Enrico Simetti

Fixed-term assistant professor

enrico.simetti@unige.it
+39 0103532206

Education and training

2012
PhD in Mathematical Engineering and Simulation
Planning and Control of Autonomous Marine Systems
University of Genova - Genova - IT

Academic experience

2019 - ONGOING
Assistant Professor (RTD-B)
University of Genova - Genova - IT
Research activities on Marine Robotics and Manipulation

2014 - 2019
Assistant Professor (RTD-A)
University of Genova - Genova - IT
Research activities on Marine Robotics and Manipulation

2012 - 2014
Post doctoral fellow (Assegnista di ricerca)
University of Genova - Genova - IT
Control of autonomous underwater vehicle manipulator systems

2008 - 2009
Research fellow (Assegnista di ricerca)
University of Genova - Genova - IT
Development of obstacle avoidance algorithms for autonomous surface vehicles

Language skills

Italian
Mother tongue

English
Proficient
FCE

Teaching activity
I'm currently (A.A 18/19) teaching the following subjects:

- Cooperative robotics, which covers a task priority approach to a

multi-arm mobile system and its extension to cooperative robots;
- Embedded systems, which covers programming microcontrollers for control oriented applications

Postgraduate research and teaching activity

Supervision of PhD students, residents and post-doctoral fellows

I'm supervising one phd student, on the topic of obsstacle detection and avoidance for autonomous surface vehicles.
I'm supervising one research fellow on the H2020 project ROBUST.

PhD committees membership

I'm currently member of the PhD Council of the curriculum ROBOTICS AND AUTONOMOUS SYSTEM of the Phd School Bioengineering and Robotics

Research interests

- Marine robotics
  - Autonomous underwater vehicles
  - Autonomous surface vehicles
  - Autonomous undetwater-manipulator systems
- Industrial robotics
  - Cooperation between mobile manipulators
  - Bimanual manipulation
  - Human robot interaction

Grants

2015 - ONGOING

H2020 ROBUST

European Commission - IT

447410 - Pricipal investigator

There is a need to develop an autonomous, reliable, cost effective technology to map vast terrains, in terms of mineral and raw material contents which will aid in reducing the cost of mineral exploration, currently performed by ROVs and dedicated SSVs and crew. Furthermore there is a need to identify, in an efficient and non-intrusive manner (minimum impact to the environment), the most rich mineral sites. This technology will aid the seabed mining industry, reduce the cost of exploration and especially the detailed identification of the raw materials contained in a mining sites and enable targeted mining only of the richest resources existing.
The ROBUST proposal aims to tackle the aforementioned issue by developing sea bed in situ material identification through the fusion of two

technologies, namely laser-based in-situ element-analyzing capability merged with underwater AUV (Autonomous Underwater Vehicle) technologies for sea bed 3D mapping. This will enable resource identification done by robotic control enabled by the synergy between AUV hovering and manipulator capabilities. The underwater robotic laser process is the Laser Induced Breakdown Spectroscopy (LIBS), used for identification of materials on the sea bed. The AUV Robotic vehicle will dive, identify the resources that are targeted for LIBS scanning through 3D real time mapping of the terrain (hydro-acoustically, laser scanners, photogrammetry) and position the LIBS in the required locations of mineral deposits on the ocean floor to autonomously perform qualitative and quantitative analyses.

2015 - 2018

H2020 WiMUST

European Commisstion - IT

288375 - Participant

WiMUST aims at conceiving, designing, and engineering an intelligent, manageable, distributed and reconfigurable underwater acoustic array that could drastically improve the efficacy of the methodologies used to perform geophysical and geotechnical acoustic surveys at sea.
The novel key feature of the WiMUST system consists in the use of a team of cooperative autonomous marine robots, acting as intelligent sensing and communicating nodes of a reconfigurable moving acoustic network.
Recent developments have shown that there is vast potential for groups of marine robots acting in cooperation to drastically improve the methods available for ocean exploration and exploitation. Traditionally, seismic reflection surveying is performed by vessel towed streamers of hydrophones acquiring reflected acoustic signals generated by acoustic sources (either towed or on-board a vessel). In this context, geotechnical surveying for civil and commercial applications (e.g., underwater construction, infrastructure monitoring, mapping for natural hazard assessment, environmental mapping, etc.) aims at seafloor and sub-bottom characterization using towed streamers of fixed length that are extremely cumbersome to operate. The vision underlying the WiMUST proposal is that of developing advanced cooperative and networked control / navigation systems to enable a large number (tens) of marine robots (both on the surface and submerged) to interact by sharing information as a coordinated team (not only in pairs).
The project brings together a group of research institutions, geophysical surveying companies and SMEs with a proven track record in autonomous adaptive and robust systems, communications, networked cooperative control and navigation, and marine robot design and fabrication.

