EXCELLABUST
EXCELLING LABUST IN MARINE ROBOTICS

Deliverable D3.7
Proceedings of Breaking the Surface summer school 3

Project Acronym:	EXCELLABUST	
Grant Agreement number:	691980	
Project title:	Excelling LABUST in marine robotics	
Funding:	Horizon2020 Twining	
Call:	H2020-TWINN-2015	
Type of action:	CSA	
Start date of project:	1st January 2016	
Duration:	36 months	
Project website:	http://excellabust.fer.hr/	
Delivery date:	31st October 2018	
Version:	1.0	
Lead participant	UNIZG-FER	
Dissemination level:		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

DELIVERABLE DATA SHEET

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Deliverable title:		Proceedings of Breaking the Surface summer school 3			
Work package:		WP3 – Broad networking events			
Type:		Delivery date	31/10/2018	Version:	1.0
Lead participant		University of Zagreb Faculty of Electrical Engineering and Computing (UNIZG - FER)			
Dissemination level:					
PU	Public				X
CO	Confidential, only for members of the consortium (including the Commission Services)				

Version log			
Revision no.	Date	Author (Partner)	Change

Deliverable summary
The 3rd **EXCELLABUST summer school "Breaking the Surface"** 2018 (http://bts.fer.hr/) was held from 30th September until 7th October in Biograd na Moru, Croatia and more than 200 people participated. The programme was divided in six programme tracks: marine robotics (MAROB); marine biology and marine nature protection (MARBIO); maritime security, naval and coast guard operations (MARSEC); maritime, nautical and ship archaeology (MARCH); marine geaology (MARGEO); and Innovation Tuesday programme (INNOVA). In 7 days 29 lectures, 8 demonstrations and 4 tutorial were presented.   This deliverable offers report on organization of BtS and its programme. The deliverable is accompanied with appendixes with abstracts, biographies and presentations of the programme presenters: *APPENDIX I. – Abstracts and biographies*   *APPENDIX II. – Presentations (slides)*

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1. INTRODUCTION

The 3rd **EXCELLABUST summer school "Breaking the Surface"** 2018 (http://bts.fer.hr/) was held from 30th September until 7th October in Biograd na Moru, Croatia and more than 200 people participated. The programme was divided in six programme tracks: marine robotics (MAROB); marine biology and marine nature protection (MARBIO); maritime security, naval and coast guard operations (MARSEC); maritime, nautical and ship archaeology (MARCH); marine geaology (MARGEO); and Innovation Tuesday programme (INNOVA). In 7 days 29 lectures, 8 demonstrations and 4 tutorial were presented.

Dates: 30th September until 7th October 2018
Location: Biograd na Moru, Croatia
Website: **http://bts.fer.hr/**

2. REPORT ORGANIZATION

The first part of the report describes the BtS 2018 organization, including the work program. The deliverable is accompanied with appendixes with abstracts, biographies and presentations of the programme presenters:
APPENDIX I. – Abstracts and biographies
APPENDIX II. – Presentations (slides)

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3. ABOUT BREAKING THE SURFACE

Breaking the Surface - BtS summer school has been organized by UNIZG FER LABUST for the last 10 years – first three years as a part of FP7-REGPOT CURE project, in following years until 2015 by Office of Naval Research Global support. From 2015 until 2018, BtS was funded by the European Commission under EXCELLABUST project. During the years, BtS served as a meeting place of experts and students of marine robotics and the marine robotics application areas such as marine biology, marine archaeology, marine security, oceanography, marine geology and oceanology. This is the world's first successful, multi-year field training program that combines academic topics in marine robotics and robotics application areas and hands-on working experience in the sea, doing remote sensing and sampling for various ocean sciences.

Breaking the Surface summer school is organized in attempt to strengthen links between marine robotics research and end-users and provide EXCELLABUST partners with one-week intense summer school consisting of plenary talks, hands-on trainings and demonstrations of marine technologies, by EXCELLABUST partners and worldwide experts.

