4th IFAC Workshop on Navigation, Guidance and Control of Underwater Vehicles (NGCUV 2015)

Dedicated to the memory of Professor Geoff Roberts

Girona, Spain
28-30 April 2015

Editors:

Pere Ridao   **Marc Carreras**
David Ribas

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Content List of IFAC Workshop on Navigation, Guidance and Control of Underwater Vehicles

Technical Program for Tuesday April 28, 2015

Tu1A	Àtrium
Underwater Manipulation I (Invited Session)	

11:00-11:20	Tu1A.1

Cooperative Underwater Manipulation Systems: Control Developments within the MARIS Project, pp. 1-7.

Casalino, Giuseppe	Univ. of Genova
Simetti, Enrico	Univ. of Genova
Manerikar, Ninad	Univ. of Genova
Sperinde, Alessandro	Univ. of Genova
Torelli, Sandro	Univ. of Genova
Wanderlingh, Francesco	Univ. of Genova

11:20-11:40	Tu1A.2

A Benchmarking Perspective of Underwater Intervention Systems, pp. 8-13.

Sanz, P.J.	Univ. of Jaume I
Pérez, Javier	Jaume I Univ
Sales, Jorge	Jaume I Univ
Peñalver, Antonio	Jaume I Univ
Fernández, J.Javier	Jaume I Univ
Fornas, David	Jaume I Univ
Marin, Raul	Univ. Jaume I
García Sánchez, Juan Carlos	Univ. Jaume I

11:40-12:00	Tu1A.3

Underwater Robot Development for Manipulation Task and Their Uses in Biwa Lake, pp. 14-19.

Kawamura, Sadao	Ritsumeikan Univ

Tu1B	Carlemany
Mapping and SLAM I (Regular Session)	

11:00-11:20	Tu1B.1

Global Alignment of a Multiple-Robot Photomosaic Using Opto-Acoustic Constraints, pp. 20-25.

Campos, Ricard	Univ. of Girona
Gracias, Nuno	Univ. of Girona
Palomer, Albert	Univ. De Girona
Ridao, Pere	Univ. of Girona VAT: ESQ6750002E

11:20-11:40	Tu1B.2

AUV Single Beacon Range-Only SLAM with a SOG Filter, pp. 26-31.

Vallicrosa, Guillem	Univ. De Girona
Ridao, Pere	Univ. of Girona VAT: ESQ6750002E
Ribas, David	Univ. of Girona

11:40-12:00	Tu1B.3

Real-Time Mosaicing of Large Scale Areas with Forward Looking Sonar, pp. 32-37.

Ferreira, Fausto	NATO STO Centre for Maritime Res. and Experimentation
Djapic, Vladimir	NATO Undersea Res. Centre
Caccia, Massimo	CNR-ISSIA

Tu2A	Àtrium
Underwater Manipulation II (Invited Session)	

12:00-12:20	Tu2A.1

Free-Floating Intervention by Means of Learning by Demonstration, pp. 38-43.

Carrera, Arnau	Univ. De Girona
Palomeras, Narcis	Univ. of Girona
Hurtós Vilarnau, Natàlia	Univ. De Girona
Carreras, Marc	Univ. of Girona

12:20-12:40	Tu2A.2

Underwater Manipulation: An Industry Perspective*.

| Petillot, Yvan | Heriot-Watt Univ. |
| Barbalata, Corina | Heriot-Watt Univ. |

| 12:40-13:00 | Tu2A.3 |

Reduction of the Dynamic Coupling in an Underwater Vehicle-Manipulator System Using an Inverse Dynamic Model Approach, pp. 44-49.

Barbalata, Corina	Heriot-Watt Univ
Dunnigan, Matthew W.	Heriot-Watt Univ
Petillot, Yvan	Heriot-Watt Univ

| **Tu2B** | Carlemany |

Navigation Control and Planning I (Regular Session)

| 12:00-12:20 | Tu2B.1 |

On-Line 3D Path Planning for Close-Proximity Surveying with AUVs, pp. 50-55.

