

# **2010 IEEE/OES Autonomous Underwater Vehicles**

**(AUV 2010)**

**Monterey, California, USA  
1 – 3 September 2010**



**IEEE Catalog Number: CFP10AUV-PRT  
ISBN: 978-1-61284-980-5**

# TABLE OF CONTENTS

## SEABED MAPPING I

<b>12 Days Under Ice – An Historic AUV Deployment in the Canadian High Arctic</b> .....	1
<i>Chris Kaminski, Tristan Crees, James Ferguson, Alexander Forrest, Jeff Williams, David Hopkin, Garry Heard</i>	
<b>AUV-Based Observations of Rough Bed Hydrodynamics</b> .....	12
<i>Sergio Jaramillo, Geno Pawlak</i>	
<b>Developing the SeabED AUV as a Tool for Conducting Routine Surveys of Fish and their Habitat in the Pacific</b> .....	21
<i>M. Elizabeth Clarke, Curt Whitmire, Erica Fruh, Jeff Anderson, Jeremy Taylor, John Rooney, Scott Ferguson, Hanumant Singh</i>	
<b>Long-term Quantitative Observation of Tubeworm Colonies using an AUV</b> .....	26
<i>Toshihiro Maki, Ayaka Kume, Tamaki Ura, Hideyuki Suzuki</i>	

## SEABED MAPPING II

<b>Challenges of Using an AUV to Find and Map Hydrothermal Vent Sites in Deep and Rugged Terrains</b> .....	36
<i>Stephen McPhail, Peter Stevenson, Miles Pebody, Maaten Furlong, James Perrett, Tim Lebas</i>	
<b>Pixel Mapping for Generation of 3D Coloured Seafloor Bathymetry Using a Single Camera</b> .....	44
<i>Adrian Bodenmann, Blair Thornton, Tamaki Ura</i>	

## NAVIGATION

<b>Stereo Self-Calibration for Seafloor Mapping using AUVs</b> .....	53
<i>Clayton Kunz, Hanumant Singh</i>	
<b>Closed-loop Terrain Relative Navigation for AUVs with Non-Inertial Grade Navigation Sensors</b> .....	60
<i>Deborah K. Meduna, Stephen M. Rock, Robert S. McEwen</i>	
<b>Delayed-state Sigma Point Kalman Filters for Underwater Navigation</b> .....	68
<i>M. Jordan Stanway</i>	

## VEHICLE SYSTEMS I

<b>Efficient Propulsion for the Tethys Long-Range Autonomous Underwater Vehicle</b> .....	77
<i>James G. Bellingham, Yanwu Zhang, Justin E. Kerwin, Jonathan Erikson, Brett Hobson, Brian Kieft, Michael Godin, Robert McEwen, Thomas Hoover, James Paul, Andrew Hamilton, Jeffrey Franklin, Andrew Banka</i>	
<b>Experimental Flight Stability Tests for the Horizontal Flight Mode of a Hybrid Glider</b> .....	84
<i>Brian Claus, Ralf Bachmayer, Christopher D. Williams</i>	
<b>Biointeractive Autonomous Underwater Vehicle “BA-1”</b> .....	90
<i>Hayato Kondo, Etsuro Shimizu, Jin-Kyu Choi, Kenji Nakane, Masakazu Matsushima, Kenji Nagahashi, Yasunori Nishida, Ryosuke Matsui</i>	
<b>Sea Experiment of a Survey Auv Powered by a Fuel Cell System</b> .....	97
<i>E. Raugel, Helion Areva, V. Rigaud, Ifremer C. Lakeman, Areva Renewable</i>	

## SEABED MAPPING III

<b>Horizontal Mapping Accuracy in Hydrographic AUV Surveys</b> .....	100
<i>Øyvind Hegrenæs, Torstein Olsmo Sæb, Per Espen Hagen, Bjørn Jalving</i>	
<b>NIUST AUV’s study Shipwrecks in the Northern Gulf of Mexico</b> .....	113
<i>A.-R. Diercks, V. L. Asper, M. Woolsey, J. L. Williams, F. Cantelas</i>	
<b>Seafloor Image Compression with Large Tile-size Vector Quantization</b> .....	118
<i>Chris Murphy, Robert Y. Wang, Hanumant Singh</i>	

<b>Enhancing NIUST's SeaBED Class AUV, Mola Mola</b> .....	126
<i>M. Woolsey, V. L. Asper, A. R. Diercks, K. McLetchic</i>	