The program is organized in the form of plenary talks, hands-on tutorials and demonstrations of marine technologies, e.g. marine robotics (MAROB); marine biology and marine nature protection (MARBIO); maritime security, naval and coast guard operations (MARSEC); maritime, nautical and ship archaeology (MARCH), marine geology (MARGEO), and Innovation Tuesday programme (INNOVA).

4. ORGANIZERS

Breaking the Surface summer school is organized under the European Union's Horizon 2020 project EXCELLABUST - Excelling LABUST in marine robotics (GA 691980). The main organizers are University of Zagreb Faculty of Electrical Engineering and Computing, Laboratory for Underwater Systems and Technologies and Centre for Underwater Systems and Technologies with organization support from Institute of Studies on Inteligent Systems for Automation - ISSIA, National Research Council of Italy (CNR), University of Girona (UdG), and University of Limerick (UL).

ORGANIZERS

University of Zagreb

Faculty of Electrical Engineering and Computing

Laboratory for Underwater Systems and Technologies

Centre for Underwater Systems and Technologies

IN PARTNERSHIP WITH

Institute of Studies on Inteligent Systems for Automation - ISSIA, National Research Council of Italy (CNR)

University of Girona (UdG)

University of Limerick (UL)

BREAKING THE SURFACE ORGANIZATION STRUCTURE:

4.1.   COMMITTEES CHAIRS

Prof. Dr. Sc. Zoran Vukić
General Chair

University of Zagreb, Faculty of Electrical Engineering and Computing, Laboratory for Underwater Systems and Technologies

Assoc. Prof. Dr. Sc. Nikola Mišković
Programme Committee Chair EXCELLABUST project Coordinator

University of Zagreb, Faculty of Electrical Engineering and Computing, Laboratory for Underwater Systems and Technologies

Ivana Mikolić, mag. ing.
Organizing Committee Chair

University of Zagreb, Faculty of Electrical Engineering and Computing, Laboratory for Underwater Systems and Technologies

Dr. Sc. Antonio Vasilijević,
Technical Committee Chair

University of Zagreb, Faculty of Electrical Engineering and Computing, Laboratory for Underwater Systems and Technologies

4.2. PROGRAMME COMMITTEE

Marco Bibuli, PhD

Centre Nazionale delle Richerce - CNR Institute of intelligent systems for automation - ISSIA

Prof. Bridget Buxton, PhD

University of Rhode Island, Department of History

Massimo Caccia, MSc

Centre Nazionale delle Richerce - CNR Institute of intelligent systems for automation - ISSIA

Assoc. Prof. Marc Carreras, PhD

University of Girona Computer Vision and Robotics Research Institute - VICOROB

Edin Omerdić, PhD

University of Limerick

Asst. Prof. Dr. Sc. Irena Radić-Rossi

University of Zadar, Department of Archaeology

Prof. Pere Ridao, PhD

University of Girona Computer Vision and Robotics Research Institute - VICOROB

Prof. Asgeir Sørensen, PhD

Norwegian University of Science and Technology

Prof. Daniel Toal, PhD

University of Limerick

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4.3. ORGANIZING COMMITTEE

Petra Kovačević

Tonko Bogovac

Anamarija Miličević

Ivan Trubić

Ivan Dominić

Mladen Petr

Valentino Žinić

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4.4. TECHNICAL COMMITTEE

Anja Babić, mag. ing.

UNIZG FER LABUST

Nadir Kapetanović, mag. ing.

UNIZG FER LABUST

Ivan Lončar, mag. ing.

UNIZG FER LABUST

Filip Mandić, mag. ing.

UNIZG FER LABUST

Milan Marković

UNIZG FER LABUST

Dr. Sc. Đula Nađ

UNIZG FER LABUST

M. Eng. Marin Stipanov

UNIZG FER LABUST

Kruno Zubčić

Croatian Conservation Institute

5. PROGRAMME

5.1. PROGRAMME STRUCTURE

BtS program is comprised of academic lectures, hands-on tutorials, presentation of projects and equipment and company demonstrations.

