

2017 1st - 8th October
**BREAKING
THE SURFACE**
BIOGRAD NA MORU, CROATIA

9th INTERNATIONAL INTERDISCIPLINARY FIELD WORKSHOP OF MARINE ROBOTICS AND APPLICATIONS



BTS MAP

HOTEL ADRIATIC (purple hotel)

1 / ACCOMODATION

2 / LECTURE ROOM

3 / TUTORIAL ROOM

**4 / REGISTRATION ROOM
OFFICE**

5 / COFFEE BREAK

6 / LAVENDER BAR
Social events

7 / DEMO SITE

8 / DEMO POOL

**9 / HOTEL ILIRIJA (yellow hotel)
RESTAURANT (in hotel)**
Conference restaurant and
accommodation for participants

10 / HOTEL KORNATI (blue hotel)
Accommodation for participants

11 / PARKING

12 / BELVEDER BAR
Social events

ABOUT BTS

The Breaking the Surface – BtS is an international interdisciplinary field workshop of marine robotics and applications. Ever since 2009, it serves as a meeting place for international experts, university professors, scientists, industry representatives and students from various fields.



marine
robotics
MAROB



marine biology
and marine
nature
protection
MARBIO



marine
nautical and ship
archaeology
MARCH



maritime
security, naval
and coast guard
operations
MARSEC



marine
geology
MARGEO



innovation
day
INNOVA



COMMITTEES

COMMITTEES CHAIRS



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General Chair



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Programme
Committee Chair



Ivana Mikolić, mag. ing.
Organizing
Committee Chair



M.Sc. Antonio Vasiljević
Technical
Committee Chair

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ORGANIZED BY

BtS has for the last 9 years been organized by the members of the Laboratory for Underwater Systems and Technologies – LABUST from the University of Zagreb Faculty of Electrical Engineering and Computing – UNIZG FER and Center for Underwater Systems and Technologies – CUST.



BTS 2017 IN NUMBERS



7

DAYS



6

PROGRAMME
TRACKS



38

LECTURES



5

TUTORIALS



10

VEHICLES



>180

ATTENDEES



∞

OPPORTUNITIES
TO NETWORK

LEGEND

SESSION COLOURS

	Lectures
	Innovation Tuesday
	Social events and special programme
	Company programme
	Tutorials
	Demonstrations

CATEGORIES

	MAROB		MARSEC
	MARBIO		MARGEO
	MARCH		INNOVA
	COMPANY PRESENTATION		

LOCATIONS

	LECTURE HALL – HOTEL ADRIATIC (PURPLE) <i>ALL lectures and presentations</i>
	DEMO POOL AND OPEN WATERS NEARBY <i>Equipment demonstrations</i>
	TUTORIALS ROOM – HOTEL ADRIATIC (PURPLE) <i>Tutorial, mission plannings, data analyses</i>
	LAVENDER BAR – HOTEL ADRIATIC (PURPLE) <i>Welcome Drink, Norwegian party</i>
	BELVEDER BAR <i>EXCELLABUST party, Bts karaoke</i>

09:00 - 09:45

OPENING SESSION
Mislav Grgić, Zoran Vukić, Nikola Mišković

Startup How To
Vladimir de Franceschi

09:45 - 10:30

Human-robot interaction under water
Nikola Mišković

The Scaling of Innovation Tools
Thomas Curtin

10:30 - 10:45

COFFEE BREAK

COFFEE BREAK

10:45 - 11:30

Shipwrecks discovered along the western coast of Turkey
A.Harun Özdaş

Rich & Famous with Underwater Robotics? Attempt of an objective assessment
Tom Runge

11:30 - 12:15

DexROV: 2017 trials results and perspectives
Jeremi Gancet

Paths to market – getting university innovation into the right hands
Vlatka Petrović

12:15 - 13:00

A Methodology for Accurate and Quick Photogrammetric Recording of Underwater Cultural Heritage
Kotaro Yamafune

Financing of Early Stage Technology Startups
Gerardo Morales-Hierro

13:00 - 14:30

LUNCH

LUNCH

14:30 - 15:00

COMPANY PRESENTATION
BlueEye Robotics

Breaking the corporate
Marin Bek

15:00 - 15:30

T1 intro: Omnidirectional Vision for Underwater Robots
University of Girona

Soft Sensing and Simulation
Alex Alspach

15:30 - 16:00

DEMO subCULTron Group 1

T1 hands-on Group 2

DEMO Blueeye Group 3

Bridging the gap between academic research and commercially viable technology
Cesare Fantuzzi

16:00 - 16:30

From research to business: some experiences at the University of Calabria
Fabio Bruno

16:30 - 16:45

COFFEE BREAK

16:45 - 17:30

DEMO subCULTron Group 2

T1 hands-on Group 3

DEMO Blueeye Group 1

Uncovering the impact of the institutional environment on transfer activities
Martina Schraudner

17:30 - 18:30

DEMO subCULTron Group 3

T1 hands-on Group 1

DEMO Blueeye Group 2

ROUND TABLE
UWR Technologies : The Road Ahead - On Creativity, Innovation and Entrepreneurship
moderated by Kemal Dalić

19:30 - 20:30

DINNER

DINNER

MONDAY
02.10.

TUESDAY
03.10.

WEDNESDAY

04.10.

Localization and mapping in dynamic underwater environments
Eduardo Silva

Technology, archaeology and student challenges: Finding a best practice for presenting maritime archaeology
Andreas Kallmeyer Bloch

COFFEE BREAK

Relevance of UMS for Below the Surface (BTS) Tasks
Richard J. Nagle

Cetaceans and sea turtles of the Adriatic – the next step
Draško Holcer

The Great Maya Aquifer
Guillermo de Anda

LUNCH

T2 intro: Parallel Computing with CUDA made (almost) simple
University of Limerick

T3 intro: Underwater Camera Calibration with the Pinax model
JACOBS Bremen

T2 hands-on Group 1

T3 hands-on Group 2

DEMO DexROV 1 Group 3

T2 hands-on Group 2

T3 hands-on Group 3

DEMO DexROV 1 Group 1

T2 hands-on Group 3

T3 hands-on Group 1

DEMO DexROV 1 Group 2

DINNER

THURSDAY

05.10.

FOCE – Long Term In Situ Ocean Acidification Instrumentation
William Kirkwood

Extreme seafloor ecology: use of ROVs and AUVs to evaluate biodiversity and ecosystem function in the world's most remote ecosystems
Craig R. Smith

COFFEE BREAK

Late Quaternary and Holocene Submerged Landscapes of the Eastern Adriatic Sea
Slobodan Miko

Contemporary Underwater Archaeology in Portugal. New challenges, new ideas
Augusto Salgado

Towards persistent AUVs for seabed inspection
Marc Carreras

LUNCH

COMPANY PRESENTATION Norbit

T4 intro: Teleoperation of a simulated ROV and arm
ISME

T4 hands-on Group 1

DEMO Norbit Group 2

DEMO DexROV 2 Group 3

T4 hands-on Group 2

DEMO Norbit Group 3

DEMO DexROV 2 Group 1

T4 hands-on Group 3

DEMO Norbit Group 1

DEMO DexROV 1 Group 2

DINNER

FRIDAY

06.10.

Ex Machina – Integrating maritime robots into human endeavours
John Potter

Subterranean Groundwater Discharge and Marine Ecosystems
Renee E. Bishop Pierce

COFFEE BREAK

Navigation and Control of Unmanned Vehicles: A Fuzzy Logic Perspective
Kimón P. Valavanis

Breaking the surface of the seafloor: Studying the traces of earthquakes underwater
Javier Escartin

COMPANY PRESENTATION Evologics

LUNCH

COMPANY PRESENTATION Blueprint subsea

T5 intro: POP ART (PORTable Pelagic Autonomous Robotic Technology) concept & field demonstration
CNR

DEMO BluePrint Group 1

T5 hands-on Group 2

DEMO Evologics Group 3

DEMO BluePrint Group 2

T5 hands-on Group 3

DEMO Evologics Group 1

DEMO BluePrint Group 3

T5 hands-on Group 1

DEMO Evologics Group 2

GALA DINNER
CLOSING CEREMONY

SOCIAL EVENTS



1.10.
SUNDAY
16:30 - 18:00
HOTEL ADRIATIC
REGISTRATIONS



1.10.
SUNDAY
18:00 - 19:30
LAVENDER BAR
WELCOME DRINKS



2.10.
MONDAY
FROM 20:30
LAVENDER BAR
NORWEGIAN PARTY



3.10.
TUESDAY
FROM 21:00
BELVEDER BAR
EXCELLABUST
PARTNERS PARTY



5.10.
THURSDAY
FROM 21:00
BELVEDER BAR
BTS KARAOKE NIGHT



6.10.
FRIDAY
19:00 - 21:00
DEMO POOL
CLOSING CEREMONY
AND GALA DINNER



6.10.
FRIDAY
FROM 21:00
DEMO POOL
BTS CLOSING
HAWAII PARTY



7.10.
SATURDAY
09:00 - 16:00
FIELD TRIP

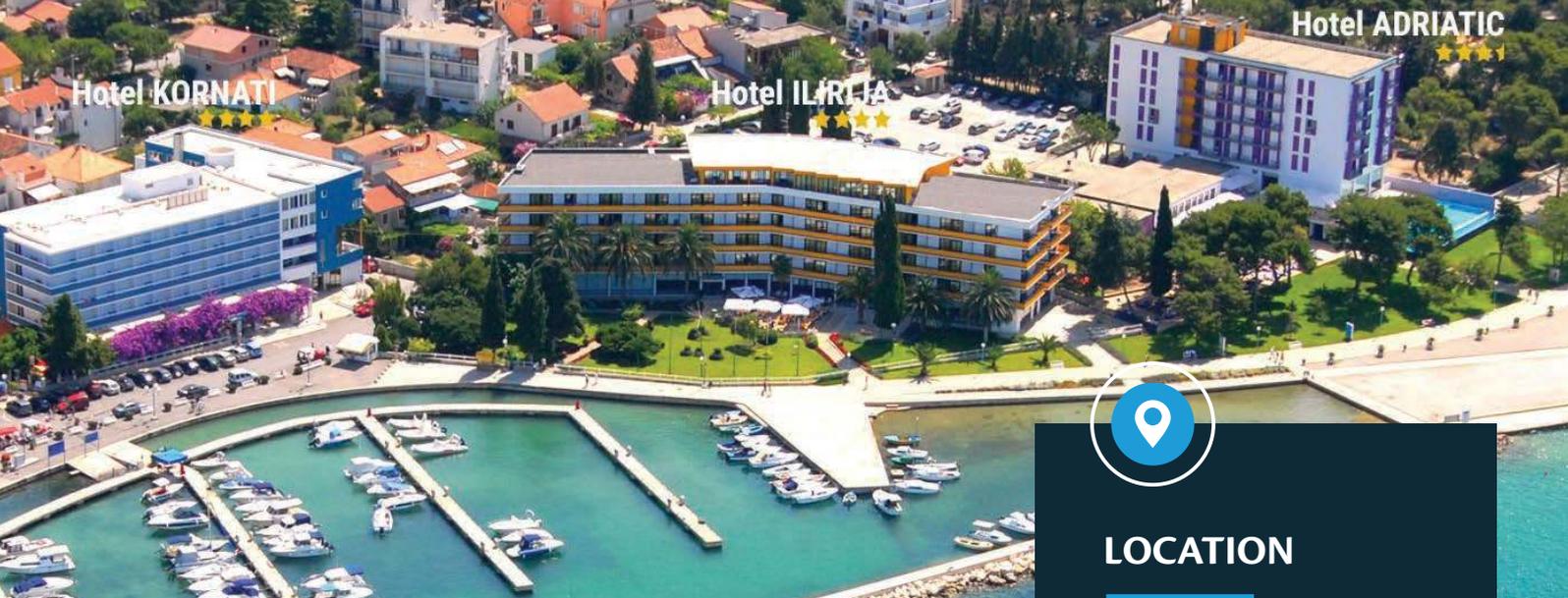
RESTAURANT HOURS



BREAKFAST
07:30 - 09:00

LUNCH
13:00 - 14:30

DINNER
19:30 - 20:30



VENUE

BtS 2017 is taking place in Ilirija Resort hotels in Biograd na Moru, Croatia. The resort consists of three hotels that are within one minute of walk from each other.

