EXCELLABUST

EXCELLING LABUST IN MARINE ROBOTICS

INVITED TALK

22nd January 2016

Overview of reseach activities in Mobile & Marine Robotics Research Centre, University of Limerick

Assoc. Prof. Dr. Daniel Toal,
Dr. Edin Omerdic
University of Limerick

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EXCELLABUST

1. INVITED TALK DETAILS

Date: 22nd January 2016
Time: 10:00 – 11:00
Location: Gray Hall, University of Zagreb Faculty of Electrical Engineering (UNIZG-FER)
Unska 3, Zagreb, Croatia

Title: Overview of reseach activities in Mobile & Marine Robotics Research Centre, University of Limerick

Name: Assoc. Prof. Dr. Daniel Toal and Dr. Edin Omerdić
Affiliation: Mobile & Marine Robotics Research Centre
University of Limerick
Limerick
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2. ABSTRACT

Established in 2000 by Director Dr. Daniel Toal, the Mobile & Marine Robotics Research Centre (MMRRC) in the University of Limerick is the only research centre focused on the application and development of marine robotics within the island of Ireland. This research centre is a highly capable engineering group focused on developing practical and smart marine technologies. From marine robotics to navigation, sensor development, emergency response planning, remote operated vehicle (ROV) and unmanned aerial (UAV) technologies, they are actively involved in developing a diverse range of emerging technologies in national funded, European funded and industry collaborative projects.

Over the last ten years the MMRRC research centre has developed OceanRINGS - a suite of smart technologies for subsea operations, designed to be integrated with any ROV – support vessel combination. It includes advanced control solutions for full range of ROVs – from mini ROVs used for remote monitoring & inspection to full-size work-class ROVs. Remotely Operated Vehicle (ROV) LATIS is a 1000m depth-rated underwater robot developed at MMRRC to test and validate OceanRINGS. System validation and technology demonstration has been performed over the last six years through a series of test trials with different support vessels off the north, south and west coast of Ireland, in Donegal, Bantry Bay, Cork Harbour, Galway Bay, Shannon Estuary and La Spezia, Italy.

This presentation provides background information about the MMRRC and University of Limerick, gives an overview of recent research activities, explains the main idea behind OceanRINGS concept, displays selected results from test trials and discusses possible applications.

3. BIOGRAPHIES OF LECTURERS

Assoc. Prof. Dr. Daniel Toal

Website: http://www.mmrrc.ul.ie/dotnetnuke/mmrrc/People/DanielToal.aspx

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Daniel Toal (BSc 1984, MSc 1986, PhD 2004) is an Associate Professor at the Electronic & Computer Engineering Department, Faculty of Science and Engineering, University of Limerick, Ireland, where he teaches courses related to automation, robotics, instrumentation, avionics, sensors and electrical machines. His research interests include field robotics for challenging environments (land-based, marine, airborne / ROVs, AUVs, UAVs). Successes in research are the result of hard work driven by the vision that the Marine Technology, Ocean Environment; Renewable Energy Sectors will grow in crucial importance. Daniel is the founder and director of the Mobile & Marine Robotics Research Centre at the University of Limerick and is Co PI of the SFI Centre MaREI - Marine and Renewable Energy Ireland (www.marei.ie). With the MMRRC research team, Dan has led the design/build of ROV Latis – a 1,000m depth rated 'smart' vehicle along with many other platforms. On-going research addresses unique challenges of operating in 'high energy' wind, wave and tidal regimes of marine renewable and airborne wind energy. Research also addresses robotic platform development for response in offshore marine incidents, search and rescue (SAR) and marine salvage. Dan is collaborating with research and industrial partners in Ireland, across Europe and North America. He has been chief scientist for numerous off shore research surveys on Celtic Explorer, Celtic Voyager, INS LÉ Eithne, and other vessels. He has numerous journals, book/book chapters, conference proceedings, invention disclosures, granted and pending patents in sonar technology and renewable energy. He has been awarded the Denny Medal - best journal paper award 2007/2008 - Journal of Marine Engineering. Technology. He has given numerous Plenary talks in Brazil, Korea, and elsewhere.