29 LECTURES
- 9 MAROB
- 2 MARBIO
- 2 MARCH
- 2 MARSEC
- 3 MARGEO
- 11 INNOVA

4 TUTORIALS
- groups of 20 students
- 2-3 students per computer

4 COMPANY PRESENTATIONS
- BluEye Robotics
- Blueprint Subsea
- EvoLogics
- Sonardyne International Ltd

4 DEMOS

4 EU PROJECTS

5.1.1. LECTURES

Lectures by experts in the domains of:

| maritime robotics MAROB | marine biology MARBIO | marine archaeology MARCH | maritime security MARSEC | innovation day INNOVA |

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List of speakers:

Marine robotics (MAROB):

- Aviad Avni, University of Haifa, Isreal: <u>Advanced maneuvering and vision algorithms for surveys with the SPARUS II AUV</u>
- Milica Stojanović, Northeastern University, USA: <u>Underwater acoustic communications: Fundamentals and new results</u>
- Torsten Jeinsch, Univeristy of Rostock, Germany: <u>Key technologies towards the vision of complex autonomous underwater operations: From project SMIS to MUM</u>
- William Kirkwood, Monterey Bay Aquarium Research Institute, USA: <u>Shearwater: The future of hybrid autonomous marine vehicles</u>
- Alexander Philips, National Oceanography Centre, UK: <u>Oceanids: Development of next generation marine autonomous systems for ocean science</u>
- Tim Mundon, University of Washington, USA: <u>Micro-scale wave energy generation for autonomous sensors and robotics</u>
- Walter Caharija, SINTEF Ocean AS, Norway: <u>Autonomy and remote control technology in sea aquaculture activities</u>
- Xianbo Xiang, Huazhong University of Science and Technology, China: <u>Cloud-based Management and Control of Autonomous Marine Vehicles: Concept and Demonstration</u>
- Iain A. Anderson, University of Auckland: <u>A fast fish-like human-powered racing submarine</u>

Marine biology (MARBIO):

- Ivona Cetinić, NASA Goddard Space Flight Center/USRA, USA: <u>Chasing ocean carbon – from sky to sea and below</u>

- Andrea Gori, Institut de Ciències del Mar - Consejo Superios de Investigaciones Científicas, Spain: <u>Submarine technology for the study and conservation of deep coral gardens and cold-water coral ree</u>

Marine archaeology (MARCH):

- Bridget Buxton, University of Rhode Island, USA: <u>"We're (not) going to need a bigger boat": the tech that will replace traditional research vessels in deep sea and coastal environments</u>
- Kotaro Yamafune, Texas A&M University, USA: A brief history of ancient ships
- Irena Radić Rossi, University of Zadar, Croatia: <u>How to protect an outstanding shipwreck site?</u>
- **Kotaro Yamafune**, A.P.P.A.R.A.T.U.S. LLC & **Matko Čvrljak**, Roskilde Viking Ship Museum: *A Methodology for Accurate and Quick Photogrammetric Recording of Underwater Cultural Heritage*

Maritime security (MARSEC):

- Philip Macilivary, US Coast Guard Pacific Area, USA: <u>Cyber-security solutions for unmanned systems, and their use in conjunction with new technologies to advance port security and maritime domain awareness</u>
- Niv David, Tel Aviv University, Israel: <u>Cyber security for marine technologies</u>

Maritime geology (MARGEO):

- Hironobu Kan, Kyushu University, Japan: [New survey visualization: Merging photogrammetric 3D model with a multibeam bathymetry](#)
- Marko Bakašun, GEOmar d.o.o., Croatia: [ROV inspection](#)
- Manuel Bensi, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale – OGS: [Exploring the ocean and the seabed: oceanographic case studies where marine robotics can be applied](#)

Innovation Tuesday (INNOVA):