Hernández, Juan David	Univ. De Girona
Vallicrosa, Guillem	Univ. De Girona
Vidal Garcia, Eduard	Univ. of Girona
Pairet Artau, Èric	Univ. De Girona
Carreras, Marc	Univ. of Girona
Ridao, Pere	Univ. of Girona VAT: ESQ6750002E

| 12:20-12:40 | Tu2B.2 |

Longitudinal Motion Instability of a Cruising AUV Flying Over a Steep Terrain, pp. 56-63.

| Kim, Kangsoo | National Maritime Res. Inst |

| 12:40-13:00 | Tu2B.3 |

Navigation State Estimation for AUVs through Unscented Kalman Filter, pp. 64-69.

Allotta, Benedetto	Univ. of Florence
Caiti, Andrea	Univ. of Pisa
Chisci, Luigi	Univ. Di Firenze
Costanzi, Riccardo	Univ. of Florence
Di Corato, Francesco	Univ. of Pisa
Fantacci, Claudio	Univ. Di Firenze
Fenucci, Davide	Univ. of Pisa
Meli, Enrico	Univ. of Florence
Ridolfi, Alessandro	Univ. of Florence

| **Tu3A** | Àtrium |

Tracking and Localization I (Regular Session)

| 15:30-15:50 | Tu3A.1 |

Pose Estimation for Underwater Vehicles Using Light Beacons, pp. 70-75.

Gracias, Nuno	Univ. of Girona
Bosch, Josep	Univ. of Girona
Karim, Mohammad Ehsanul	École Pol. Fédérale De Lausanne (EPFL)

| 15:50-16:10 | Tu3A.2 |

GPU-Accelerated Monte Carlo Localization for Underwater Robots, pp. 76-81.

Vale, Rodrigo Telles da Silva	Univ. of São Paulo
de Barros, Ettore	Univ. of Sao Paulo
Martins, Thiago de Castro	Univ. of Sao Paulo

| 16:10-16:30 | Tu3A.3 |

Outlier Rejection in Underwater Acoustic Position Measurements Based on Prediction Errors, pp. 82-87.

Lekkas, Anastasios	Norwegian Univ. of Science and Tech
Candeloro, Mauro	NTNU
Schjølberg, Ingrid	Norwegian Univ. of Science and Tech

| **Tu3B** | Carlemany |

Operations (Regular Session)

| 15:30-15:50 | Tu3B.1 |

UUV's in Maritime Spill Response Exercise Cathach, pp. 88-93.

Dooly, Gerard	Univ. of Limerick
Omerdic, Edin	Univ. of Limerick
Coleman, Joseph	Univ. of Limerick
Miller, William	Univ. of Limerick
Braga, José	Univ. of Porto, LSTS
Ferreira, Filipe	FEUP (Faculty of Engineering - Univ. of Porto)
Hayes, James	Univ. of Limerick
Conlon, Hugh	Shannon Foynes Port Company
Sousa, Joao	Fac. Engenharia Univ. Do Porto
Toal, Daniel	Univ. of Limerick

15:50-16:10	Tu3B.2

Mixed-Initiative Interaction for Tracking of Ocean Sunfish, pp. 94-99.

Pinto, Jose	Fac. Engenharia Univ. Do Porto
Dias, Paulo	Faculdade De Engenharia Da Univ. Do Porto
Pereira, João	Faculdade De Engenharia Univ. Do Porto
Caldas, Renato	Faculdade De Engenharia Univ. Do Porto
Rodrigues, Tiago	Faculdade De Engenharia Univ. Do Porto
Sousa, Joao	Fac. Engenharia Univ. Do Porto
Py, Frederic	Faculdade De Engenharia Univ. Do Porto
Rajan, Kanna	FEUP, Univ. of Porto

16:10-16:30	Tu3B.3

An Approach for Planning a Safe Mission Begin and End for Teams of Marine Robots, pp. 100-106.

Glotzbach, Thomas	Tech. Univ. Ilmenau
Eckstein, Sebastian	Tech. Univ. Ilmenau
Ament, Christoph	Tech. Univ. Ilmenau

Technical Program for Wednesday April 29, 2012

We3K	Àtrium
Keynote 3 (Plenary Session)	

09:30-10:30	We3K.1

Towards Integrated Autonomous Underwater Operations, pp. 107-118.