REGISTRATION

The registration and accommodation fees are combined. You can register through BtS official web-page at bts.fer.hr

The registration package includes:

- accreditation which allows participation in all technical and social programs
- accommodation with three meals per day in single rooms (Standard registrations) or shared double rooms (Student registrations) in a 4* hotel for 7 nights (from 1st until 8th October)

Company registration includes:

- 2 full Standard Registrations (accreditations and accommodation)
- a 30 min time-slot for the presentation of the product gamut
- logistical / infrastructural local support and organization collaboration for an expo / hands-on demonstration activity at the prescribed site



LOCATION

Ilirija Resort
Tina Ujevića 7
23200 Biograd na Moru
Croatia

TYPE	EARLY BIRD BY 2ND JULY	REGULAR BY 4TH SEPTEMBER
<u>Student</u>	<u>500 €</u>	<u>600 €</u>
<u>Standard</u>	<u>600 €</u>	<u>750 €</u>
<u>Accompanying person</u>	<u>250 €</u>	<u>250 €</u>
<u>Corporate</u>	<u>3000 €</u>	<u>3500 €</u>

BIOGRAPHIES & ABSTRACTS

Monday, 2nd October

Opening session

Mislav Grgić, Zoran Vukić, Nikola Mišković, University of Zagreb Faculty of Electrical Engineering and Computing

 02.10.2017.

 09:00 - 09:45

 Mislav Grgić
Zoran Vukić
Nikola Mišković

Opening words by the representers of the organizing institution University of Zagreb Faculty of Electrical Engineering and Computing Dean Prof. Mislav Grgić, BTS General Chair Prof. Zoran Vukić and Programme Chair Assoc. Prof. Nikola Mišković.

Human-robot interaction under water

Nikola Mišković, University of Zagreb Faculty of Electrical Engineering and Computing, Croatia

The underwater environment is hazardous for humans due to the fact that they are dependent on technical equipment for life support, divers have limited navigation capabilities and communication with the surface, and the underwater environment is under constant influence of external environmental disturbances. In order to minimize some of these risks, the EU “CADDY – Cognitive Autonomous Diving Buddy” project introduced an autonomous underwater vehicle that is capable of assisting the diver during underwater operations. The talk will describe the final results obtained within the project, focusing on the three functionalities that the autonomous robotic system is capable of performing: buddy “observer”, buddy “guide”, and buddy “slave”. The “observer” monitors the diver at all times thus increasing diver safety, the “guide” leads the diver through the GPS-deprived underwater environment, while the “slave” assists the diver in performing specific tasks such as mosaicking of seabed.



 02.10.2017.

 09:45 - 10:30

 Marine Robotics

 Nikola Mišković

Nikola Mišković is an associate professor at the University of Zagreb Faculty of Electrical Engineering and Computing where he teaches control engineering related courses and serves as the Head of the Faculty Centre for Research Support. He is a project coordinator of H2020 “EXCELLABUST - Excelling LABUST in Marine Robotics”, FP7 “CADDY – Cognitive Autonomous Diving Buddy”, H2020 FET LaunchPad project “aPad” and ONR-G projects related to marine robotics. He was a coordinator of a number of national funded projects. He is currently also involved in H2020 “subCULtron” project. He is the author of 2 book chapters and more than 50 papers in journals and international conferences. His research interests include mathematical modelling, cooperative guidance, control and navigation of marine vessels (surface and underwater), nonlinear control theory and its applications in marine robotics. He serves as the “Breaking the Surface” workshop Programme Chair. In 2015 he received Annual state prize for science awarded by the Croatian Parliament.

Monday, 2nd October

Shipwrecks discovered along the western coast of Turkey

A. Harun Özdaş, Dokuz Eylul University Institute of Marine Science and Technology, Turkey

The Aegean Sea has always played a significant role in the ancient maritime trade in terms of connecting the Mediterranean, the Marmara, and the Black Seas together. A large number of sheltered bays and natural harbours along the coast of the Aegean Sea provided a favourable environment for ancient mariners. As the population of cities increased, their basic needs required various products from other settlements, and the sea transportation became a preferred means for trade since it was cheaper and faster. Numerous shipwrecks and submerged cultural remains have been discovered along the coast of the Aegean Sea during the surveys of Shipwreck Inventory Project of Turkey (SHIPIT). The shipwrecks from the Bronze Age to the Ottoman Period were located and documented in the Eastern Aegean regions. Most of the shipwrecks found have been dated to from the Hellenistic to Late Roman period during the ten-year survey. The survey results indicate that there was a great commercial capacity created by the transportation of cargo in this region. The underwater archaeological remains also serve as an indicator for general trade routes.



Harun Özdaş is a Professor at Dokuz Eylul University, Institute of Marine Science and Technology, in Izmir, Turkey. He completed his PhD at Hacettepe University, Ankara. Prior to working at Dokuz Eylul University, he worked at the Bodrum Museum of Underwater Archaeology in Turkey. Dr. Ozdas participated in several underwater surveys and shipwreck excavations, such as Kaş Uluburun Bronze Age, Tektaş Classical, Gelidonya Bronze Age (Scientific Co-director), Kızılburun (Scientific Co-director). He was a Visiting Scholar at Texas A&M University, Department of Anthropology, Nautical Archaeology Program, USA and Visiting Scholar-Lecturer at Marburg University, Department of Classical Archaeology, Germany. He has been coordinating the underwater archaeological survey titled “Shipwreck Inventory Project of Turkey” since 2008 and Hisarönü Bronze Age shipwreck excavation as a scientific director. He recently serves as the President of Protection of the Underwater Cultural Heritage Committee, Turkish National Commission for UNESCO and Vice Director of the Aegean Sea Research Center (EBAMER) of Dokuz Eylul University.

 02.10.2017.

 10:45 - 11:30

 Marine Archaeology

 A. Harun Özdaşı

Monday, 2nd October

DexROV: 2017 trials results and perspectives

Jeremi Gancet, Space Applications Services, Belgium

DexROV is an EC Horizon 2020 funded project addressing the development of under-sea robotic intervention capabilities, with a focus on (1) far distance teleoperation – involving communication latency to mitigate, and (2) dexterous manipulation capabilities benefiting from context specific human skills and know-how. DexROV intends to develop cost-effective technologies and methods that will enable subsea operations with fewer off-shore personnel while increasing the range, flexibility and complexity of operations that are possible. The consortium consists of 9 European organizations, coordinated by Space Applications Services. Academic partners include the Universities of Genova, Cassino and Salento, Jacobs University Bremen, and IDIAP research laboratory (affiliated to EPFL). Industrial partners include COMEX, Graal Tech and EJR Quartz (Netherlands). The lecture will give an overview of the results and lessons learnt of trials carried out over two weeks between Marseille and Zaventem, in June/July 2017. Additionally, emphasis will be put on the future of offshore underwater interventions.



Dr. Jeremi Gancet received a M.Sc in computer science from Université Laval, Quebec, Canada, and a PhD in Robotics and Artificial Intelligence from the National Polytechnical Institute of Toulouse, working with the Laboratoire d'Analyse et d'Architecture des Systèmes (LAAS), Toulouse, France. During his PhD, he developed navigation strategies for planetary rovers, making use of stereovision based terrain modelling and traversability analysis. He also developed a multi-aerial robots (UAV) architecture for decision making. He joined Space Applications Services in 2005, where he led activities in many ESA and EC (FP6, FP7, H2020) R&D projects, as robotic systems team leader. In 2016, he was appointed manager of the Technologies, Research and Applications division. He is the coordinator of the ongoing H2020 DexROV project (Dexterous ROV intervention in presence of communication latency), and also coordinates two other H2020 Space programme projects (InFuse and LUVMI).

 02.10.2017.

 11:30 - 12:15

 Marine Robotics

 Jeremi Gancet

Monday, 2nd October

A Methodology for Accurate and Quick Photogrammetric Recording of Underwater Cultural Heritage.

Kotaro Yamafune, A.P.P.A.R.A.T.U.S. LLC, Japan

Agisoft PhotoScan and other off-the-shelf photogrammetry software became available for archaeologists in 2010; In 2017, after only 7 years, photogrammetry has become a one of the most frequently used recording methods for UCH (underwater cultural heritage) sites. The author of this paper works as a professional maritime archaeologist and applied photogrammetric recording on more than 35 archaeological sites in more than 10 different countries. Because of its submerged circumstances of many shipwrecks, each site has different conditions: such as visibility and colors of waters, depth, topography, water current and so on. Those different conditions create problems that requires different ways to solve those difficulties. Additionally, each project has different mission statement, or project's goal. For that reason, each submerged site requires different types of methodologies for data-collection and data processing. Moreover, to use produced 3D digital models as archaeological data, it is important to create 1:1 scale-constrained georeferenced 3D models. Yet, to produce these accurate models, it is essential to takes a week to produce local coordinate system that gives scale and georeferenced on the model. To solve these lengthy problem, the author created a methodology that produces local coordinate system in short time (1 or 2 dives) yet provide fairly accurate results. In this paper, the author shall share his methodology of photogrammetric recording that he has developed and currently using.



Kotaro Yamafune received his Bachelor of Arts degree in history from Hosei University in Tokyo in 2006. He entered the Nautical Archaeology Program in the Anthropology Department at Texas A&M University in September 2009 and received his Master of Arts degree in August 2012. He continued his studies in the Texas A&M University Nautical Archaeology Program and earned his doctorate in May 2016. His research interests include shipbuilding in Medieval Europe and the European Age of Discovery, and ship reconstruction both manually and through the use of digital tools such as 3D modeling software. He also focuses on photogrammetric recording of submerged cultural heritage, including shipwreck sites. He also expands his study interest to museology for nautical and maritime archaeology. In September 2016, he founded A.P.P.A.R.A.T.U.S. LLC. and became its president. Currently he is helping both terrestrial and underwater archaeological projects and providing workshops in many countries using his skills of photogrammetry.

 02.10.2017.

 12:15 - 13:00

 Marine Archaeology

 Kotaro Yamafune

Monday, 2nd October

Company presentation: Blueye Robotics

Christine Spiten, Erik Dyrkoren, Martin Ludvigsen, Blueye Robotics, Norway



Blueye underwater drones for the consumer and low end professional market.

Website: blueyerobotics.com



02.10.2017



COMPANY PRESENTATION

14:30 - 15:00

COMPANY DEMO

(divided in 3 groups)

15:30 - 18:30



Company presentation



Christine Spiten
Erik Dyrkoren
Martin Ludvigsen

Monday, 2nd October

Tutorial 1: Omnidirectional Vision for Underwater Robots

Nuno Gracias, Ricard Campos, Computer Vision and Robotics Institute of the Universitat de Girona (ViCOROB/UdG), Spain

The use of omnidirectional cameras on land and in air has become very popular for both research and entertainment. For the scientific community, omnidirectional cameras have high potential in tasks such as mapping, augmented reality, visual surveillance, motion estimation and SLAM. However, their use in underwater environments is still very limited due to the unfavourable properties of the medium. Nevertheless, omnidirectional cameras are expected to have a high impact in fields as diverse as marine life sciences, oil and gas industries, underwater archaeology and preservation/outreach. This tutorial will present key concepts of multi-camera omnidirectional vision, and review the main achievements of the University of Girona in designing, deploying and processing this type of imagery. Application cases will be presented on multi-robot formation tracking, virtual touring, and 3D reconstruction for archaeology.



Dr. Nuno Gracias received the M.Sc. and Ph.D. degrees in Electrical Engineering (Control and Robotics) in 1998 and 2003 from the Technical University of Lisbon, Portugal. From 2004 to 2006 he was a post-doctorate fellow at the University of Miami. Since 2006 he has been a member of the Computer Vision and Robotics Group (ViCORB) of the University of Girona. His research interests span the areas of underwater optical mapping, and navigation and guidance of autonomous underwater robots, image processing and classification. Dr. Gracias has authored more than 30 articles in peer-review journals and more than 45 in scientific conferences, and co-supervised 2 PhD and 6 MSc theses. He is adjunct faculty at the department of Marine Geology and Geophysics of the University of Miami, and member of the editorial board of the Journal of Intelligent and Robotic Systems.



Dr. Ricard Campos received the M.Sc. degree in computer science (2009), the Master in “Automation, Computation and Systems” (2010) and the Ph.D. in technology (2014) from the University of Girona, Spain. His research interests are focused on 2D/3D mapping from optical data, especially focusing on underwater applications. Currently, he is a researcher at the Computer Vision and Robotics institute (ViCOROB) of the University of Girona, and a member of the Underwater Vision and Robotics Research Center (CIRS). He has collaborated in many national projects (e.g., MUMAP, OMNIUS) as well as European projects (e.g., TRIDENT, MORPH).