- Yvan Petillot, Heriot-Watt University, UK: [The ORCA Hub: Offshore robotics for certification of assets](#)
- Scott Reed, SeeByte, UK: [The evolution of smart software within maritime robotics](#)
- Daniel M. Lofaro, George Mason University, USA: [Robots in politics and business](#)
- Paul Oh, University of Nevada Las Vegas, USA**:** [Consumer Robotics in the Age of Acceleration](#)
- Miriam Rueda, Asociación Emerge, Spain**:** Protoatlantic – [Protoatlantic – a European accelerator program of the marine sector](#)
- Marc Carreras, IQUA Robotics, Spain**:** [IQUA Robotics: past, present and future](#)
- Iain Vincent, Planet Ocean Limited / ecoSUB Robotics Limited, UK: [Democratising the AUV: ecoSUB Robotics – from concept to commercial reality](#)
- Enrique Gonzalez Sancho, Nido Robotics, Spain**:** [Entrepreneurship in marine robotics](#)
- Marin Bek, H2O Robotics, Croatia: [Experiences in building an international business](#)
- James Ives, XOCEAN, Ireland: [Unmanned ocean data collection](#)
- António Sérgio Ferreira, Laboratório de Sistemas e Tecnologia Subaquática (UPorto), Portugal: [EUMarineRobots: The "Oprah" of Marine Robotics](#)

5.1.2. TUTORIALS

- Mandar Chitre, Chinmay Pendharkar, Prasad Anjangi, Manu Ignatius, Subnero, Singapore: [Hands-on with software-defined modems & underwater networks](#)
- Barbara Arbanas; Anja Babić; Ivan Lončar; Milan Marković; Filip Mandić; Goran Vasiljević, University of Zagreb Faculty of Electrical Engineering and Computing, Croatia: **subCULTron – underwater measurements using aMussel**
- Nuno Gracias; László Neumann, Computer Vision and Robotics Institute of the Universitat de Girona/ ViCOROB, Portugal: **Underwater Optical Image Enhancement Techniques**
- Narcís Palomeras, University of Girona, (Spain) and Natàlia Hurtós, IQUA Robotics, (Spain): [Sparus II](#)

5.1.3. DEMONSTRATIONS

- Thomas Glotzbach; Sabir Ouchen; Joaquim Pinol Bel, Torpex Scooter, Germany: **Underwater scooter Torpex with newly developed hollow shaft motor**
- Iain Vincent; Jeremy Sitbon, Ecosub Robotics, UK: **Smart network localisation**
- Marko Bakašun; Matej Ćurić; Ivor Meštrović, Geomar, Croatia: **ROV inspection**
- Enrique Gonzalez Sancho, Nido Robotics, Spain: [Enrique Gonzalez Sancho](#)

5.1.4. COMPANY PROGRAMME

- Martin Ludvigsen, Norway: BLUEYE ROBOTICS
- Tom Bennetts, Colin Sutherland, UK: SONARDYNE INTERNATIONAL LTD
- Konstantin Kebkal, Oleksiy Kebkal, Germany: EVOLOGICS
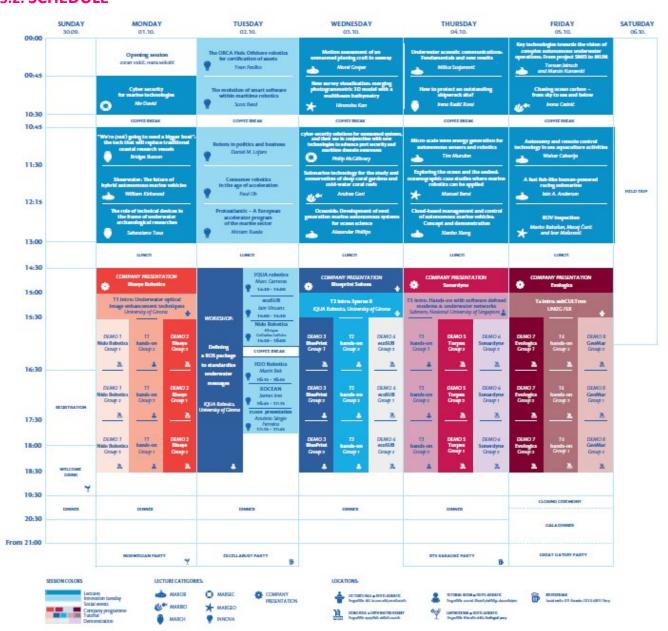- Robin Sharphouse, Kevin Webster, UK: BLUEPRINT SUBSEA