Soerensen, Asgeir	Norwegian Univ. of Science and Tech
Ludvigsen, Martin	NTNU

We3A	Àtrium
EU Projects II (Invited Session)	

15:30-15:50	We3A.1

ROBOCADEMY – European Academy for Marine and Underwater Robotics*.

Kruusmaa, Maarja	Tallinn Univ. of Tech.
Vögele, Thomas	DFKI GmbH, German Res. Center for Artificial Intelligence
Lane, David M.	Heriot-Watt Univ.

15:50-16:10	We3A.2

EU Project MORPH: Current Status after 3 Years of Cooperation under and above Water, pp. 119-124.

Kalwa, Joerg	Atlas Elektronik GmbH
Pascoal, Antonio M.	ISR-Inst. Superior Tecnico
Ridao, Pere	Univ. of Girona VAT: ESQ6750002E
Glotzbach, Thomas	Tech. Univ. Ilmenau
Brignone, Lorenzo	Ifremer
Bibuli, Marco	CNR-ISSIA
Alves, Joao	Orange Energy
Birk, Andreas	Jacobs Univ
Carreiro Silva, Marina	IMAR-Inst. Do Mar

16:10-16:30	We3A.3

CADDY Project, Year 1: Overview of Technological Developments and Cooperative Behaviours, pp. 125-130.

Miskovic, Nikola	Univ. of Zagreb
Pascoal, Antonio M.	ISR-Inst. Superior Tecnico
Bibuli, Marco	CNR-ISSIA
Caccia, Massimo	CNR-ISSIA
Neasham, Jeffrey	Univ. of Newcastle
Birk, Andreas	Jacobs Univ
Egi, Murat	Div. Alert Network Europe
Grammer, Karl	Univ. of Vienna
Marroni, Alessandro	Div. Alert Network Europe
Vasilijevic, Antonio	Univ. of Zagreb, Faculty of Electrical Engineering Andcompu
Vukic, Zoran	Univ. of Zagreb

We3B	Carlemany
Navigation, Control and Planning II (Regular Session)	

15:30-15:50	We3B.1

Accuracy Enhancement of Position Stabilization of the Tethered Submersible Vehicle, pp. 131-136.

Gayvoronskiy, Sergey	National Res. Tomsk Pol. Univ
Ezangina, Tatiana	National Res. Tomsk Pol. Univ

15:50-16:10	We3B.2

AUV Terrain-Aided Navigation Using a Doppler Velocity Logger, pp. 137-142.

Teixeira, Francisco	Univ. of Aveiro
Quintas, João	Inst. Superior Técnico
Pascoal, Antonio M.	ISR-Inst. Superior Tecnico

16:10-16:30	We3B.3

An Inside Perspective on LAUV Control and Localization Layers, pp. 143-148.

Braga, José	Univ. of Porto, LSTS
Calado, Pedro	FEUP
Sousa, Joao	Fac. Engenharia Univ. Do Porto

We1A   Àtrium
Tracking and Localization II (Regular Session)

11:00-11:20	We1A.1

Tracking Underwater Target Using Extremum Seeking, pp. 149-154.

Mandić, Filip	Univ. of Zagreb, Faculty of Electrical Engineering and Comp
Miskovic, Nikola	Univ. of Zagreb

11:20-11:40	We1A.2

Underwater Single-Beacon Localization: Optimal Trajectory Planning and Minimum-Energy Estimation, pp. 155-160.

Pedro, Margarida	Lab. of Robotics and Systems in Engineering and Science (L
Moreno-Salinas, David	UNED
Crasta, Naveena	Inst. Superior Técnico (IST), Lisbon,
Pascoal, Antonio M.	ISR-Inst. Superior Tecnico

11:40-12:00	We1A.3

Combined Multiuser Acoustic Communication and Localisation System for µAUVs Operating in Confined Underwater Environments, pp. 161-166.