 02.10.2017.

 15:00 - 15:30

 Tutorial

 Nuno Gracias
Richard Campos

Monday, 2nd October

Demonstration: H2020 subCULTron project – first swarm tests

Tamara Petrović, Barbara Arbanas, Anja Babić, Ivan Lončar, Milan Marković, Goran Vasiljević, University of Zagreb
Faculty of Electrical Engineering and Computing, Croatia

subCULTRON aims to achieve long-term autonomy in a learning, self-regulating, self-sustaining underwater society/culture of robots in a high-impact application area: Venice, Italy. Our heterogeneous system consists of 3 different robot types: artificial mussels (aMussels) on the sea-ground, artificial lily pads (aPads) on the water surface, and artificial fish (aFish) that move/monitor/explore the environment and exchange info with the mussels and lily pads. aMussels monitor the natural habitat, while each aPad serves as a charging and transportation station for aMussels and a connection to the outer world. The project aims to construct 120 aMussels, 5 aPads, and 25 aFish. After two years of the project all aMussels and aPads have been constructed (a swarm of 125 robots). We bring a smaller part of the swarm to BTS (~15 robots) and demonstrate its operation on-site. Along with a demonstration of autonomous and manual operation of individual robot units, we are going to show their cooperation – aPads detecting, navigating and docking to aMussels autonomously, enabling transportation and charging of aMussels. Further, we show reactive underwater swarm communication, in particular aMussels accepting acoustic commands from aPads and acting accordingly.

Website: subcultron.eu



02.10.2017

DEMO
(divided in 3 groups)
15:30 - 18:30

Demonstration

Tamara Petrović
Barbara Arbanas
Anja Babić
Ivan Lončar
Milan Marković
Goran Vasiljević

Tamara Petrović is a research assistant at the Laboratory for Advanced Robotics and Intelligent Control Systems (LARICS) at the Department of Control and Computer Engineering at the University of Zagreb Faculty of Electrical Engineering and Computing – FER. She graduated from FER with a Master's Degree in Electrical Engineering in 2007, majoring in Control Systems. She defended her PhD thesis in July 2014. Her research is mainly in the field of discrete event systems, particularly applied to modelling and control of flexible manufacturing system and multi-robot systems. Her research interest is development of methods for planning, coordination, task dispatching, scheduling and optimization in (large scale) multi-robot systems. She was involved with the ER funded projects EC-SAFEMOBIL – Estimation and Control for Safe Wireless High Mobility Cooperative Industrial Systems, and ACROSS-Centre of Research Excellence for Advanced Cooperative Systems, as well as several nationally and industry funded projects. She is currently working on the H2020-FETPROAC project subCULTRON – submarine CULTURES perform long-term robotic exploration of unconventional environmental niches.

Monday, 2nd October



Barbara Arbanas is a research assistant in the Laboratory for Robotics and Intelligent Control Systems (LARICS) at the Department of Control and Computer Engineering at the University of Zagreb Faculty of Electrical Engineering and Computing – UNIZG FER. She joined the group after graduating from UNIZG FER in 2015. Coming from a Computer Science background, her interests include multi-robot coordination and planning, distributed artificial intelligence, scheduling and optimization. She is currently involved in EU funded projects subCULTRON - submarine CULTURES perform long-term robotic exploration of unconventional environmental niches and EuRoC - European Robotics Challenges.



Anja Babić is a researcher and PhD student at the University of Zagreb Faculty of Electrical Engineering and Computing and a member of the Laboratory for Underwater Systems and Technologies – LABUST. She works primarily on the H2020 project subCULTRON – submarine CULTURES perform long-term robotic exploration of unconventional environmental niches. She was previously involved in implementing tasks for a robot-assisted autism spectrum disorder diagnostic protocol using the humanoid robot NAO for the HRZZ funded ADORE project and developing diver-focused sensing, data processing, and underwater communication as part of the FP7 project CADDY – Cognitive Autonomous Diving Buddy. Her research interests include evolutionary, neural, and bio-inspired robotics, emergent behaviour, task allocation and scheduling, formation control, and communication between both heterogeneous agents and members of a swarm, as applied to marine robotic platforms.



Ivan Lončar received a M.Sc. in Control Engineering and Automatization from University of Zagreb Faculty of Electrical Engineering and Computing – UNIZG FER in Zagreb (Croatia) in 2016. During his studies, he was a national winner of SIM(P)ATIC PLC+ Challenge 2016 competition, and a member of the Centre for Underwater Systems and Technologies – cust. Even before graduation, he started to work at the Laboratory for Underwater Systems and Technologies – LABUST at UNIZG FER. As of 2017, Ivan is pursuing a PhD in marine robotics, specifically in underwater localization. Currently, he is collaborating on multiple scientific and research projects: H2020 subCULTRON – submarine CULTURES perform long-term robotic exploration of unconventional environmental niches, H2020 EXCELLABUST – Excelling LABUST in marine robotics, and nationally funded HRZZ project Cooperative robotics in marine monitoring and exploration – CroMarX.

Monday, 2nd October



Milan Marković is a Researcher at the Laboratory for Underwater Systems and Technologies – LABUST at the University of Zagreb Faculty of Electrical Engineering and Computing – UNIZG FER. He received his B.Sc.E. (2013) degree and his M.Sc. degree (2017) in Mechatronics and Robotics from University of Zagreb Faculty of Mechanical Engineering and Naval Architecture. He has worked as a Research Development Mechanical engineer at the LABUST from 2010 until 2013. He is working at the current position developing robotic mechanical and electrical systems since 2013, and has worked on multiple EU and ONR funded projects such as CADDY, UReady4OS, CART, subCULTron, SeaJumper and PLADYFLEET.



Goran Vasiljević was born in 1986 in Kutina, Croatia. He graduated from high school Tin Ujević in Kutina in year 2004 and enrolled the Faculty of Electrical Engineering and Computing – UNIZG FER at the University of Zagreb. In 2009, he successfully defended his diploma thesis with title Automatic obstacle avoidance using active virtual 3D models at the University of Zagreb Faculty of Electrical Engineering and Computing – UNIZG FER. In 2009, he became a research associate at the Laboratory for Robotics and Intelligent Control Systems - LACRIS at FER's Department of Control and Computer Engineering, where he successfully works on national and international scientific and research projects, as well as on the industrial collaboration projects. In 2009, he enrolls a postgraduate program at FER and in 2016 he defends the topic of his doctoral dissertation with the title Highly Accurate Markerless Localization Of Mobile Robots In Indoor Industrial Environments. His scientific interests include mobile robot localization and control, special robotics systems control and safety driver assistance algorithms in electric cars. He has authored and co-authored two papers in the Current Contents journals of Q1 category, two book chapters and eight conference papers. During his employment at FER, he was a teaching assistant for the courses Programming and Software Engineering, and Laboratory and Skills – Matlab. He was assisting to a number of students working on their bachelor thesis, diploma thesis and seminar works. From the year 2009 he is a member of IEEE, Industrial electronics society.

Tuesday, 3rd October

Innovation Tuesday



Since 2016, BtS also organizes an “Innovation day”, a whole-day workshop where robotics experts, ranging from acclaimed researchers to the leaders of successful robotics start-ups, will share their experience in commercializing robotics-related technologies with the rest of scientific community and aspiring entrepreneurs.

Startup How To

Vladimir de Franceschi, Founder Institute, Inc., USA

Learn how to pick a commercially viable startup idea, protect it and successfully launch a venture fundable startup. Most startups fail because founders make common and avoidable mistakes at the beginning. Scientific startup founders are often struggling with “technology in search of a market” without realizing it. Engineering founders often confuse their customers with too many features instead of focusing on a product-market fit. Startups can’t do everything and they are not the only way to commercialize technology. But, there is a way to commercialize technology through a startup that maximizes chances for success. This talk will provide an overview of how the startup ecosystem works, where startup founders fit-in within it and the key elements of successfully creating and launching a startup learned by hard earned experience.



Vladimir de Franceschi is a Silicon Valley based “lawyerpreneur.” Since graduating from Stanford Law in 2000, he has been corporate counsel for tech startups and an early stage team member on a few occasions. He has counselled startups and their venture capital investors on over \$400Mil in financings and exits. Vladimir is also a global director at the Founder Institute, the world’s largest startup accelerator, operating in 60 countries that graduates over 1000 startups per year worldwide. He launched Founder Institute’s program in Croatia that has graduated over 30 startups since 2013, and has mentored startups from Argentina, Austria, China, Colombia, Finland, Netherlands, Serbia, Slovenia, Spain, Switzerland, Turkey, UK and USA. He is currently general counsel and VP of corporate development for an early stage Singapore-US lifescience startup and a member of the board of directors of one of Croatia’s most successful IT startups. Vladimir is a former navy NCO, passionate about sailing (licensed captain) and scuba diving (PADI master scuba diver).

 03.10.2017.

 09:00 - 09:45

 Innovation Day

 Vladimir de Franceschi

Tuesday, 3rd October

The Scaling of Innovation Tools

Thomas Curtin, Applied Physics Laboratory, University of Washington, USA

A large literature exists on the theory, process, practice and impact of innovation. Valuable insights were also presented in the seven lectures at Breaking the Surface 2016. This lecture will distill the previous work with a focus on innovation tools applicable to organizations of different sizes. How well do innovation methodologies scale? What skills are needed to use the relevant tools effectively and efficiently at different scales? The distinction between disruptive innovation and disruptive technology will also be drawn.



Thomas Curtin is Senior Principal Research Scientist at APL/UW. Previously, he served as Chief Scientist at NATO Undersea Research Centre in Italy, Program Manager at the US Office of Naval Research, Assistant Professor at NC State University, and oceanographer at Fisheries Research Institute in Malaysia. He holds B.Sc., M.Sc., Ph.D. and MBA degrees from Boston College, Oregon State, University of Miami, and MIT. He has been awarded the U.S. Navy Meritorious Civilian Service Medal, the U.S. Navy Superior Civilian Service Medal, the us Coast Guard Arctic Service Medal and is a Fellow of the Marine Technology Society.



02.10.2017.



09:45 - 10:30



Innovation day



Thomas Curtin

Tuesday, 3rd October

Rich & Famous with Underwater Robotics? Attempt of an objective assessment

Tom Runge, German Research Center for Artificial Intelligence DFKI, Robotics Innovation Center, Germany

The talk will focus on opportunities and challenges for research and innovation in underwater robotics outside the realm of publicly funded projects. It will look at current research needs, promising application areas, existing and developing markets, and business models for university-driven start-ups and spin-offs in the domain of underwater robotics.



 03.10.2017.

 10:45- 11:30

 Innovation day

 Tom Runge

Tom Runge is a Project Manager at the Robotics Innovation Center (RIC), which is part of the German Research Center for Artificial Intelligence (DFKI). He graduated from the University of Oldenburg with a Bachelor Degree in Political Economics and Philosophy in 2014. During his studies he was working in several European and German projects, most of them in the field of Smart Energy Systems and Electro mobility, which was also the research topic of his Bachelor thesis. The NeMoLAND project for example was focused on developing new mobility concepts for rural areas. His contribution to these projects was the development of different business models and use cases. Since 2014 Tom is co-leading the EIT Marie Curie Initial Training Network ROBOCADEMY – European Academy for Marine and Underwater Robotics. ROBOCADEMY established a European training and research network to develop key skills and enabling technologies in underwater robotics for the scientific and economic exploration of the oceans (e.g. offshore oilfield of the future). Through the close collaboration of leading research institutes, academia, industry, and small-medium enterprises (SME) in robotics, marine technology, marine science, and offshore industry, ROBOCADEMY provided first-class training and research opportunities for Early Stage Researchers (ESR).

Tuesday, 3rd October

Paths to market – getting university innovation into the right hands

Vlatka Petrović, University of Zagreb, Croatia

The presentation will address key factors to consider when seeking to commercialise new technologies developed in the university setting. It will also discuss possible approaches in reaching the market and engaging partners that can help get it there. It will take into account financing needs for technology and product development and how to best access available options. Drawing on experience in working with researchers on commercialising technology, the aim of the talk is also to stimulate discussion on how to overcome any real or perceived constraints and how to integrate market orientation within the research career path.



