

PROCEEDINGS
13th INTERNATIONAL SYMPOSIUM ON
UNMANNED UNTETHERED SUBMERSIBLE TECHNOLOGY
(UUST03)

August 24 - 27, 2003
Durham, New Hampshire USA

AUV PAPERS:

OPERATIONS:

AUV Surveys: Extending our Reach 20,000km Later.

T.S. Chance - C&C Technologies, Inc. - USA

NAVOCEANO Seahorse AUV Participation in the Giant Shadow Experiment..

J. Dzielski¹, M.J. Bregar¹, D. L. McDowell¹, R. P. Swanson, Jr.², S. Tangirala, C.R. Zentner,

(1) Penn State University - USA

(2) Naval Oceanographic Office

High-Resolution Multibeam Sonar Mapping with the Autonomous Benthic Explorer (ABE).

M. Jakuba¹ and D. Yoerger²

(1) MIT/WHOI Joint Program

(2) Woods Hole Oceanographic Institution - USA

AUV-based Turbulence Estimates Near Coastal Fronts.

E. Levine¹, L. Goodman², R. Lueck³

(1) Naval Undersea Warfare Center, Newport - USA

(2) SMAST, University of Massachusetts, Dartmouth - USA

(3) University of Victoria - CANADA

SYSTEMS:

UUV Dynamic Control for Minehunting with Synthetic Aperture Sonar.

K. Streitlien¹, S. Willcox¹, K. Watkinson²

(1) Bluefin Robotics Corporation - USA

(2) Vehicle Control Technologies, Inc. - USA

Development of a Small-Size Testbed AUV "Tam-Egg 1" with Acoustic Teleoperation System.

H. Kondo^{1,2}, Y. Itoh³, T. Ura², J. Kojima⁴, Y. Kurimoto⁵, Y. Nose²

(1) Tokyo University of Mercantile Marine - JAPAN

(2) University of Tokyo - JAPAN

(3) Ocean Engineering Research, Inc.

(4) KDDI R&D Laboratories

(5) Meiji University

AUTOTRACKER: Real-Time Architecture for Pipeline and Cable Tracking on AUVs.

J. Evans, Y. Petillot, P. Redmond, M. Wilson, D. Lane - Heriot-Watt University - Scotland, UK

Low-cost UUVs for Task Specific and Expendable Missions.

B. Hobson, B. Schulz, H. Pinnix, R. Moody, C. Pell - Nekton Research, LLC - USA

Solar-Powered Autonomous Underwater Vehicle Development.

J. Jalbert¹, R. Blidberg², J. Baker¹, B. Dalton¹, J. Duchesney¹, P. Pietryka¹, R. Nitzel³, S. Chappell², K. Holappa

(1) Falmouth Scientific, Inc. - USA

(2) Autonomous Undersea Systems Institute - USA

(3) Technology Systems, Inc. - USA

Use of an Autonomous Underwater Vehicle for Environmental Effects Monitoring.

V. Pennell¹, B. Veitch¹, K. Hawboldt¹, T. Husain¹, N. Bose¹, G. Eaton², J. Ferguson³.

(1) Memorial University of Newfoundland - CANADA

(2) Applied Microsystems Ltd. - CANADA

(3) International Submarine Engineering - CANADA

Effects of Upgrades on the Reliability of the AUTOSUB AUV.

G. Griffiths, N.W. Millard, S.D. McPhail, J. Riggs - Southampton Oceanography Centre - UK

Dynamics Modeling and Performance Evaluation of an Autonomous Underwater Vehicle.

J. Evans, M. Nahon - McGill University - CANADA

C-Systems - Concept for a Modular AUV Family.

W. Hornfeld¹, J.P. Baunsgaard²

(1) STN ATLAS Elektronik GmbH - GERMANY

(2) Maridan ApS - DENMARK

Design of a Mobile and Bottom Resting Autonomous Underwater Gliding Vehicle..

K. Niewiadomska, C. Jones, D. Webb - Webb Research Corporation - USA

Exploring Miniaturization Limits for an Instrumented Autonomous Submersible Explorer for Extreme Environments.

A. Behar¹, F. Bruhn², F. Carsey¹

(1) California Institute of Technology - USA

(2) Uppsala University - SWEDEN

SENSORS & SENSOR PROCESSING:

Using Statistical Mixture Models for Tracking Natural Underwater Boundaries.

M.J. Rendas, C. Barat -Laboratoire I3S - FRANCE

Automatic Determination of Vision Lock on the Seafloor in the Presence of Dust.