Dikarev, Alexander	The Univ. of Manchester
Griffiths, Arron	Univ. OF Manchester
Watson, Simon	The Univ. of Manchester
Lennox, Barry	Univ. of Manchester
Green, Peter	The Univ. of Manchester

We1B   Carlemany
Vehicle Modeling and Design I (Regular Session)

11:00-11:20	We1B.1

Measurements of Hydrodynamic Parameters and Control of an Underwater Torpedo-Shaped Vehicle, pp. 167-172.

Velasco, Francisco J.	Univ. of Cantabria
Revestido Herrero, Elias	Univ. of Cantabria
Lastra Santos, Francisco J.	Univ. of Cantabria
Riola Rodríguez, Jose Maria	Under-Directorate for Tech. and Innovation (SDGTECIN-DGAM)
Díaz Hernández, Juan Jesús	Under-Directorate for Tech. and Innovation (SDGTECIN-DGAM)
Vega Antolín, Luis M.	Univ. of Cantabria

11:20-11:40	We1B.2

Research on Next Autonomous Underwater Vehicle for Longer Distance Cruising, pp. 173-176.

Yamamoto, Ikuo	Nagasaki Univ

11:40-12:00	We1B.3

Performance and Sealing Material Evaluation in 6-Axis Force/Torque Sensors for Underwater Robotics, pp. 177-182.

Palli, Gianluca	Univ. of Bologna
Moriello, Lorenzo	Univ. of Bologna
Melchiorri, Claudio	Univ. of Bologna

We2A   Àtrium
EU Projects I (Invited Session)

12:00-12:20	We2A.1

Towards Autonomy in ROV Operations, pp. 183-188.

Schjølberg, Ingrid	Norwegian Univ. of Science and Tech
Utne, Ingrid Bouwer	NTNU

12:20-12:40	We2A.2

Navigation, Guidance and Control of Underwater Vehicles within the Widely Scalable Mobile Underwater Sonar Technology (WiMUST) Project: An Overview, pp. 189-193.

Al-Khatib, Habib	CGG
Antonelli, Gianluca	Univ. of Cassino and Southern Lazio
Caffaz, Andrea	Graal Tech. S.r.l
Caiti, Andrea	Univ. of Pisa
Casalino, Giuseppe	Univ. of Genova
de Jong, Ivan Bielic	Geo Marine Survey Systems
Duarte, Henrique	Geosurveys Consultores

Indiveri, Giovanni	Univ. of Salento
Jesus, Sergio	CINTAL
Kebkal, Konstantin	EvoLogics
Pascoal, Antonio M.	ISR-Inst. Superior Tecnico
Polani, Daniel	Univ. of Hertfordshire

12:40-13:00	We2A.3

The ARROWS Project: Adapting and Developing Robotics Technologies for Underwater Archaeology, pp. 194-199.

Allotta, Benedetto	Univ. of Florence
Costanzi, Riccardo	Univ. of Florence
Ridolfi, Alessandro	Univ. of Florence
Colombo, Carlo	Univ. of Florence
Fanfani, Marco	Univ. of Florence
Bellavia, Fabio	Univ. of Florence
Salvetti, Ovidio	ISTI-CNR Pisa
Reggiannini, Marco	ISTI-CNR Pisa
Kruusmaa, Maarja	Tallinn Univ. of Tech
Salumae, Taavi	Tallinn Univ. of Tech
Frost, Gordon	Heriot-Watt Univ
Tsiogkas, Nikolaos	Heriot-Watt Univ
Lane, David M.	Heriot-Watt Univ
Cocco, Michele	Edgelab Srl
Gualdesi, Lavinio	Edgelab Srl
Roig, Daniel	Albatros Marine Tech
Gundogdu, Hilal	NESNE Electronic
Dede, Can	Izmir Inst. of Tech
Baines, Steven	TWI
Tusa, Sebastiano	Regione Sicilia
Zangara, Stefano	Regione Sicilia
Dresen, Urmas	Meremuuseum Estonia
Latti, Priit	Estonian Maritime Museum
Daviddi, Walter	D3Studio

We2B	Carlemany
Mapping and SLAM II (Regular Session)	

12:00-12:20	We2B.1

Stereo Graph-SLAM for Robust Navigation of the AUV SPARUS II, pp. 200-205.