Vlatka Petrović is the Head of Technology Transfer Office at the University of Zagreb. She joined the University TTO at its formation in 2008 and has since supported research groups in commercialisation of research results. She has worked closely with management of research organisation in building innovation capacity, implementing projects supporting technology transfer activities. She is a mentor with ZIP-Zagreb Entrepreneurship Incubator, working with teams selected for their startup programme. She holds technology transfer and entrepreneurship workshops for researchers and students, and also teaches intellectual property management within the University of Zagreb Intellectual Property specialist postgraduate programme. Prior to joining the technology transfer field, she worked in research on genome evolution and obtained a Ph.D. from the University of Zagreb Faculty of Science.

 03.10.2017.

 11:30 - 12:15

 Innovation day

 Vlatka Petrović

Tuesday, 3rd October

Financing of Early Stage Technology Startups

Gerardo Morales-Hierro, Triple Helix Venture Capital, Spain

Financing is extremely important for innovation and growth, in particular at the seed and early stages of business development. But innovative early stage SMEs face several barriers for accessing finance because of their inherent riskiness and weaknesses and these market imperfections justify public intervention in entrepreneurial financing. We will present the case of a region as the Canary Islands and the different instruments implemented from the public and the private sector for the development of the technology entrepreneurial ecosystem.



 03.10.2017.

 12:15 - 13:00

 Innovation day

 Gerardo Morales-Hierro

Gerardo Morales-Hierro is a serial entrepreneur with over 15 years of experience leading technical projects and launching new ventures. He has been a consultant to technology companies, governments and international or regional organizations in the United States, Europe and Latin America. He is co-founder of LatIPnet, www.latipnet.org a not-for-profit corporation based on NASA Ames Research Park focused on intellectual property and technology commercialization in us, Latin America and Europe, and co – founder of several startups. He has served as Director of Technology Transfer of the University of Las Palmas www.ulpgc.es and also as Director of the Regional Development Agency of the Canary Islands from where he led the design of the investment funds for technological entrepreneurs and innovative SMEs of the for a total of € 52M. Since October 2016, he has been in charge of the Triple Helix project, the first Canarian private initiative to invest in technology-based business projects based on public R & D.

Website: 3hlx.es

Tuesday, 3rd October

Breaking the corporate

Marin Bek, University of Zagreb Faculty of Electrical Engineering and Computing / H2O Robotics, Croatia

This lecture will discuss entrepreneurship – taking innovative and bold ideas to solve real-world problems when odds are stacked up against you. However, ideas are almost least important – running a successful business is a mixture of various elements, stress and failure. In addition to analysing what makes a business succeed, we will cover different kinds of entrepreneurship, draw parallels between running a business in the US and Europe and discuss how to turn academic work into a business.



Marin Bek holds a M.Sc. in control systems engineering, graduating in the field of underwater robotics. After working for a while in automotive industry, he started his first venture in California in 2011. Since then he worked with and advised various startups in the US and Europe, most notably helping one of them scale to 4 continents, get clients like Nestle, Ferrero and Unilever and ultimately turn into every startup's dream – a profitable venture. He also runs his own IT company in Croatia and is working in Laboratory for Underwater Systems and Technologies – LABUST from University of Zagreb Faculty of Electrical Engineering and Computing – UNIZG FER on a maritime robotics spinoff H2O Robotics.



03.10.2017.



14:30 - 15:00



Innovation day



Marin Bek

Tuesday, 3rd October

Soft Sensing and Simulation

Alex Alspach, Toyota Research Institute, USA

A critical component of object manipulation in the world, both on land and underwater, is the grasp. Uncertainty about an object's shape, pose and dynamics, as well as uncertainty about your robot's kinematics and dynamics makes executing robust, consistent and non-destructive grasps difficult. At Toyota Research Institute, we are focusing heavily on compliance, tactile sensing and modeling as strategies for ensuring robust robotic grasping. This talk will focus on the speaker's past and current work in manipulation and soft sensing, as well as potential applications in marine robotics.



Alex Alspach has been working and researching in robotics since the outset of his university career. While still in school, he spent time in Drexel University's Autonomous Systems Lab (DASL) and South Korea's Advanced Institute of Science and Technology (KAIST) studying the manufacture and construction of their humanoid robot, HUBO. After graduating from Drexel, he spent two more years in Korea at SimLab in Seoul where he developed and marketed hardware and software tools for robotic manipulation research. While in Korea, he also worked with a professional production company to develop artists' software tools for animating complex, constrained and synchronized robot motions. After that, he spent two years on "huggable" robots and various other systems at Disney Research in Pittsburgh. Now an engineer at Toyota Research Institute (TRI) in Cambridge, MA, Alex designs and fabricates soft systems for human-robot and environmental sensing and interaction.

 03.10.2017.

 15:00 - 15:30

 Innovation day

 Alex Alspach

Personal website: alexalspach.com

Tuesday, 3rd October

Bridging the gap between academic research and commercially viable technology

Cesare Fantuzzi, University of Modena and Reggio Emilia, Italy

Academic spin off company is essential to bridge the gap between project outcome and industry application. However, running a brilliant start up is totally different story than to drive a successful research project. The talk will cover the problems and challenges to be faced in running academic based companies, focussing on the example of multi-AGV systems in industrial applications. Groups of AGVs have been increasingly used, in the last few years, for automating logistics operations in industrial environments. This talk will focus on methodologies for modeling, in a dynamic manner, the traffic of the AGVs moving in the plant. Such a traffic model can then be exploited for implementing advanced coordination strategies. Along these lines, the talk will discuss some recently developed methodologies that, using a hierarchical strategy, lead to optimizing the traffic flow through industrial plants



 03.10.2017.

 15:30 - 16:00

 Innovation day

 Cesare Fantuzzi

Cesare Fantuzzi has over 25 years of experience in the area of industrial automation and robotics, with a solid scientific background certified by over 200 publications in leading conferences and journals in automation and robotics area. He is associate editor of “Mechatronics” Journal (Elsevier) and has a chair in the scientific committee of IEEE International Conference on Emerging Technologies and Factory Automation, IEEE International Conference on Automation Science and Engineering and Intellimech Consortium. He is in the scientific committee who wrote the Italian Research and Innovation Roadmap for the Smart Factory . He is the reference researcher for University of Modena and Reggio Emilia at EFFRA (European Factory of the Future Research Association). Cesare was in the board of experts who wrote the “Smart Specialisation Strategy” for Emilia-Romagna Region, Italy. Since 1998, Cesare has been the chief investigator of more than 80 industry founded research projects in cooperation with large, medium and small companies. These researches aim to the application of concepts and technologies of Industry 4.0 and Digital Factory (IoT, integrated design and simulation, vision systems, predictive maintenance, robot-human co-working, etc.) to the development of smart machine and devices to improve manufacturing processes. In the latter years, Cesare coordinates a research staff of about 25 people in the ARSControl laboratory of University of Modena and Reggio Emilia. He was the main coordinator of VII FP European project STRATOS (Open System for TRACTORS autonomous Operations, and the coordinator for University of Modena and Reggio Emilia of VII FP European projects UNIFARM (GNSS based Navigation User Forum on Innovation for Farmers) and PAN-ROBOTS (Plug and Navigate Mobile Robots for Smart Manufacturing Systems). He is the coordinator for University of Modena and Reggio Emilia of Horizon 2020 European projects SYMPLEXITY (Symbiotic human-robot collaborations for safe and multimodal manufacturing systems), Grant Agreement nr. 637080 and IMPROVE (Innovative Modeling Approaches for Production Systems to raise validatable efficiency), Grant Agreement nr. 678867 . He is main scientist and coordinator of Horizon 2020 project INCLUSIVE, Grant Agreement nr. 723377.

Tuesday, 3rd October

From research to business: some experiences at the University of Calabria

Fabio Bruno, University of Calabria, Italy

This lecture presents the stories of three spin-off companies born at the University of Calabria and operating in the area of underwater technologies. The focus will be on the opportunities, main issues and practical problem that the companies have faced during their development.



 03.10.2017.

 16:00 - 16:30

 Innovation day

 Fabio Bruno

Fabio Bruno is Associate Professor at the Department of Mechanical, Energetics and Management Engineering (DIMEG), University of Calabria (UNICAL) in Italy. He is co-founder of 2 spin-off companies, 3D Research s.r.l. and Tech4Sea s.r.l., that operate in the area of underwater technologies. His research interests include the development of new technologies and systems for the documentation, preservation and exploitation of underwater cultural heritage. He is currently in charge of the UNICAL and 3D Research teams in four European projects: INTERREG MED – BLUEMED; H2O2O IMARECULTURE; EASME Lab4Dive “Mobile Smart Lab for augmented Archaeological Dives”; EASME – “Underwater Cultural Route in Classical Antiquity”. He has been the principal investigator of the national project “VISAS – Virtual and augmented exploitation of Submerged Archaeological Sites”. He has been in charge of the DIMEG Research Unit in several national projects like: “ITACA – Innovative Tools for cultural heritage ArChiving and restorAtion” and COMAS “Planned in Situ Preservation of Underwater Archaeological Artifacts”. He is co-author of more than 90 scientific papers.

Tuesday, 3rd October

Uncovering the impact of the institutional environment on transfer activities

Martina Schraudner, Fraunhofer Center for Responsible Research and Innovation, Germany

In order to explain the researchers' and especially female researchers' engagement in entrepreneurial and transfer activities, institutional and organizational contexts of research organizations have to be taken into account. Investigating such settings, studies focusing on the academic sector analyzed the multi-faceted role of universities in transferring academic knowledge to industry and society. Despite strong efforts to embrace their 'third mission', universities still vary significantly in their entrepreneurial performances. One important pillar that influences scientists' engagement in entrepreneurial activities substantially is the organizational culture at their institutions and department. Our studies reveals leverage points how research institutions can initiate such change and can promote especially women as entrepreneurs and active players in knowledge transfer.



Prof. Dr. Martina Schraudner heads the Fraunhofer Center for Responsible Research and Innovation. After studying biology and biotechnology and graduation at the Technical University of Munich, she has held various positions in the Gesellschaft für Umwelt und Gesundheitsforschung München (GSF), the Eidgenössischen Technischen Universität Zürich (ETH) and Forschungszentrum Jülich (FZJ). Since the year 2000, she has been in the headquarters of Fraunhofer to advance the expansion of the life sciences as well as the development of the subject group medical technology under the guidelines of Fraunhofer. At the Technical University of Berlin, Prof. Dr. Martina Schraudner holds the chair for "Gender and diversity in technology and product development". She deals with methods, instruments and processes that make diversity accessible to innovation processes. Martina Schraudner is active in national and international committees for application-oriented research and innovation projects, among others for the "Structural Change" group of experts of the EU. She is a member of the University Council of the University of Paderborn, the Board of Trustees of the European Academy for Women in Politics and Business (EAF) and the Executive Board of the Kompetenzzentrum Technik-Diversity-Chancengleichheit e.V..

 03.10.2017.

 16:45 - 17:30

 Innovation day

 Martina Schraudner

Tuesday, 3rd October

Innovation Tuesday: Round table on creativity, innovation and entrepreneurship – Underwater technologies: The road ahead

Moderated by: **Kemal A. Delic**, ACM Ubiquity Editor, France

Oceans and seas are the source of the life on Earth. They are critical for regulating climate and the survival of humanity. It is therefore paradoxical that we know more about some distant planets than our own, Blue Earth covered 73% by water. As we sense that underwater robotics (UWR) technologies are reaching a tipping point, we strongly believe that this will require new discoveries and consistent development of several new technologies in sensors, materials, energy, communication, navigation, architecture and intelligence. This roundtable will gather leading authorities in this field to discuss the current state of UWR technologies, to gauge some near-term advances, and to bravely project the future of this promising field.



 03.10.2017.

 17:30 - 18:30

 Innovation day

 Kemal A. Delic

Kemal A. Delic is a senior technologist and practicing enterprise architect with Hewlett-Packard Co. He is Visiting Senior Fellow with The Open University, UK. He is also adjunct professor at IAE business school at Grenoble University. He serves as associate editor to ACM Ubiquity magazine. He acted as an advisor and consultant to European Commission on FET programs. He holds 2 US and 1 EU patent. Lives in Grenoble, France. He holds Dipl. El. Ing. Degree from the University of Sarajevo ('81). During the last 30+ years he has worked mainly in the area of very large scale systems: either on industrial, commercial products or academic research. His principal interest is in architecture, design and engineering of the very large scale systems. In 1989/90 and 1994/96 he was visiting professor and researcher with CNR – Italian National Research Council – IEI institute working on error detection through signature analysis (PDCs Project), Bayesian Belief Network models in safety arguments (EU SHIP Project) and marketing with mobile intelligent agents (EU MIA Project). He has published 100 + papers, articles and essays in journals, magazines and conferences. He has given talks, delivered lectures and organized workshops and conferences. In 80ies he has published original book on Pattern Recognition Principles and lately 3 book chapters on Enterprise Knowledge Clouds (2010, 2011). His recent research interest is in the science and practice of hybrid complex systems. Big Science, Big Data and Digital Economy are his most recent interest.