K. Richmond, D. Black-Schaffer, S. Rock - Stanford University - USA

Sea Trial Verification for a Terrain Navigation Method.

F. Traugott - Defence Materiel Administration - SWEDEN

Recursive Terrain Navigation with the Correlation Method for High Position Accuracy.

I. Nygren, M. Jansson - Royal Institute of Technology (KTH) - SWEDEN

Concurrent Mapping and Localisation Using Side-Scan Sonar for Autonomous Navigation.

I. Tenar Ruiz, S. Reed, Y. Petillot, J. Bell and D. Lane - Heriot-Watt University - Scotland, UK

Preliminary Experiments with a Calibration Technique for Gyro and Doppler Navigation Sensors for Precision Underwater Navigation.

J. Kinsey, L. Whitcomb - The Johns Hopkins University - USA

Novel Two Dimensional High Frequency Phase Array Based Doppler Velocity Log for UUV Applications.

M. Edelhauser and O. Poroy - RD Instruments - USA

A 3D, Forward-Looking, Phased Array, Obstacle Avoidance Sonar for Autonomous Underwater Vehicles.

M. Zimmerman - FarSounder, Inc. - USA

Sensor Selection and Behavior Strategies for Obstacle Avoidance in Small-Diameter AUV's.

E.G. Jones, N. Fairfield - Bluefin Robotics Corporation - USA

High Frequency Side Scan Sonar for Target Reacquisition and Identification.

B. Fletcher¹ and T. Wilcox²

(1) Space and Naval Warfare Systems Center - USA

(2) Marine Sonic Technology, Ltd. - USA

Small Parametric Sonars for AUV Undersea Reconnaissance.

H.C. Woodsum - Sonetech Corporation - USA

Experimental Studies Into Acoustic Transmissions Across an Estuary Using the ForthBase Facility.

D. McLaren, R. McHugh - Heriot-Watt University - Scotland, UK

Real Time Digital Photo System for Semi AUV TSL.

A. Boreyko, A. Zolotarev, A. Scherbatyuk. - Institute of Marine Technology Problems - Russian Academy of Sciences - RUSSIA

Recovery of 3D Information from Underwater Images.

M. Arredondo, K. Lebart, D. Lane - Heriot-Watt University - Scotland, UK

A Chemical Sensor to Aid in the Search for Underwater Archaeological Sites.

J. Mathieu - Massachusetts Institute of Technology - USA.

Improving Performance of a Jelly-Tracking Underwater Vehicle Using Recognition of Animal Motion Modes.

A. Plotnik, S. Rock - Stanford University and Monterey Bay Aquarium Research Institute - USA

CONTROL & HYDRODYNAMICS:

Sonar and Video-based Automatic Docking for Intervention-AUVs.

J. Evans, P. Redmond, C. Plakas, K. Hamilton, D. Lane - Heriot-Watt University - Scotland, UK

Adaptive Sampling Using Feedback Control of an Autonomous Underwater Glider Fleet.

E. Fiorelli¹, P. Bhatta¹, N. Leonard¹, I. Shulman²

(1) Princeton University - USA

(2) Naval Research Laboratory - USA

Mapping the Oceans Using Flock Distortion.

E. Honary, D. McFarland, C. Melhuish - University of West England - UK

An Optimal Control for Multiple Unmanned Underwater Crawling Vehicles.

K. Lee - Naval Surface Warfare Center - USA

Propulsive Performance of the Autonomous Underwater Vehicle “C-SCOUT”.

R. Thomas¹, N. Bose¹, C. Williams²

(1) Memorial University of Newfoundland - CANADA

(2) Institute of Marine Dynamics, National Research Council - CANADA

Underwater Glider Model Parameter Identification.

J. Graver¹, R. Bachmayer¹, N. Leonard¹, D. Fratantoni²

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(2) Woods Hole Oceanographic Institution - USA

Validation of the Hydrodynamic and Maneuvering Models for Three Legacy Undersea Gliders.

D. Humphreys¹, J. Osse², C. Jones³

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(2) University of Washington - USA

(3) Webb Research Corporation - USA

Modeling and Control of an Odyssey III AUV Through System Identification Tests.

M. Rentschler, F. Hover, C. Chrysostomidis - Massachusetts Institute of Technology - USA

Distributed Embedded Modular Architecture (DEMA) for Autonomous Underwater Vehicle (AUV) Control Systems.

S. Taylor¹, M. Simms¹, S. O’Young², N. Bose²

(1) Cuthexis Innovations, Inc. - CANADA

(2) Memorial University of Newfoundland - CANADA

3D Track-Keeping Control for Autonomous Underwater Vehicle.

