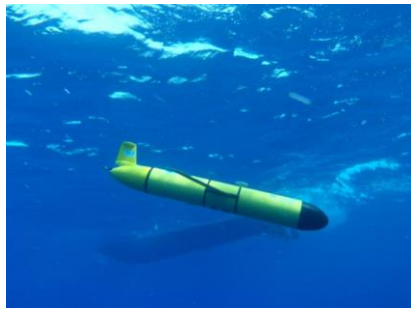
- Clear **quantification** and **communication** of the economic impacts to convince the decision-makers about the need to intervene
- **Increase the awareness** of the impact of the environment on our life and on the economy!

Market creation

*Investments and **scientific and technological push** in **ocean preservation** and in the use of novel means such as **robotics**….*

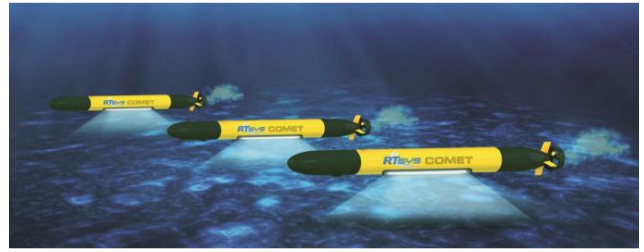
What robotics can offer today?

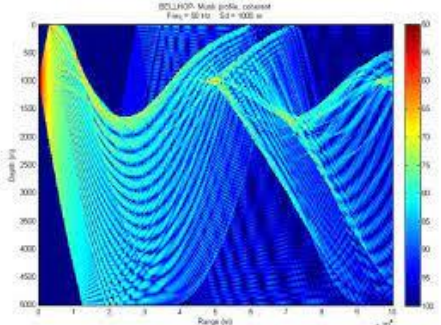
Recent **advances in sensing, robotics, networking** make the use of robotic systems in different environmental tasks **a reality**.



Robots, especially if working in **networks**, can **increase the spatial and temporal resolution** of the monitoring tasks, providing **persistence** and **synopticity**.

Surface robots and UW single-robot solutions start to be mature for their use in **monitoring tasks**.





Further work is required in:

- **UW networks** of underwater robots handling the comms limitations;
- **Integration** of robots **with mathematical environmental models**;
- Robots **in intervention missions** (e.g. oil spill remediation) - scale problems: many small robots or fewer larget ones?
- Liability, classification, standardisation, safety, and security.

Opportunities and challenges in robotics for the environment: new technologies

Ease of use

Autonomous intervention and manipulation

New missions: cleaning (plastics removal), remediation (e.g. delivering chemicals or biological remediation material)

Advanced communication (uw comms)

Integration of robots with math models

Endurance

Standards, liability, security

Autonomous systems

AI/Machine learning

Durability

Big-N networks

Transparent autonomy

Human-machine teaming

Inter-domain cooperation

Cyber-physical architectures

Advanced sensing

Flexibility

Coordination

Bio-inspired solutions

Persistent/resident autonomy

News from the TG
- from Massimo Caccia, CNR, Italy

EMRA 2024 - the Workshop of EU-funded Marine Robotics and Applications

Arenzano, Italy, May 27-29, 2024

EMRA 10th Anniversary represents a unique opportunity for:

- presenting your project to a wide audience of stakeholders
- having a full overview of the EU-funded projects involving marine robotics
- networking with academia, research, industry, public authority, and policy maker players in the field of the Blue Economy and Technology

Access more tools and enhanc

Registration is now open
https://emra-24.marinerobotics.eu/

To **present your project**, contact
massimo.caccia@cnr.it

from Alfredo Martins, INESC-TEC, Portugal

TRIDENT

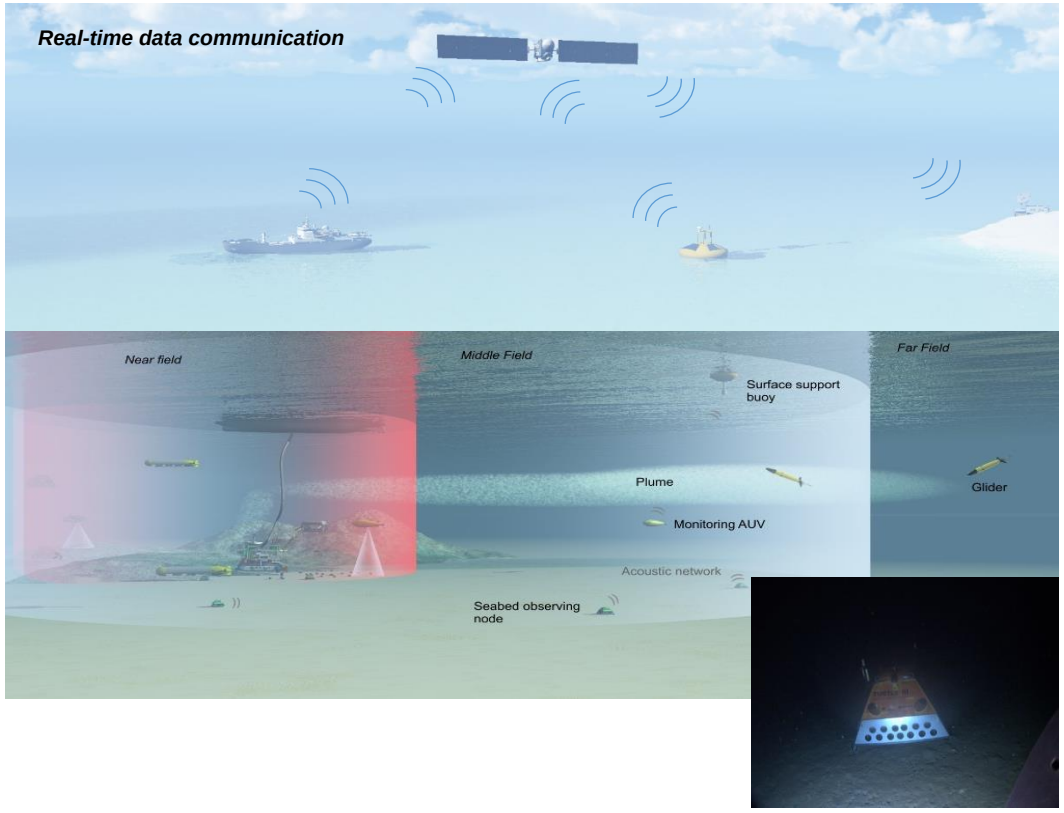
Technology based impact assessment tool foR sustaInable, transparent Deep sEa miNing exploraTion and exploitation

Technology development for **real time environmental monitoring of deep sea** bed activities (robots, sensors, communications, modeling…)

Leader: INESCTEC

HE, 16 M€, 25 partners, 10 countries

Spring 2024 mission on Tropic Seamount



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Thanks for your kind attention!

Please have a look at the Wiki and to the website and let us know if you want to add more use cases or other material!

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