Wednesday, 4th October

Localization and mapping in dynamic underwater environments

Eduardo Silva, INESC TEC / ISEP, Portugal

Autonomous localization and environment mapping are considered key capabilities to achieve truly autonomous robotic systems. Localization is the process of estimating the robot's global position and orientation, while mapping consists on building an accurate internal representation of the environment. Both tasks are associated with perception through onboard carried sensors. So, information about the environment usually comes from noisy measurements taken in a noisy, dynamic and unstructured environment. Sensor capabilities are also environmental dependent, take the example of underwater SONAR, that evidently it is not suitable for in land operation. Another example is the GNSS, that provides handy global references in open skies, but suffers from deteriorated performance inside canyons, becoming unreachable indoors. For those facts, no general solution, for localization or mapping, is known to work universally in every scenario. Usually, a single sensor does not provide enough information to properly estimate localization or mapping. Hence, long-term reliable operation, with high sampling rate, results from the combination of complementary information given by different sensors. Moreover, robot perception is affected by uncertainty, therefore, instead of computing a single solution, probability distributions are used instead to represent the intrinsic uncertainty of robot's localization and mapping states. Underwater environments encompass extra challenges that derive from the particular properties of the aquatic medium. Due to the reduced visibility underwater, the effectiveness of optical sensing devices is limited no near range operations. Moreover, in the middle of the water column, no consistent visual clues are expected, therefore visual based techniques are useless.



Dr. Eduardo Silva is the Coordinator of the Centre for Robotics and Autonomous Systems (CRAS) at INESC TEC and Professor at the School of Engineering (ISEP) of the Porto Polytechnic Institute (IPP). He has a PhD in Electrical and Computer Engineering from the University of Porto. His main research areas are marine robotics, control architectures, perception and navigation for autonomous robots. He has participated in more than 14 research projects and has more than 60 publications in the Field Robotics.

 04.10.2017.

 09:00 - 09:45

 Marine Robotics

 Eduardo Silva

Wednesday, 4th October

Technology, archaeology and student challenges: Finding a best practice for presenting maritime archaeology

Andreas Kallmeyer Bloch, The Viking Ship Museum in Roskilde, Denmark

How do we get the museum guest to feel the thrill of discovering an invaluable archaeological artefact? How can we make people feel the magic of the Big Blue? How can we test a hundred different ways of getting the public engaged in maritime archaeology? The Viking Ship Museum has the responsibility for ca. 2000 km coastline filled with archaeology. Sites and finds from the first people who entered the area 15000 years ago, and up until our present day. It is the most vulnerable coastline in Denmark in terms of impact from construction of bridges, harbours, pipes and cables. These projects are constantly exposing and partly destroying the underwater cultural heritage, but also allowing the archaeologist to excavate a high number of sites at the expense of the contractor. Excavating and collecting data is important, but the final product also has to be of a high standard and equally important is has to be available to both academics and the general public. The Viking Ship Museum and the University of Roskilde have encouraged students to create installations as part of their curriculum. More than a hundred students have participated in the testing of hardware, and the development of software and creative ideas to address the experiment. To evaluate the projects school kids have tested the ideas, enabling the museum to exploit the possibilities offered by new technology. The project has no end date, but strives towards generating a best practice handbook for the museum. When the museum has the opportunity to expand its exhibitions in the future, it will be ready to fill the installations, projections and bare walls with unique data, that the public can relate to and be amazed by.



Andreas Kallmeyer Bloch has a MA in Maritime and Public Archaeology from University College London and a BA in Medieval Archaeology and Museum Studies from Aarhus University. Andreas is a commercial diver and has worked with maritime archaeology at The Viking Ship Museum for ten years. He joined the exhibition department at the museum in 2013. His main focus area over the last few years has been dissemination and exhibition of maritime archaeology, and current approach to documentation in the field and methods to present the underwater cultural heritage.

 04.10.2017

 09:45 - 10:30

 Marine Archaeology

 Andreas Kallmeyer
Bloch

Wednesday, 4th October

Relevance of UMS for Below the Surface (BTS) Tasks

Richard J. Nagle, Naval Sea Systems Command/PMS-408; Navy EOD Program Support Senior Program Analyst, G2 Software Systems, Inc. , USA

Academia and industry continue to advance the state of technology in sensors, sensor processing, precision navigation, communications, automatic target recognition (ATR), autonomy, energy, and electronics and to integrate them into a growing family of Unmanned Maritime Systems (UMS). As new material solutions emerge, increasing demands for broader applications of UMS for scientific, commercial and military uses are materializing. This brief will highlight the presenter's perspectives on the most challenging technical and operational aspects associated with transition of UMS from proven concept to successfully fielded, sustainable capabilities in end-user organizations and activities. The presentation will provide a short background, based on lessons learned and observations from the presenter's unmanned undersea vehicle (UUV) systems acquisition experience in one area of U.S. Navy applications for UMS involving naval mine countermeasures, maritime homeland defense, and port clearance 'below-the-surface' tasks. A summary of the most significant barriers to successful transition from proof of concept to future capabilities is provided. Finally, some thoughts are offered for consideration by technology developers and demonstrators on future investment and acquisition priorities and strategies as they relate to future UMS capabilities.



 04.10.2017

 10:45 - 11:30

 Maritime Security

 Richard J. Nagle

Rick Nagle is a retired U.S. Naval Officer and Master EOD Technician supporting PMS-408. During his 20 years of Naval service, Rick qualified surface warfare officer (SWO) deploying on a number of ships, and served as an EOD Officer in Charge, as a department head at Navy EOD Mobile Units, and as Commanding Officer (CO) of EOD Mobile Unit SIX in Charleston, SC, and EOD Mobile Unit EIGHT in Sigonella, Sicily. While in command, Rick deployed as the Task Unit Commander for Navy EOD MCM forces in Operation Desert Storm and led Navy EOD forces in several other campaigns and operations. His final assignment was as the EOD Program resource sponsor and requirement officer at the Pentagon. During his naval service, Rick received numerous campaign, service and unit commendation awards. Since transition from Naval Service in 1997, Rick has provided analysis and project management support to the Navy EOD Program Office, specializing in technology transition and acquisition of unmanned maritime systems. Rick continues to play a contributing role, most significantly in the Navy's Shallow Water (SW), Very Shallow Water (VSW) and Expeditionary Mine Countermeasures and Maritime Homeland Defense counter-underwater improvised explosive device (UW/IED) investment portfolios in support of the Navy Expeditionary Combat Enterprise (NECE). Over his active duty and follow-on career, he has authored numerous papers, presented at professional symposia, and has played an instrumental role in the development and staffing of investment strategies, strategic plans, and concepts of operations to gain stakeholder guidance and feedback and to sustainment support for material solution investment toward the acquisition of future naval capabilities.

Wednesday, 4th October

Cetaceans and sea turtles of the Adriatic – the next step

Draško Holcer, Croatian Natural History Museum, Blue World Institute of Marine Research and Conservation, Croatia

Until recently, we considered Adriatic Sea as a „boring place” with low diversity of cetaceans and sea turtles. However, two decades of dedicated research effort gave us quite a different perspective – eight Cetacean species and two sea turtle species, present throughout the Mediterranean, are also present in the Adriatic Sea with different densities. These include common bottlenose dolphin, short-beaked common dolphin, striped dolphin, fin whale, sperm whale, long-finned pilot whale, Risso’s dolphin, Cuvier’s beaked whale, loggerhead turtle and green turtle. In addition, occasional visitors to the Mediterranean Sea, false killer whale, humpback whale and leatherback turtle, have also been recorded with solitary individuals in the Adriatic Sea. Our research methods included photo identification (to evaluate residency patterns and homerange, social ecology, abundance estimates etc.), tissue sampling (for genetics, toxicology, stable isotopes) and aerial surveys (species presence, basin wide distribution and abundance). Present level of knowledge provides us with opportunities to develop management measures that could provide needed conservation to this endangered species. But, effectiveness of applied management can be evaluated only through regular monitoring, and basin-wide monitoring does not come easy (or cheap). The lecture will outline the need and possibilities for development of automated procedures for data analysis and use of unmanned vehicles for data collection with the aim of development of future species monitoring activities.



 04.10.2017

 11:30 - 12:15

 Marine Biology

 Draško Holcer

Draško Holcer is a senior curator at Croatian Natural History Museum (Zagreb) and president of the Blue World Institute of Marine Research and Conservation (Veli Lošinj). Draško holds a Ph.D. on the Ecology of the common bottlenose dolphin in the central Adriatic Sea from University of Zagreb. During his career, he has been devoted to research and conservation of mammals – from bats, voles and mice to Cetaceans. His current interests are marine conservation biology, Cetacean population studies and marine conservation policies. He is a member of ACCOBAMS Scientific Committee and acts as conservation policies advisor to national and international organisations and authorities. He published over dozen books and book chapters, over 20 peer-reviewed papers and over 50 conference papers and abstracts. In the last five years he participated in several IPA Interreg projects, including NETCET – Network for the Conservation of Cetaceans and Sea Turtles in the Adriatic and Adriatic+: sharing marine and coastal cross management experiences in the Adriatic basin. In cooperation with ISPRA (Rome), he organised and carried out two aerials surveys of the Adriatic sea providing first estimates of abundance and distribution of Cetaceans, sea turtles and giant devil rays. Currently, he is coordinator of joint Collective actions for improving the conservation status of the EU sea turtle populations – LIFE Euroturtles project, between 6 EU countries and 9 partners.

Wednesday, 4th October

The Great Maya Aquifer

Guillermo de Anda, Instituto Nacional de Antropología e Historia / National Geographic Society /
Proyecto Gran Acuífero Maya, Mexico

The Great Maya Aquifer Research Project is undoubtedly one of the most important initiatives in the Yucatan peninsula, due to its impact on the generation of information for the preservation of the cultural, historical and natural heritage of our country and the world. The GAM team consists of experts in different disciplines, with more than 20 years of experience, as well as young students, whose purpose is to contribute to the understanding and conservation of the great natural and cultural wealth that gives life to this whole area.



04.10.2017



12:15 - 13:00



Marine Archaeology



Guillermo de Anda

Guillermo de Anda is an underwater archaeologist specialized in the study of mortuary and funeral rituals in caves and cenotes, contexts that he has worked for more than 30 years. He is a doctor in Mesoamerican studies and a diving instructor with more than 15 specialties including cave diving. De Anda is a National Geographic Explorer, Fellow of the Aspen Institute Mexico and active member of the Mexican Society of Geography and Statistics. He has developed and directed various projects of underwater archeology in the Yucatan peninsula, including the Cult of the Cenote and the taphonomic analysis of the human bones from the Sacred Cenote of Chichen Itzá, with which he received in 2007 the honorific mention of anthropology physical Of the “Javier Romero Molina” award. He also founded and directed for 12 years the first workshop of underwater archeology in Mexico. In addition, he has been speaker at more than 50 congresses and invited as a lecturer in the U.S., Europe and Latin America. He is the author of numerous articles and two books. He currently works in the National Archaeological Coordination as Special Projects for Underwater Archeology and is director of The Great Maya Aquifer, a multidisciplinary exploration project for the subsoil of the Yucatan peninsula, with which he seeks to understand the relationship between humans and aquifers and the environment.

Wednesday, 4th October

Tutorial 2: Parallel Computing with CUDA made (almost) simple

Matija Rossi, University of Limerick, Ireland

This tutorial is an introduction to general-purpose computing on graphics processing units (GPGPU) using Nvidia's CUDA platform. GPGPU is used by a wide range of modern software to drastically increase performance by exploiting the parallel processing capabilities of GPUs. Some of its common applications include scientific computing, signal processing, computer vision, CAD, computer graphics, artificial intelligence, etc. Whether you are barely aware of having an Nvidia sticker on your PC, or whether you are a bearded C programmer, this tutorial can help you understand GPGPU and how to make use of it. Interaction is welcome, everyone is encouraged to bring their Nvidia powered laptops to set them up for CUDA, to find out if their application can benefit from a GPU, or to discuss algorithms they wish to parallelise.