Bonin-Font, Francisco Jesús	Univ. of the Balearic Islands
Negre Carrasco, Pep Lluis	Univ. of the Balearic Islands
Massot Campos, Miquel	Univ. of the Balearic Islands
Oliver, Gabriel	Univ. of the Balearic Islands

12:20-12:40	We2B.2

Underwater Photogrammetric Mapping of an Intact Standing Steel Wreck with ROV, pp. 206-211.

Nornes, Stein M.	Norwegian Univ. of Science and Tech. (NTNU)
Ludvigsen, Martin	NTNU
Ødegård, Øyvind	Norwegian Univ. of Science and Tech. (NTNU)
Soerensen, Asgeir	Norwegian Univ. of Science and Tech

12:40-13:00	We2B.3

An Open-Source Bio-Inspired Solution to Underwater SLAM, pp. 212-217.

Silveira, Luan	Federal Univ. of Rio Grande - FURG
Guth, Felipe	Federal Univ. of Rio Grande
Drews Jr, Paulo	Federal Univ. of Rio Grande
Ballester, Pedro	Federal Univ. of Rio Grande
Machado, Matheus	Federal Univ. of Rio Grande
Codevilla, Felipe	Federal Univ. of Rio Grande
Duarte Filho, Nelson	Univ. Federal Do Rio Grande
Botelho, Silvia	Univ. Federal Do Rio Grande

We4A	Àtrium

EU Projects III (Invited Session)

17:00-17:20	We4A.1

DexROV: Dexterous Undersea Inspection and Maintenance in Presence of Communication Latencies, pp. 218-223.

Gancet, Jeremi	Space Applications Services
Weiss, Peter	COMEX
Antonelli, Gianluca	Univ. of Cassino and Southern Lazio
Birk, Andreas	Jacobs Univ
Calinon, Sylvain	Idiap Res. Inst
Turetta, Alessio	Graal Tech. S.r.l
Walen, Cees	EJR Quartz BV
Ilzkovitz, Michel	Space Applications Services
Urbina, Diego	Space Applications Services
Letier, Pierre	Space Applications Services
Gauch, Frederic	COMEX
Indiveri, Giovanni	Univ. of Salento
Casalino, Giuseppe	Univ. of Genova
Pfingsthorn, Max Folkert	Jacobs Univ. Bremen
Tanwani, Ajay	IDIAP
Guilpain, Lisa	EJR Quartz

17:20-17:40	We4A.2

Performance Measures to Improve Evaluation of Teams in the Eurathlon 2014 Sea Robotics Competition, pp. 224-230.

Petillot, Yvan	Heriot-Watt Univ
Ferreira, Fausto	NATO STO Centre for Maritime Res. and Experimentation
Ferri, Gabriele	NATO Centre for Maritime Res. and Experimentation

17:40-18:00	We4A.3

The NOPTILUS Project Overview: A Fully-Autonomous Navigation System of Teams of AUVs for Static/dynamic Underwater Map Construction, pp. 231-237.

Kapoutsis, Athanasios	Information Tech. Inst. CERTH, Thessaloniki, Greece
Salavasidis, Georgios	Information Tech. Inst. CERTH, Thessaloniki, Greece
Chatzichristofis, Savvakis	Information Tech. Inst. CERTH, Thessaloniki, Greece
Braga, José	Univ. of Porto, LSTS
Pinto, Jose	Fac. Engenharia Univ. Do Porto
Sousa, Joao	Fac. Engenharia Univ. Do Porto
Kosmatopoulos, Elias	Democritus Univ. Thrace & ITI/CERTH

18:00-18:20	We4A.4

PANDORA - Persistent Autonomy through Learning, Adaptation, Observation and Replanning, pp. 238-243.