## **WATER COLUMN MAPPING**

<b>Auv Observations of Mixing in the Tidal Outflow from a Scottish Sea Loch</b> .....	131
<i>T. Boyd, M. Inall, E. Dumont, C. Griffiths</i>	
<b>Under-ice Operations with a REMUS-100 AUV in the Arctic</b> .....	140
<i>A. Kukulya, A. Plueddemann, T. Austin, R. Stokey, M. Purcell, B. Allen, R. Littlefield, L. Freitag, P. Koski, E. Gallimore, J. Kemp, K. Newhall, J. Pietro</i>	
<b>Estimation of Iceberg Motion for Mapping by AUVs</b> .....	148
<i>Peter Kimball, Stephen Rock</i>	
<b>Collecting, Interpreting and Merging Fish Telemetry Data from an AUV: Remote Sensing from and Already Remote Platform</b> .....	157
<i>Thomas M. Grothues, Joseph Dobarro, John Eiler</i>	

## **VEHICLE SYSTEMS II**

<b>Automatic Fault Detection and Execution Monitoring for AUV Missions</b> .....	166
<i>Juhan Ernits, Richard Dearden, Miles Pebody</i>	
<b>Design and Testing of the Marport SQX-500 Twin-Pod AUV</b> .....	176
<i>David Shea, Christopher Williams, Moqin He, Peter Crocker, Neil Riggs, Ralf Bachmayer</i>	
<b>Design of a Versatile AUV for High Precision Visual Mapping and Algorithm Evaluation</b> .....	185
<i>Marc Hildebrandt, Jens Hilljegerdes</i>	

## **MISSION CONTROL/PLANNING I**

<b>Using Geometric Control to Design Trajectories for an AUV to Map and Sample the Summit of the Loihi Submarine Volcano</b> .....	191
<i>Michael Andonian, Monique Chyba, Sergio Grammatico, Andrea Caiti</i>	
<b>Randomized Testing for Robotic Plan Execution for Autonomous Systems</b> .....	201
<i>Zeyn Saigol, Fredric Py, Kanna Rajan, Conor McGann, Jeremy Wyatt, Richard Dearden</i>	

## **MISSION CONTROL/PLANNING II**

<b>Development of a Control System for an Auto Underwater Vehicle</b> .....	210
<i>I. Masmijja, G. Masmijja, J. Gonzalez, S. Shariat-Panahi, S. Gomariz</i>	
<b>Cooperative-Adaptive Algorithms for Targets Localization in Underwater Environment</b> .....	215
<i>Assia Belbachir, Simon Lacroix, Felix Ingrand, Michel Perrier, Jan Opderbecke</i>	
<b>Cluster Space Control of Autonomous Surface Vessels Utilizing Obstacle Avoidance and Shielding Techniques</b> .....	222
<i>Paul Mahacek, Ignacio Mas, Christopher Kitts</i>	
<b>Concepts and Tools for Coordination and Control of Networked Ocean-going Vehicles</b> .....	227
<i>J. Borges De Sousa</i>	

## **ADDITIONAL PAPERS**

<b>Rectilinear Coordinate Frames for Deep Sea Navigation</b> .....	233
<i>Chris Murphy, Hanumant Singh</i>	
<b>Spline-based Trajectory Planning Techniques for Benthic AUV Operations</b> .....	243
<i>Kiran Murthy, Stephen Rock</i>	
<b>Long-Range Near-Optimal Path Planning for Gliders in Complex High-Energy Environments</b> .....	252
<i>Donald A. Sofge, Julian S. Whitman</i>	
<b>Disruption/delay Tolerant Networking with Low-bandwidth Underwater Acoustic Modems</b> .....	256
<i>Ricardo Martins</i>	
<b>Advances in Decentralized Single-Beacon Acoustic Navigation for Underwater Vehicles: Theory and Simulation</b> .....	261
<i>Sarah E. Webster, Louis L. Whitcomb, Ryan M. Eustice</i>	

<b>Re-construction of an AUV as a Platform for Oceanographic Research and a Test bed for Implementation of Control Systems Based on Neurobiological Networks.....</b>	<b>269</b>
<i>Javier Busquets, Antonio Guerrero, Javier Gilabert, Francisco García-Córdova</i>	
<b>Author Index</b>	