Matija Rossi is a Ph.D. researcher at the Mobile and Marine Robotics Research Centre of the University of Limerick, currently working on vision and sonar systems for ROV based inspection and intervention operations. His research involves development of sensor (camera, acoustic, inertial, etc.) based approaches for target registration and inspection, ROV positioning and navigation, and advanced visualisation for augmenting the pilot's perception. CUDA is one of his daily tools in his work on real-time computer vision systems.



04.10.2017



TUTORIAL INTRO

14:30 - 15:00

HANDS-ON

(divided in 3 groups)

15:30 - 18:30



Tutorial



Matija Rossi

Wednesday, 4th October

Tutorial 3: Underwater Camera Calibration with the Pinax model: a new camera model allowing accurate in-air calibration of cameras in flat pane underwater housings

Andreas Birk, Tomasz Łuczyński, Jacobs University Bremen, Robotics Group, Germany

A new calibration process for underwater cameras is presented that is very easy and convenient to use while yielding very accurate results. It is based on the novel pinax model that allows in-air calibration of underwater cameras. The focus is on a hands-on usage of the model and related software for calibration. The pinax refraction correction is derived from an analysis of the axial camera model for underwater cameras, which is among others computationally hard to tackle. But by exploiting realistic constraints on the distance of the camera to the window, aspects of a virtual pinhole model with the projection function from the axial camera model can be combined. This allows the pre-computation of a lookup-table for very fast refraction correction of the flat-pane with high accuracy. The model takes the refraction indices of water into account, especially with respect to salinity, and it is therefore sufficient to calibrate the underwater camera only once in air. It can be demonstrated by experiments in different salt and sweet water conditions that the new pinax model outperforms standard methods. Among others, it can be shown that the pinax model leads to accurate results with single in-air calibration and even with just estimated salinity values. The pinax model is introduced and explained in detail in the following article (available with open access): T. Łuczyński, M. Pflingsthorn and A. Birk. The Pinax-Model for Accurate and Efficient Refraction Correction of Underwater Cameras in Flat-Pane Housings. Ocean Engineering, Vol. 133, pp. 9-22, March 2017



Andreas Birk is since November 2011 a Full Professor in Electrical Engineering and Computer Science at Jacobs University Bremen where he leads the robotics group. He started at Jacobs University in fall 2001 as associate professor while rejecting an offer for a professorship (C3) at the University of Rostock. Before he joined Jacobs University, he held a research-mandate of the Flemish Society for Applied Research, IWT. He was in addition from October 1997 on appointed as visiting professor (docent) at the Vrije Universiteit Brussel (VUB). He also worked as a visiting professor (C3) at the Universitat Koblenz-Landau in the winter-semester of 1999/2000. During the almost six years at the VUB, Andreas Birk was a member of the Artificial Intelligence Lab, which he joined as Postdoc in April 1996. In 1995 he received his doctorate from the Universitat des Saarlandes, Saarbrücken, where he previously studied Computer Science from fall 1989 to spring 1993.

 04.10.2017

 TUTORIAL INTRO
15:00 - 15:30
HANDS-ON
(divided in 3 groups)
15:30 - 18:30

 Tutorial

 Andreas Birk
Tomasz Łuczyński

Wednesday, 4th October



Tomasz Łuczyński is a Ph.D. student and Research Associate in Robotics team at Jacobs University Bremen. He received his BSc Eng degree (2013) in Automation and Robotics from Warsaw University of Technology and his M.Sc. degree in Computer Science (2015) from Jacobs University Bremen. He worked for leading robotics research institutes: the Industrial Research Institute for Automation and Measurements in Warsaw (2011-2012) and the Institute of Mathematical Machines in Warsaw (2012-2013). He also worked in multiple EU-funded projects, namely in FP7 on TIRAMISU, MORPH, and CADDY and in Horizon2020 on DexROV. Furthermore he is a finalist of a science popularization contest FameLab Poland 2017.

Demonstration: DexROV – Dexterous manipulation

Alessio Turetta, Graal Tech S.r.l., Italy

The goal of the demo is showing the motion capabilities of the DexROV manipulator.



Alessio Turetta graduated Cum Laude in 2000 as a software engineer at University of Genova. After a brief experience as a business analyst in McKinsey & Co, he joined the University of Genova as Assistant Professor in 2002. He got a Ph.D. title in Robotics in 2005 and became Research Assistant in 2011. In parallel with the academic career, since 2002 he has been cooperating with Graal Tech, as a control system and embedded system specialist. In 2015, he left the University and definitively joined Graal Tech. Currently he is the business development manager of the company, other than a partner and a member of its board of directors.



04.10.2017



DEMO
(divided in 3 groups)
15:30 - 18:30



Demonstration



Alessio Turetta

Thursday, 5th October

FOCE – Long Term In Situ Ocean Acidification Instrumentation

William Kirkwood, Monterey Bay Aquarium Research Institute, USA

The goal of FOCE (Free Ocean CO₂ Enrichment) technology is to provide precise control of pH within in situ experimental chambers with minimal effect on other environmental conditions, to support experiments evaluating the consequences of ocean acidification on marine organisms and communities. The chemical and physical techniques for controlling CO₂ chemistry are well understood, but depend on the marine environments of interest. The technologies and application techniques used to execute FOCE required considerable time and expertise to develop. A user community has developed and is now putting FOCE technology and expertise in an open source package called xFOCE. This paper discusses the FOCE developments that have occurred, are currently operating and those planned for the future using closed loop control to adjust pH to imitate expected future ocean conditions. FOCE is a multi-disciplinary tool for Ocean Acidification (OA) studies in any marine environment. xFOCE is the open source variant intended to allow more researchers to use FOCE techniques by through the existing user community contributing expertise and technical support.



William Kirkwood has been with the Monterey Bay Aquarium Research Institute (MBARI) for 25 years. During that time Bill has been Mechanical Engineering Supervisor, Associate Director of Engineering and Director of Engineering before taking on the Senior R and D role in 2014. Over the 25 years Bill has been program manager and lead engineer on a number of vehicle systems such as the ROV Tiburon and the Dorado AUV systems. Bill developed the AUV Tutorial for the IEEE Oceanic Engineering Society. Bill's current focus is developing underwater instrumentation for science to look at hydrates and anthropogenic CO₂ ocean acidification issues doing closed loop control around pH and in situ laser Raman spectroscopy. Bill is also an Adjunct Professor at Santa Clara University as well as Treasurer for the Oceanic Engineering Society.

 05.10. 2017

 09:00 - 09:45

 Marine Robotics

 William Kirkwood

Thursday, 5th October

Extreme seafloor ecology: use of ROVs and AUVs to evaluate biodiversity and ecosystem function in the world's most remote ecosystems

Craig R. Smith, University of Hawaii at Manoa, USA

The seafloor deeper than 500 m covers most of the earth's surface and harbours substantial biodiversity, evolutionary novelty and mineral resources. Evaluation of deep-sea biodiversity as well as human impacts from mining, oil drilling and climate change require use of robotic technologies including remotely operated vehicles (ROVs) and autonomous underwater vehicles (AUVs). This lecture will begin by describing the unusual, and challenging nature of deep-sea ecosystems. Then, drawing from our own research on climate change and species invasions in Antarctic ecosystems, studies of deep-sea whale-fall communities, and environmental baseline studies for manganese-nodule mining in the abyssal Pacific Ocean, I will highlight three topics: (1) challenges of working in the remote and extreme environments of the deep sea and polar oceans, (2) the types of seafloor data ideally collected with ROV/AUV technology to support deep-sea ecological research and environmental baseline studies, (3) examples of scientific discoveries and insights made possible through use of remote technology, and (4) the strengths and weaknesses of the ROV/AUV approach compared to direct human observations (e.g., via human occupied vehicles, or HOVs). Finally, I will summarize some of the continuing major challenges for use of remote technologies for basic research, environmental baseline studies, and deep-ocean observing systems in the earth's most extreme environments.



 05.10.2017.

 09:45 - 10:30

 Marine Biology

 Craig R. Smith

Craig R. Smith obtained his Ph.D. from Scripps Institution of Oceanography in 1983 and is now a Professor of Oceanography at the University of Hawaii with strong interests in biodiversity, disturbance ecology and human impacts on seafloor ecosystems. His research and conservation efforts have focused on the vast and poorly understood deep-sea and Antarctica, where high diversity, fragile habitats, and slow recovery rates cause ecosystems to be especially sensitive to human impacts and climate change. Smith has conducted research from the equator to Antarctica, studying mangroves, submarine canyons, whale-fall communities, cold seeps, continental slopes and abyssal plains to obtain a broad perspective of natural and anthropogenically stressed marine ecosystems. He has been chief scientist of 66 research cruises that have conducted >200 dives into the deep sea with human occupied vehicles (Alvin, Pisces, Sea Cliff, Turtle, Nautile), ROVs (5 different vehicles), AUVs, gliders and a variety of other imaging platforms. This work led to the discovery of whale-fall communities, king crabs invading the Antarctic shelf, a numerous species new to science. He has published over 160 papers in the peer reviewed scientific literature and his work has been featured in the BBC Blue Planet Television Series (The Deep), the documentary film Expedition to the Abyss, the NPR program Radiolab, the television program Bill Nye the Science Guy (on which he was a "Way Cool Scientist"), and in exhibits in 7 museums and public aquaria in five different countries. He has received a Pew Fellowship in Marine Conservation (which led to the setup of the world's largest network of marine protected areas in the deep sea) and the international Senckenberg Prize for Nature Research.

Thursday, 5th October

Late Quaternary and Holocene Submerged Landscapes of the Eastern Adriatic Sea

Slobodan Miko, Croatian Geological Survey, Croatia

The Croatian coastal region is a part of Maritime Dinaric Alps which coincides with the Adriatic Carbonate Platform (AdCP). Some of the coastal karst depressions developed into larger lakes. Due to the permeable nature of karst some of the coastal lakes never developed as freshwater bodies (Veliko jezero, Mljet Island). Terrestrial paleosol sequences in the Croatian coastal karst regions are often incomplete due to erosion or nondeposition. Therefore, accumulation of lake and marine sediments offer complete archives spanning through most of the Holocene. Generally larger karst depressions lie between the islands at present day water depths from – 40 m to -90 m. These geomorphological and sedimentological landscapes contain archives of climate change and have experienced repeated relative sea-level cycles during the Quaternary. Between the last interglacial (MIS 5.5, 125 kyr BP) and Holocene (10 kyr cal BP) periods the present submerged depressions of Kvarnerić bay (-80 to -90 m below present day sea level), Valun bay and Lošinjski kanal due to submerged sills at various sea depths and the amounts of fresh water feeding the basins during the glacial low-stand favored development of shallow glacial freshwater lakes. The thickness of paleo-lake sediments varies from 2 m in Karinsko more to more than 10 m in Lošinjski kanal. Most of the present day lakes along eastern Adriatic coast formed during the early Holocene (Bokanjačko blato, Vransko jezero near Biograd, Veliko jezero- Mljet). Vransko jezero on the Island of Cres survived from the Pleistocene as probably did Lake Crniševo (Baćina lakes). The LGM lakes of Lošinjski kanal and Valun bay were flooded at onset of the Holocene, while the Pleistocene lake in Pirovac bay was flooded by the sea 8 ky cal BP and Veliko jezero on Mljet Island at 3 ky cal BP.



Slobodan Miko's research is focused on the study surface processes in karst related to the geochemistry and mineralogy of soils and sediments. Experience of interdisciplinary work ranging from experimental geochemistry and environmental science, mineral resources to statistics. Recently, the focus of his studies are soils, lake and marine sediments as archives of environmental change (climate and anthropogenic) during the Holocene and the geomorphology and development of submerged landscapes along the Eastern Adriatic coast. He is the principal investigator of the Lost lake Landscapes of the Eastern Adriatic Shelf-LoLADRIA project (Croatian Science Fund), also the PI for Croatian contribution to the EMODnet (European Marine Observation and Data Network) geology II project. Author or co-author of more than 50 papers in peer reviewed international and Croatian scientific journals, 350 cites in WOS, 300 in Scopus, 625 in Scholar, h-index range=10-13. Co-editor and co-author of the Geochemical Atlas of the Republic of Croatia (2009) and 9 chapters in books. More than 150 other publications (conference papers, abstracts and reports). He has supervised 15 theses ranging from master's to PhD level.

 05.10.2017.