Dr. Edin Omerdić

Website: http://www.mmrrc.ul.ie/dotnetnuke/mmrrc/People/EdinOmerdic.aspx
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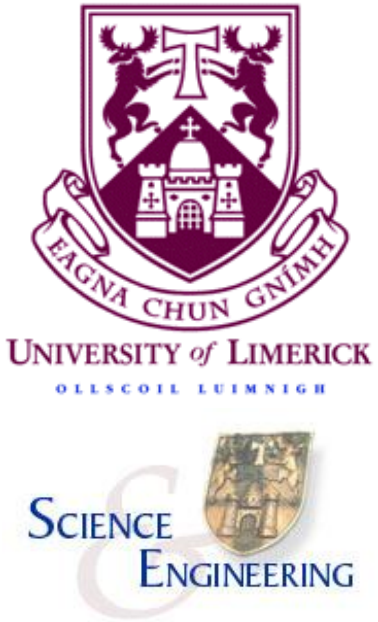
Edin Omerdić (BSc 1997, MSc 2001, PhD 2004) is currently employed by the University of Limerick as a Senior Research Fellow at the Department of Electronic and Computer Engineering. He has been engaged in numerous national-funded, European-funded and industry-sponsored research projects in the area of submersible robotics. He is also the main developer & designer of OceanRINGS concept & software suite, including design of state-of-the-art control architecture for ROV LATIS. Edin's research interests include modelling & simulation of dynamic systems (marine platforms, ocean dynamics & disturbances), renewable energy, real-time simulators, virtual reality, development and design of guidance, navigation and control system for marine vessels, nonlinear control systems, and implementation of soft-computing techniques in intelligent systems, underwater robotics, fault-tolerant systems. Dr. Omerdic received five awards for his work, including First Prize Winner in National Competition in Mathematics (Bosnia, 1985), Society of Underwater Technology (SUT) Prize for Best Multimedia Presentation (GCUV 2003) 'Thruster Fault Accommodation for Underwater Vehicles', IFAC prize for best on-line demonstration (MCMC 2003) 'Fault Detection and Accommodation for ROVs', IMarEST SMI Donald Maxwell Award Prize for Best Journal Paper (2004) 'A Fuzzy Track-Keeping Autopilot for Ship Steering' and Curriculum Paper Contest National Instruments International Competition LabVIEW in the Curriculum 2006 (First Prize Winner) 'Virtual Underwater Lab: Efficient Tool for System Integration & UUV Control Development'.

4. DESCRIPTION OF THE PARTNER INSTITUTION:



Faculty of Science and Engineering
University of Limerick (UL)

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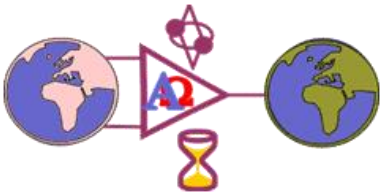
Since its foundation in 1972, the **University of Limerick (UL)** has an established reputation for being Ireland's leading university in industry-led research. The UL was awarded prestigious 5-star rankings for graduate employability, innovation and knowledge transfer, teaching, engagement, internationalisation and infrastructure by QS Stars independent assessors. With close to 12,000 students, including more than 2,000 international students each year, UL is a young and enterprising university with a proud record of innovation in education and scholarship. UL offers more than 70 undergraduate programmes across Arts, Humanities and Social Sciences; Education and Health Sciences, Science and Engineering and the Kemmy Business School. UL also delivers a strong postgraduate offering with more than 100 taught postgraduate programmes to Doctoral and Post-doctoral level. With strong links to business and industry, UL excels at translational research which aims to accelerate the practical application of academic research to benefit society. UL houses some of the most innovative and successful research centres in Ireland.

The Faculty of Science & Engineering (S&E) offers a wide range of undergraduate, taught postgraduate and research based postgraduate programmes, comprises ten academic departments and three Learning Support Centres in ICT, Mathematics and Science and is home to three Research Institutes and several Research Centres and Groups.



Mobile & Marine Robotics Research Centre (MMRRC)
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Contact: Ass. Prof. Dr. Daniel Toal
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MMRRC consists of a mix of postdoctoral researchers and PhD students from various disciplines including electronic, computer, mechanical and aeronautical engineering backgrounds. The research centre brings together a highly capable engineering group focused on developing practical and industrial relevant marine technologies. From marine robotics to navigation, sensor development, emergency response planning, remote operated vehicle (ROV) and unmanned aerial (UAV) technologies, they are actively involved in developing a diverse range of emerging technologies in national funded, European funded and industry collaborative projects.

The core research activities of the research centre are listed below:

- Remotely operated vehicles (ROV LATIS) smart systems- fault tolerant control, auto tuning, one-click auto survey, augmented reality visualisations (transparent ocean).
- Remote & auto flight control of tethered parafoil kites for airborne wind energy & aerial sensor/comms platforms.
- Sensored telemetry streaming from fixed wing aircraft, system identification, and controller design.
- Emergency response exercise planning & coordination. UAVs deployed in segregated airspace over three day exercise. Key partners: Irish Aviation Authority, Irish Naval Service, Irish Coast Guard, Commissioner of Irish Lights.
- Long Range High Bandwidth comms- remote presence, live interaction with distant robotic vehicles independent of existing infrastructure.

Ocean sensing platforms with daughter mini ROVs- for persistent remote presence offshore with global satellite comms (controlled & monitored anywhere in world independent of existing infrastructure).