5.1.5. WORKSHOPS

- Narcís Palomeras, University of Girona, Spain and Natàlia Hurtós, IQUA Robotics, Spain: Workshop: defining a ROS package to standardize underwater messages

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5.2. SCHEDULE

SESSION COLORS: Lecture, Innovation tuesday, Social events, Company programme, Tutorial, Demonstration

LECTURE CATEGORIES: MAROB, MARREC, MARCH, MARSEC, MARGEO, INNOVA, COMPANY PRESENTATION

LOCATIONS: LECTURE HALL, DEMO POOL & OPEN WATER, TUTORIAL ROOM, LAPTOP LAB, BOTIKUMA

SOCIAL EVENTS

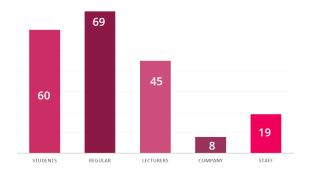| Registrations	Welcome drink	Norwegian party	EXCELLABUST party	BTS karaoke night	Gala dinner	Great Gatsby party	Field trip
Sunday, 30.9.	Sunday, 30.9.	Monday, 1.10.	Tuesday, 2.10.	Thursday, 4.10.	Friday, 5.10.	Friday, 5.10.	Saturday, 6.10.
16:30 – 18:30	18:00 – 19:30	From 21:00	18:00 – 19:30	From 21:00	19:30 – 21:00	From 21:00	9:00 – 16:00

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6. BTS PARTICIPANTS

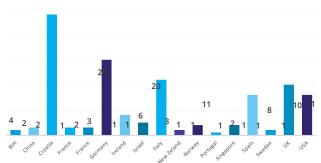In 2018, more than 200 participants from academia and industry from various fields joined Breaking the Surface.

PARTICIPANTS PROFILE

201 PARTICIPANTS

- STUDENTS: 60
- REGULAR: 69
- LECTURERS: 45
- COMPANY: 8
- STAFF: 19

17 COUNTRIES

- BIH: 4
- China: 2
- Croatia: 64
- France: 1
- France: 2
- Germany: 3
- Ireland: 1
- Israel: 1
- Italy: 6
- New Zealand: 20
- Norway: 1
- Portugal: 11
- Singapore: 1
- Spain: 2
- Sweden: 1
- UK: 8
- USA: 10

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7. PROGRAMME ABSTRACTS, BIOGRAPHIES AND PRESENTATIONS

Lectures' abstracts and lecturers' biographies are available in *APPENDIX I. – Abstracts and biographies.*
Slides from presentations are available in *APPENDIX II. – Presentations (slides).*

8. SUPPORTERS

FINANCED BY

Financed in the scope of project EXCELLABUST - Excelling LABUST in marine robotics (GA 691980) which has received funding from the European Union's Horizon 2020 research and innovation programme.

SUPPORTED BY

Embassy of the United States Zagreb – Croatia

Royal Norwegian Embassy in Zagreb

Foundation of the Croatian Academy of Sciences and Arts – HAZU

Ministry of Science and Education Republic of Croatia

Nekić cosmetics   Rakije Perković   Medvedgrad brewary

9. APPENDIX I – ABSTRACTS AND BIOGRAPHIES

Abstracts and biographies are available here.

10. APPENDIX II – PRESENTATIONS

Presentations are available here.