 10:45 - 11:30

 Marine Geology

 Slobodan Miko

Thursday, 5th October

Contemporary Underwater Archaeology in Portugal. New challenges, new ideas

Augusto Salgado, CINAV - Centro de Investigação Naval, Portugal

Within the research line of Maritime History, the CINAV created HistArC: a Research Program about Maritime History and Archaeology of the Conflicts, that aims the study Maritime study of the xx century, on its Military, Merchant and Fishing areas, in both dimensions: Archaeology and History, added of the Maritime Landscape approach, on a multidisciplinary level, not only by consider different areas of human sciences, but also with sciences as biology, chemistry, geophysics and robotics. In this multidisciplinary and multi-science approach we try to develop some different solutions to a series of new problems that this Contemporary period brings, as the verticality or the nature of the wrecks. Metal wrecks arise different problems and demand other solutions when being investigated.



Augusto Salgado was born in 1965 and graduated from the Portuguese Naval Academy in 1983. He is a Captain of the Portuguese Navy, has a PhD in Maritime History by the Faculdade de Letras, Lisbon, since 2011. He is a researcher at CINAV – PT Naval Research Centre, member of the Academia de Marinha and of the Portuguese Military History Commission. He teaches Maritime History (xvi to xx centuries) at the Portuguese Navy Academy (Escola Naval) and in pos-graduated courses. His field of study is the Portuguese Naval History, mainly sixteen century onward and has published 3 books on this subject, plus several papers. In 2011 he won the award Prémio do Mar – Rei D. Carlos 2011 (Cascais). He is also a keen underwater archaeologist enthusiast since 1996 and underwater photographer for over 30 years. Currently he is the co-coordinator of the project The U-35 operations in the Algarve that won the National Archaeology Society (UK) award Adopt a Wreck Award 2015 and of the Research Program – HistArC: Maritime History and Archaeology of the Conflicts.



05.10.2017.



11:30 - 12:15



Marine Archaeology



Augusto Salgado

Thursday, 5th OCTOBER

Towards persistent AUVs for seabed inspection

Marc Carreras, Computer Vision and Robotics Institute of the Universitat de Girona (ViCOROB/UdG), Spain

Inspection of underwater natural or artificial structures is one application of high interest to be performed by AUVs. Underwater environments provide challenging scenarios, mainly due to technological difficulties related to exploration (i.e., lack of reliable localization and communication, autonomy limitations), but also due to water currents and complex underwater reliefs. These are problems not easy to deal with, and that is the reason why new technology to explore the ocean floor is under continuous development nowadays. Persistent deployment of AUVs holds the key to achieve consistent, long-term undersea monitoring and inspection. The use of docking stations allows long-term usage of AUVs by connecting them for data download and remote mission redefinition and supervision. This talk presents the work done in the University of Girona during the last years about online exploration and path planning for seabed inspection, and the work done in the Sunrise Loon-Dock project about persistent deployment using a docking station. The results of these projects point out the possibility of having in the near future AUVs working persistently for long-term exploration or inspection applications.



Marc Carreras is Associate Professor in the Computer Engineering Department at UdG, and member of the VICOROB institute working in the CIRS laboratory. He holds a B.Sc. degree in Industrial Engineering (1998) and PhD in Computer Engineering (2003, Best PhD award) from the University of Girona. He has participated in several European projects (FP7 STREP “TRIDENT”, FP7 STREP “PANDORA”, FP7 IP “MORPH”, FP7 EUROFLEETS “CALDERA 2012”) about autonomous underwater robotics. Since 1999, he has participated in 14 research projects (6 European and 8 National), he is author of more than 90 publications, and he has supervised 3 PhDs thesis (2 more under direction). He led the participation of VICOROB in SAUC-E (Student European AUV competition) in 2006 (1st prize), 2010 (1st prize), 2011 (2nd prize) and in euRathlon underwater competition 2014 (1st prize). His research activity is mainly focused on underwater robotics in research topics such as intelligent control architectures, robot learning, path planning, AUV design, modelling and identification. Dr. Carreras is member of the IEEE RAS and OES Societies.

 05.10.2017.

 12:15 - 13:00

 Marine Robotics

 Marc Carreras

Thursday, 5th October

Company presentation: Norbit

Thomas Rygh, Norway

NORBIT
-explore more-

-  05.10.2017
-  COMPANY PRESENTATION
14:30 - 15:00
- COMPANY DEMO
(divided in 3 groups)
15:30 - 18:30
-  Company presentation
-  Thomas Rygh

Norbit Subsea designs and develops wideband multibeam sonars for hydrographic applications, forward-looking applications, as well as advanced subsea leakage detection. Our solutions are based on the latest in analog and digital signal processing and our products provide wide coverage monitoring combined with high sensitivity and accuracy. NORBIT SUBSEA is part of the NORBIT GROUP, an industrial corporation with companies in Subsea, Intelligent Traffic Systems, and Original Design Manufacturing of industrial electronics. Our engineers have pioneered groundbreaking innovations within monitoring, instrumentation, telemetry and communication solutions for harsh environments.

Tutorial 4: DexROV: Teleoperation of a simulated ROV and arm

Gianluca Antonelli, ISME - University of Cassino, Italy

Joystick-based teleoperation of a simulated ROV and control of the DexROV's arms resorting to real-time, set-based, task-priority inverse kinematics algorithms.



-  05.10.2017
-  TUTORIAL INTRO
15:00 - 15:30
- HANDS-ON
(divided in 3 groups)
15:30 - 18:30
-  Tutorial
-  Gianluca Antonelli

Gianluca Antonelli is Professor at the “University of Cassino and Southern Lazio”. His research interests include marine and industrial robotics, multi-agent systems, identification. He has published 39 international journal papers and more than 110 conference papers, he is author of the book “Underwater Robots” (Springer-Verlag, 2003, 2006, 2014) and co-authored the chapter “Underwater Robotics” for the Springer Handbook of Robotics, (Springer-Verlag, 2008, 2016). He has been involved in various roles in research projects funded under FP7 and H2020 schemes: CO3AUVs, ECHORD, ARCAS, EUROCC, AEROAMS, DexROV, WiMUST and ROBUST. He served both as independent expert and reviewer for the European FP/H2020 calls several times since 2006. He is member elected of the “IEEE Robotics & Automation Society” Administrative Committee, he is coordinator elected of the EuRobotics Topic Group in Marine Robotics, he has been secretary of the IEEE-Italy section, he has been chair of the IEEE Robotics and Automation Society (RAS) Italian Chapter, he has been Chair of the IEEE RAS Technical Committee in Marine Robotics. He served in the Editorial Board of the IEEE Transactions on Robotics, IEEE Transactions on Control Systems Technology, Springer Journal of Intelligent Service Robotics, he has been Editor for the RAS Conference Editorial Board. He is chief editor of the open access journal “Frontiers in Robotics & AI” specialty “Robotic Control Systems”.

Personal website: eng.docente.unicas.it/gianluca_antonelli

Thursday, 5th October

Demonstration: DexROV – Experiencing and mitigating latency in remote ROV operations

Jeremi Gancet, Space Applications Services, Belgium

The proposed demonstration will include a setup similar to the one used in DexROV to supervise ROV operations from an onshore location, and will stress the concerns that one shall expect when relying on satellite communication for such remote interventions. A selection of scenarios will be demonstrated, with various latency and bandwidth constraints. Mitigation strategies will be explained and demonstrated (involving in particular a Cognitive Engine tool).



Dr. Jeremi Gancet received a MSc in computer science from Université Laval, Quebec, Canada, and a PhD in Robotics and Artificial Intelligence from the National Polytechnical Institute of Toulouse, working with the Laboratoire d'Analyse et d'Architecture des Systèmes (LAAS), Toulouse, France. During his PhD, he developed navigation strategies for planetary rovers, making use of stereovision based terrain modelling and traversability analysis. He also developed a multi-aerial robots (UAV) architecture for decision making. He joined Space Applications Services in 2005, where he led activities in many ESA and EC (FP6, FP7, H2020) R&D projects, as robotic systems team leader. In 2016, he was appointed manager of the Technologies, Research and Applications division. He is the coordinator of the ongoing H2020 DexROV project (Dexterous ROV intervention in presence of communication latency), and also coordinates two other H2020 Space programme projects (InFuse and LUVMI).



05.10.2017



DEMONSTRATION
(divided in 3 groups)
15:30 - 18:30



Demonstration



Jeremi Gancet

Friday, 6th October

Ex Machina – Integrating maritime robots into human endeavours

John Potter, NATO STO Centre for Maritime Research and Experimentation (CMRE), Italy

Development in marine robotics over recent decades has generally focussed on the technical challenges. Many of these core challenges are solved, at a price. We can certainly continue to work on better/cheaper solutions, but this may be missing the point. This presentation argues that the bottleneck to bringing robotic power to bear on maritime operational problems is now largely clustered around necessary changes in people and process, e.g. culture, trust, ethics. This is compounded by the shift from one-on-one human systems-to-robotic systems operations to distributed robotic architectures, where the power of emergent behaviour and large spatial-temporal apertures become possible. The fundamental constraints on communication bandwidth and range inevitably drive solutions to address the need for AI and autonomy in the UW world, contrasting with UAS developments. How might processing, command and control best be distributed in a multi-asset system? There's also something exciting going on with cloud architecture, edge computing, deep learning and AI that translates into the UW Maritime domain. The future lies in locally-smart devices at the edge, with distributed sensing, processing and decision-making performed locally at each node to enable agile action, with slower global deep learning loops running back to the cloud through non-real-time data harvesting and concentration through a gateway. This is a dawning game-changer and will require mastering distributed control, emergent behaviour, managing trusted networks and much more, all in a bandwidth-constrained domain.



 06.10.2017.

 09:00 - 09:45

 Maritime Security

 John Potter

Dr. John Potter has a joint honours Mathematics and Physics Degree from Bristol University (1979) and a PhD in Glaciology and Oceanography from Cambridge, UK (1985) based on research into the ice mass balance of the Antarctic, where he spent four consecutive summers, and was awarded the Polar Medal by Queen Elizabeth II. Dr. Potter worked at the NATO Undersea Research Centre 1986-1991, then he sailed across the Atlantic, through the Panama Canal and up to San Diego where he worked at Scripps Institution of Oceanography on Ambient Noise Imaging and marine mammal acoustics. He built the first ambient noise video camera, culminating in an ASA award for best scientific paper for a Scientific American article. sio is also where his interest in the impact of noise on marine mammals was born, supporting the Acoustic Thermometry of Ocean Climate (ATOC) project. In 1996 Dr. Potter sailed across the Pacific and on to Singapore where he founded the Acoustic Research Laboratory (ARL). Dr. Potter headed the ARL and was an Associate Director of the Tropical Marine Science Institute for 12 years. In 2004-2005 he took a year 'sabbatical' with his family to circumnavigate the Indian Ocean by sailboat on a sponsored expedition of marine environmental research, public outreach and education, in support of improving awareness and our stewardship of the oceans and our planet. In 2007 Dr. Potter returned to Italy as a consultant and in 2009 took up a full-time post at NATO STO CMRE, managing the project on communications and networking. In 2014 Dr. Potter was reassigned as Principal Strategic Development Officer for CMRE. Dr. Potter is a Senior Member of the IEEE, an Associate Editor for the IEEE Journal of Oceanic Engineering, PADI Master Scuba Diver Trainer and an International Fellow of the Explorer's Club, among other things. It is no longer true that he neither owns nor operates a television.

Friday, 6th October

Subterranean Groundwater Discharge and Marine Ecosystems

Renee E. Bishop Pierce, Pennsylvania State University, USA

The discharge of subterranean groundwater serves as a geochemical conduit from freshwater aquifers to coastal waters. In arid regions, such as the Dalmatian coast, input via submarine groundwater discharge (SGD) frequently exceeds riverine inputs creating pockets of elevated primary productivity and coastal nursery habitat for many marine species. SGD into coastal waters is important for the maintenance of coastal productivity and support of nearshore ecosystems. Anthropogenic impacts upon on aquifers can destabilize coastal ecosystems two ways: via reduction in SGD and the influx of contaminants. With coastal development, there is an associated increase in water usage. As water is withdrawn from the aquifer, there is a corresponding inland increase in saltwater intrusion, reducing subterranean groundwater flows and indirectly reducing primary productivity. Ecosystems can also be destabilized through the discharge of contaminated water, either in the form of excessive nutrients or as heavy metals, into coastal habitats. Continued residential and agricultural development of near-shore areas worldwide leads to increased inputs of nitrogen and phosphorus into groundwater. Trace metals can be influenced by human activity and are toxic to aquatic organisms. Overlooking the contribution of groundwater to the productivity of coastal ecosystems could lead to serious misinterpretation of ecological data. Due to the long residence time of water in the subterranean environment, abatement would take decades. Therefore, determination of flow rates and the quantitative assessment of the impact subterranean groundwater discharge has upon organisms and ecosystems are the first steps toward understanding the subterranean environment that connects the land and sea.