2015 - 2018

H2020 DexROV

European Commission - IT

184375 - Participant

DexROV brings together seven different organisations from all over Europe

to challenge the possibilities for undersea operations. DexROV will use and evaluate new technologies to allow safer and more cost-effective undersea operations with Remotely Operated Vehicles (ROVs).
The goals of the project are:

- Move control of ROVs to shore, from a safe distance.
- Overcome latency involved between onshore control centres and ROVs, through autonomous operations
- Develop advanced dexterous tools with the capacity to grip and manipulate in ways similar to a human hand

DexROV is part of the long-term Blue Growth strategy to support sustainable growth in the European marine and maritime sectors.

2014 - 2015

Autonomous Marine Drones for Scientific Applications

DESA Engineering srl - IT
Participant
Design and realization of two autonomous catamarans for scientific applications in a 6 months time period.

2013 - 2016

MARIS

MIUR (PRIN) - IT
283736 - Participant
In order to achieve the ambitious general objective of the project, it is necessary to achieve some important advances within the integrated development of different enabling technologies and methodologies. In particular, the MARIS project aims at fulfilling the following goals:

- Reliable guidance and control of the floating bases (during long-range motions) on a multi-sensory basis. This is done via the integration of inertial sensors, Doppler velocity measuring devices, external acoustic supports to localization (USBL or SSBL), as well as real-time SLAM techniques based on the sea-floor observations, and more generally of the submerged environment.
- Construction of multi-modal maps via real-time SLAM, as also referred at the previous point.
- Stereo-vision techniques for object recognitions and/or specific features recognition, including object position and pose estimation.
- Advanced techniques for grasping and manipulation from a floating base, by part of each operating agent. Automatic reasoning for the reliable grasping and manipulation of objects, and related reactive control, based on visual, force/torque and possibly tactile sensing of the entire system. This must be done guaranteeing the safety of its operative conditions, with particular care for thegrasp keeping on a force-torque-tactile sensing basis.

- Automatic methods for the execution of coordinated intervention operations by part of cooperative teams of floating manipulator systems, based on their mutual exchange of information, their mutual visualization and localization.
- High level mission planning techniques, including the automatic decomposition and cooperative distribution of tasks among the agents, based on the mutual exchange of information.
- Advanced underwater communication techniques among the agents to the aims expressed by both the previous points.

The MARIS project aims to coordinately develop all the reaserch activities above, allowing the achievement of the following specific objectives:

- Dexterity and agility for floating manipulator systems, individually or team operating.
- Experimental autonomous system 'single floating manipulator'.
- Experimental autonomous system 'team of floating manipulators' .

2010 - 2013

FP7 TRIDENT

European Commission - IT

403515 - Participant

TRIDENT proposes a new methodology to provide multipurpose dexterous manipulation capabilities for intervention operations in unknown, unstructured and underwater environments. The TRIDENT project is built on the top of two main concepts: 1) the use of a team of heterogeneous marine robot with complementary skills, an USV and an I-AUV, to achieve light intervention capabilities without the need for expensive support ships and 2) the use of a dexterous hand mounted on a redundant robot arm to achieve multipurpose manipulation capabilities.

Editorial activity

I've been and I'm Associated Editor for ICRA (2015, 2016, 2017, 2018).
I'm serving as Guest Editor for IEEE Robotics and Automation Magazine for a Special Issue on Autonomous (Aerial and Underwater) Floating Intervention.