Lane, David M.	Heriot-Watt Univ
Maurelli, Francesco	Heriot-Watt Univ
Kormushev, Petar	Istituto Italiano Di Tecnologia
Carreras, Marc	Univ. of Girona
Fox, Maria	King's Coll. London
Kyriakopoulos, Kostas J.	National Tech. Univ. of Athens

We4B	Carlemany

Multiple Vehicle Systems (Regular Session)

17:00-17:20	We4B.1

Formation Control in the Scope of the MORPH Project. Part I: Theoretical Foundations, pp. 244-249.

Caldeira Abreu, Pedro	Lab. of Robotics and Systems in Engineering and Science (L
Pascoal, Antonio M.	ISR-Inst. Superior Tecnico

17:20-17:40	We4B.2

Formation Control in the Scope of the MORPH Project. Part II: Implementation and Results, pp. 250-255.

Caldeira Abreu, Pedro	Lab. of Robotics and Systems in Engineering and Science (L
Bayat, Mohammadreza	Tech. Univ. of Lisbon, Inst. Superior Técnico(IST)
Pascoal, Antonio M.	ISR-Inst. Superior Tecnico

17:40-18:00	We4B.3

Towards Programmable Coordination of Unmanned Vehicle Networks, pp. 256-261.

Marques, Eduardo R. B.	Univ. De Lisboa
Ribeiro, Manuel	Faculdade De Engenharia Da Univ. Do Porto

Pinto, Jose   Fac. Engenharia Univ. Do Porto
Sousa, Joao   Fac. Engenharia Univ. Do Porto
Martins, Francisco   Univ. De Lisboa

Thu1A	Àtrium
Navigation, Control and Planning III (Regular Session)	

11:00-11:20	Thu1A.1

Artificial Intelligence Planning for AUV Mission Control, pp. 262-267.

Cashmore, Michael	King's Coll. London
Fox, Maria	King's Coll. London
Long, Derek	King's Coll. London
Magazzeni, Daniele	King's Coll. London
Ridder, Bram	King's Coll. London

11:20-11:40	Thu1A.2

Fuzzy Controller for the Yaw and Velocity Control of the Guanay II AUV, pp. 268-273.

González Agudelo, Julián	Univ. Pol. De Catalunya
Gomáriz, Spartacus	Univ. Pol. De Catalunya
Batlle, Carles	Univ. Pol. De Catalunya BarcelonaTech
Galarza, César	Univ. Pol. De Catalunya

11:40-12:00	Thu1A.3

Pool Testing of AUV Visual Servoing for Autonomous Inspection, pp. 274-280.

Krupinski, Szymon	Cybernetix
Desouche, Rémi	Cybernetix
Palomeras, Narcis	Univ. of Girona
Allibert, Guillaume	Cnrs / Unsa
Hua, Minh-Duc	Isir Upmc-Cnrs Umr7222

Thu1B	Carlemany
Vehicle Modeling and Design II (Regular Session)	

11:00-11:20	Thu1B.1

Combined Gas-Fluid Buoyancy System for Improved Attitude and Maneuverability Control for Application in Underwater Gliders, pp. 281-287.

Busquets-Mataix, Javier	IEEE Student Member
Busquets-Mataix, David	Pol. Univ. of Valencia
Busquets-Mataix, Jose Vicente	DISCA Computer Architecture Department - Univ. Pol

11:20-11:40	Thu1B.2

Wireless Image Compression and Transmission for Underwater Robotic Applications, pp. 288-293.

Eduardo, Moscoso Rubino	Jaume-I Univ
Centelles, Diego	Jaume-I Univ
Sales, Jorge	Jaume I Univ
Marti, Jose Vicente	Univ. Jaume I
Marin, Raul	Univ. Jaume I
Sanz, P.J.	Univ. of Jaume I

11:40-12:00	Thu1B.3

Design and Construction of a Robot Hand Prototype for Underwater Applications, pp. 294-299.

Spadafora, Francesco	Univ. of Calabria
Muzzupappa, Maurizio	Univ. of Calabria
Bruno, Fabio	Univ. of Calabria
Ribas, David	Univ. of Girona
Ridao, Pere	Univ. of Girona VAT: ESQ6750002E