Renée Bishop conducted doctoral and post-doc research in biological oceanography at the University of South Florida in St. Petersburg, Florida. Her initial focus was on age and growth of fish and eventually moved into the study of energetics and how organisms adapt to environmental challenges. At Penn State University, she began work on physiological adaptations to extreme environments and the ecological physiology of anchialine organisms. Most recently, she has begun work on the impacts of subterranean groundwater discharge on coastal ecosystems.

 06.10.2017.

 09:45 - 10:30

 Marine Biology

 Renee E. Bishop
Pierce

Friday, 6th October

Navigation and Control of Unmanned Vehicles: A Fuzzy Logic Perspective

Kimon P. Valavanis, University of Denver, USA

When dealing with navigation/control of (semi-) autonomous robotic vehicles in obstacle filled dynamic environments, Fuzzy Logic offers a reliable and viable alternative to conventional controller design and analytic techniques, as it is capable of handling environment uncertainty that is difficult if not impossible to model, as well as system modeling uncertainties without affecting system robustness nor adversely impacting performance. This talk presents a generalized Fuzzy Logic based hierarchical architecture and framework along with its application specific modifications for aerial, aquatic and terrestrial robotic vehicle sensor-based autonomous navigation and control. For such applications, a mathematical model of the dynamics of the vehicle is not needed during the design process of the motion controller; however, the problem-specific heuristic control knowledge is needed for the inference engine design. From the practical and implementation point of view, it is shown that Fuzzy Logic is the most appropriate modeling tool to represent imprecision and uncertainty of sensor readings, and for hardware implementation of fuzzy controllers in real-time due to low computation time. Experimental and simulation studies and results validate and support implemented techniques and approaches to ground, aerial and underwater vehicles, followed by a comparative study of classical and soft computing based controllers designed to control small unmanned helicopters.



 06.10.2017.

 10:45 - 11:30

 Marine Robotics

 Kimon P. Valavanis

Dr. Kimon P. Valavanis is John Evans Professor and Chair of the ECE Department, D. F. Ritchie School of Engineering and Computer Science, University of Denver, and Director of the Unmanned Systems Research Institute. He has graduated 35 PhD students and more than 100 MSc students. He has attracted and has helped attracting more than \$50 M in research funds from Federal and State agencies, industry and the private sector. His research interests span Unmanned Systems, Distributed Intelligence Systems, Robotics and Automation. He has published close to 400 book chapters, technical journal/transaction, referred conference papers, invited papers and technical reports. He has authored/co-authored/edited 18 books, including: *On Integrating Unmanned Aircraft Systems into the National Airspace System: Issues, Challenges, Operational Restrictions, Certification, and Recommendations*, 2nd Edition, Springer, 2012; *Linear and Nonlinear Control of Small Scale Unmanned Rotorcraft*, Springer, 2012 (translated into Chinese); *Handbook of Unmanned Aerial Vehicles (UAVs)*, Springer, 2015, also translated into Chinese – a 2nd Edition will be published by Springer in 2017; *Foundations of Circulation Control Based Small-Scale Unmanned Aircraft: A Comprehensive Methodology from Concept to Design and Experimental Testing*, to be published in 2017. Dr. Valavanis is Editor-in-Chief of the *Journal of Intelligent and Robotic Systems*, Springer. He founded/launched the International Conference on Unmanned Aircraft Systems, which he runs annually. He was Distinguished Speaker in the IEEE Robotics and Automation Society, he is Fellow of the American Association for the Advancement of Science, Fellow of the UK Institute of Measurement and Control, Senior Member of IEEE and Fulbright Scholar.

Friday, 6th October

Breaking the Surface of the Seafloor: Studying the Traces of Earthquakes Underwater

Javier Escartin, CNRS/IPGP, France

Earthquakes are ruptures in the Earth's brittle upper layer, and represent one of the major geological hazards on Earth. Both the ground movement (displacement, shaking). Associated processes that they trigger (e.g., landslides, floodings), can cause significant damage and casualties when they strike. As more than two-thirds of the Earth's surface is underwater, submarine earthquakes represent approximately ~75% of the Earth's seismicity; these can cause tsunamis, potentially devastating over widespread and faraway areas. Earthquakes often breach the Earth's surface, their the ruptures record the geometry of earthquake displacement. The mapping and study of these ruptures (e.g. their geometry, length magnitude of displacement), conducted exclusively onland to date, allow us to understand earthquake dynamics, seismic history, and evaluate risks (e.g., predicting recurrence time and magnitude of earthquakes). The lack of submarine observations is thus a major gap on our understanding of the Earth's seismicity and associated risks This talk will present the SUBSAINTS'2017 (France) cruise project (April 2017), identifying and mapping an earthquake rupture associated with the 2004 Mw6.3 Les Saintes Earthquake in the French Antilles, at a water depth of ~1 km. This cruise deployed the deep-sea ROV VICTOR6000 and AUV AsterX (IFRAMER). Our fieldwork demonstrates that the combination of acoustic and optical mapping techniques, and the use of operational vehicles, now allow us to efficiently conduct geological fieldwork at scales and resolutions that are similar to those onland. We can thus now gather submarine systematically data to better understand the Earth's seismicity and associated risks.



Javier Escartin, after graduating at the University of Barcelona (Spain), received in 1996 his PhD from the MIT/WHOI joint program in Oceanography. Following post-doc positions between 1996 and 1998 in the Universities of Durham and Einmburgh (UK) and IJA-CSIC (Spain), he integrated CNRS as a Research Scientist in 1999. He is now a CNRS Senior Scientist working at IPGR, and he is the head of the Marine Geosciences Team there. He also holds an Adjunct Scientist position at Woods Hole Oceanographic Institution since 2002, and has been a visiting investigator at Harvard University and MIT in 2006-2007 . His research of the deep ocean focuses on the understanding of tectonic, volcanic, and hydrothermal processes along mid-ocean ridges, and the formation of the oceanic crust. He has led 11 major oceanographic cruises, conducting seafloor exploration and studies with ROVs, AUVs, and HOVs, in addition to other geophysical exploration tools (deep-towed systems, instrumentation, seismics, etc.). He has authored more than 90 articles, and supervised 4 PhDs (4 completed, one in progress), an addition to numerous Masters.

 06.10.2017.

 11:30 - 12:15

 Marine Geology

 Javier Escartin

Friday, 6th October

Company presentation: Evologics GmbH – Scalable Hybrid Acoustic Localization Approach for AUV Formation Control

Konstantin Kebkal, Oleksiy Kebkal, Evologics GmbH, Germany



05.10.2017

COMPANY PRESENTATION
12:15 - 13:00

COMPANY DEMO
(divided in 3 groups)
15:30 - 18:30

Company presentation

Konstantin Kebkal
Oleksiy Kebkal

Evologics is a high-tech enterprise founded in 2000 to develop innovative key technologies for maritime and offshore industries. It developed many underwater communication and navigation systems which are currently the most advanced products on the maritime market. EvoLogics' commercial underwater products have networking capabilities and can successfully operate under different communication protocols. Moreover, EvoLogics' experts collaborated with its industrial partners on a series of modular systems and have experience in adapting its products to multiple protocol requirements. Further developments include bionic sonar systems for positioning, navigation and monitoring applications, and non-destructive material control and underwater inspection. Flexible bodied bionic robots such as the award-winning "Bionic Manta ray" and "Aqua-Penguin", and innovative underwater manipulators have also been developed. A combination of these technologies led to most advanced robot systems designed for special inspection purposes in aircraft security and aquatic environments (SONOBOT). Supported by the German ministry of economy and industry, Evologics recently conducted R&D of a deep water acoustic network with mobile nodes. Evologics currently participates in following EU and national German projects: EU Projects: SUNRISE (FP7-ICT-2013-611449): sensing, monitoring and actuating the underwater world through a federated research infrastructure extending the future Internet, WiMUST (H2020-ICT-2014-645141): widely scalable mobile underwater sonar technology, SWARMS (H2020-ECSEL-RIA-2014-662107): smart and networking underwater robots in cooperation meshes, German Projects: DNS Teifsee (German project: BMWi 03SX276C), BOSS-Manta (German project: BMWi, 03SX361A).

Company presentation: Blueprint Subsea

Robin Sharphouse, Blueprint Subsea, United Kingdom



05.10.2017

COMPANY PRESENTATION
12:15 - 13:00

COMPANY DEMO (divided
in 3 groups) 15:30 - 18:30

Company presentation

Robin Sharphouse
Kevin Webster

Blueprint Subsea manufacture a range of sonar, navigation and positioning systems including: Oculus dual frequency multibeam imaging sonars suitable for a wide range of platforms, StarFish sidescan sonars offering fully featured professional capabilities in a compact package, Artemis diver handheld navigation systems, and SeaTrac USBL positioning modems providing robust acoustic tracking and data communications.

Website: blueprintsubsea.com

Friday, 6th October

Tutorial 5: POP ART (POrtable Pelagic Autonomous Robotic Technology) concept & field demonstration

Massimo Caccia, Marco Bibuli, Gabriele Bruzzone, Angelo Odetti, Consiglio Nazionale delle Ricerche – Istituto di Studi sui Sistemi Intelligenti per l'Automazione, Italy

The tutorial will introduce the POP ART (PORTable Pelagic Autonomous Robotic Technology) concept based on a modular Unmanned Marine Vehicle that can be reconfigured at field as ROV, USSV and USV. The first phase of system development, consisting of the Proteus UMV will be presented in details, pointing out mechanical solutions and results of its recent Arctic exploitation in Svalbard islands. Then the participants, received short instructions on how to mount/unmount the vehicle, will have the opportunity of operating Proteus UMV from the peer reconfiguring it as ROV and USSV.



Marco Bibuli (M.Sc. 2005, Ph.D. 2010) joined CNR- ISSIA in 2005. He is co-author of about sixty international journal and conference publications. He is responsible of various national and European research projects and he participated in many experimental campaigns.



Gabriele Bruzzone graduated in electronic engineering in 1993 and joined CNR as a research scientist in 1996. He is the person in charge of “Field and Interaction Robotics” research group and of the scientific and technological development of all robotic vehicles developed by CNR- ISSIA. He is author of more than 100 international publications with peer review. CNR- ISSIA Marine Robotics research focuses on (cooperative) NGC and mission supervision & control, modeling & identification, vision & acoustic base motion estimation and characterization of the environment, real-time and embedded hardware and software architectures, mechanical & naval design of innovative marine vehicles.



Massimo Caccia is the Director of the Institute of Intelligent Systems for Automation of the Italian National Research Council from October 2013. He received the degree in Electronic Engineering (summa cum laude) from the University of Genova in 1991, and joined the Institute for Ship Automation of cnr in 1993. He was responsible of the research group Autonomous robotic systems and control from 2005 and of the Support Operating Unit of Genova of CNR- ISSIA from 2008.



Angelo Odetti, Naval Architect and Marine Engineer. He worked in the Air Cushion Vehicle field before joining CNR-ISSIA as research fellow. He is designer of the structural and mechanical components of the two ROV: e-URoPe and P2ROV and of the transformable vehicle named Proteus.



05.10.2017



TUTORIAL INTRO

15:00 - 15:30

HANDS-ON

(divided in 3 groups)

15:30 - 18:30



Tutorial



Massimo Caccia, Marco
Bibuli, Gabriele Bruzzone,
Angelo Odetti

LIST OF PARTICIPANTS

Registered participants until 15th September:

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Swen Bosch
Thomas Glotzbach
Daniel Lebsanft
Jochen Staiger

ABB Marine & Ports, NO
Matko Baršić

Acoustic Research Laboratory/ Keppel-nus Corporate Lab,sg
Bharath Kalyan

A.P.P.A.R.A.T.U.S. LLC, JP
Kotaro Yamafune

Atlas Elektronik GmbH, DE
Horst Nickel
Kostas Siantidis
Hermann de Vries

BioRobotics Institute, IT
Fabio Bonsignorio

Blueprint Subsea, UK
Robin Sharphouse
Kevin Webster

Blueye Robotics, NO
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Ena Lucija Kovač
Petra Kovačević
Andrea Radmanić
Alan Vukić
Valentino Žinić

CINAV - Centro de Investigação Naval, PO
Augusto Salgado

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