

Date: Wednesday November 26

Speaker: Prof. Benedetto Allotta, Dept. of Industrial Engineering, University of Florence

Title: Robotics research at the MDM Lab of the University of Florence

Location: Nano Building 51, seminar room 015

Abstract: The seminar will address the two main research topics on which the Laboratory of Mechatronics and Dynamic Modeling – MDM Lab – of the University of Florence is active, namely:

- 1) Wearable robotics for rehabilitation and assistance to disabled people with reduced hand function;
- 2) Underwater robotics.

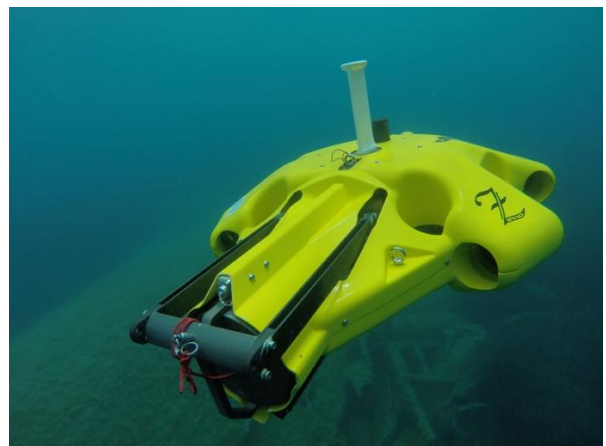
The talk initially explores the potential of wearable hand exoskeletons to significantly improve functional independence and quality of life for people with disabilities, supporting daily activities and home rehabilitation. Despite the benefits, adoption is limited by technical issues like weight, bulkiness, and poor battery life. The goal is to create reliable, accessible, and clinically valid systems. In this context, the MDM Lab team developed DANTE, a fully wearable exoskeleton with a hybrid and modular design, capable of reproducing over twenty gestures. DANTE, controlled via myoelectric signals, was successfully presented at EXPO 2025 in Osaka, bringing the systems to a development stage that allows for clinical validation.

Since 2010 the Laboratory of Mechatronics and Dynamic Modelling (MDM Lab) of the University of Florence has been active in research projects in underwater robotics. The research group is now very well-known at the national and European level. During the first years the focus was mainly on the design, construction and operation at sea of Autonomous Underwater Vehicles (AUVs). More recently, although the activities on the development of new vehicles are still active, a great amount of effort has devoted to the perception of the environment by means of payload sensors with particular emphasis on on-board processing with limited computational resources.

The talk will review the underwater robotics activities of MDM Lab, including research on mutant underwater vehicles. Underwater drones are designed based on operational needs, so two different families exist, meeting conflicting requirements:

- Carry out surveys over large areas of seafloor or water column using available on-board power efficiently.
- Perform close inspection or intervention on submerged infrastructures.

Close inspection and intervention, require compact, “stocky,” shape with several actuators aimed at achieving hovering with good pose precision. For surveying large areas of the seafloor, the preferred shape is torpedo, and hovering is not requirement. Mutant underwater drones, featuring reconfigurable shape are the right answer to the need to obtain drone excellent performance in both hovering and survey tasks.





Biosketch: Prof. Benedetto Allotta holds an MS in Mechanical Engineering (1987) from the University of Pisa, Italy, and a Ph.D. in Robotics (*magna cum laude*, 1992) from the Scuola Superiore Sant'Anna, Pisa, Italy. Following his graduation, he served at the Scuola Superiore Sant'Anna as an assistant professor (tenured) in Applied Mechanics (1993–2001). In 2001, he was appointed associate professor of Applied Mechanics at the Department of Industrial Engineering of the University of Florence, Italy. Between 2015 and 2019, he served as the director of the department. Currently, he holds the positions of full professor of Robotics and Mechanism Design (2005–present). He is coordinator of the master's Study Course in Robotics, Automation and Electrical Engineering, and a member of the faculty boards of the Tuscan regional doctoral program "Smart Industry" (2018–present) <https://smartindustry.unipi.it/en/home/> and of the Italian National Doctoral School in Robotics and Intelligent Machines (DRIM, 2022–present) <https://drim.i-rim.it/en/>.

Prof. Allotta is a senior member of IEEE. His current research activity spans marine robotics and wearable robotics technologies, with over 90 publications in peer-reviewed journals and nine patents to his name. Prof. Allotta is also a founder and driving force behind several robotics startups and spin-offs and has consistently mentored student teams to international success in marine robotics competitions such as the European Robotics League and SAUC-E. His projects have garnered substantial European and national funding, including leadership of the €3M EU-FP7 ARROWS project for underwater archaeological robotics and contributions to the SUNRISE/BRUCE, SUONO, RECON-UV, and DEXTIMUS initiatives, among others. He is currently Principal Investigator of the Tech Incubation project "SEAMORPH," aimed at creating a startup based on the RUVIFIST technology on underwater reconfigurable robots patented by the University of Florence. SEAMORPH is funded by Roboit, the first Italian Technology Transfer Hub on Robotics.

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