Bian Xin-Qian and Wang Wei - Harbin Engineering University - PEOPLE’S REPUBLIC OF CHINA

Freesub: Modular Control System for Intervention AUVs (IAUV).

P. Weiss¹, J. Catret Mascarell², M. Badica³, D. Labbe⁴, L. Brignone⁵, L. Lapierre⁶, P. Wilson⁴

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Freesub: Dynamic Stabilisation and Docking of Autonomous Underwater Vehicles.

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Automatic Control of a Low-Cost Commercial ROV.

S. Zanolli, D. Scaradozzi - University of Ancona - ITALY

Steering Control of an Underwater Vehicle: An Anti-Windup Design.

J. P. Folcher -Laboratoire I3S - FRANCE

MISSION PLANNING TOOLS:

Situation Assessment for Autonomous Underwater Vehicles Using a priori Contextual Knowledge.

R. Arritt, R. Turner - University of Maine - USA

Mission Planner and Contingency Framework for Ranger.

H. Pinnix - Nekton Research, LLC - USA

Interfacing the CoDA and CADCON Simulators: A Multi-Fidelity Simulation Testbed for Autonomous Oceanographic Sampling Networks.

E. Albert, J. Bilodeau, R. Turner - University of Maine - USA

Haptic-GeoZui3D: Exploring the Use of Haptics in AUV Path Planning.

R. Komerska, C. Ware - University of New Hampshire - USA

Autonomous Undersea Systems Network (AUSNET) - Protocols to Support Ad-Hoc AUV Communications.

C. Benton¹, J. Kenney¹, R. Nitzel¹, S. Chappell¹, R. Blidberg²

(1) Technology Systems, Inc. - USA

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MULTIPLE AUTONOMOUS VEHICLES:

A Common Control Language for Dynamic Tasking of Multiple Autonomous Vehicles.

C. Duarte¹, G. Martel¹, E. Eberbach², C. Buzzell²

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(2) University of Massachusetts Dartmouth - USA

Efficient Protocols for Integrated Communication and Formation Control in UUV Task Forces.

R. Kannan¹, B. Bourgeois²

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(2) Naval Research Laboratory - USA

Market Based Multiple AUVs Cooperation.

You Guangxin, Xu Yuru, Pang Youngjie - Harbin Engineering University - PEOPLE'S REPUBLIC OF CHINA

Fractional Bandwidth Algorithms.

M. Kemp¹, D. Marthaler², A. Bertozzi²

(1) Nekton Research - USA

(2) University of California - Los Angeles - USA

S²BHCA - Multiple AUV's Cooperation Oriented Control Architecture.

You Guangxin, Harbin Engineering University - PEOPLE'S REPUBLIC OF CHINA

Current Progress in Building a Small Community of Simply Networked Micro-AUVs with Synthesis of Simple Behaviors; Strategic and Research Directions.

S. Stutman - Ocean Robots LLC - USA

Multi-UUV Missions Using the Ranger Micro UUV.

B. Schulz, B. Hobson, M. Kemp, J. Meyer, R. Moody, H. Pinnix, M. St. Clair - Nekton Research, LLC - USA

SUPPORTING TECHNOLOGIES:

The Impact of Power System Type and Vehicle Size on Range and Payload for UUVs.

T. Hughes - The Pennsylvania State University - USA

New Acoustic Systems For AUV Tracking and Communications at NSWCCD-ARD, Lake Pend Oreille, Idaho.

D. Odell, K. Hertel, C. Nielsen - Naval Surface Warfare Center - USA

The Use of Plastics and Polymeric Products in Construction of ROVs and AUVs.

Chris Van Belle - SUBSEA ROBOTICS - BELGIUM

BIOROBOTICS PAPERS:

Introduction: Promode Bandyopadhyay, Office of Naval Research - USA

INTEGRATED BAUV - OVERVIEW:

Morphology and Experimental Hydrodynamics of Locomotor Control Surfaces in Fishes.

G. Lauder and E. Drucker - Harvard University - USA

Artificial Muscle Technology: Physical Principles and Naval Prospects.

J. Madden¹, R. Zimit², N. Vandesteeg², P. Madden², P. Anquetil², S. Lafontaine², A. Takshi¹, I. Hunter², P. Wierenga¹

(1) University of British Columbia - CANADA

(2) Massachusetts Institute of Technology - USA

Energetics of the Oscillating Fin Thruster.

M. Kemp, B. Hobson, C. Pell - Nekton Research, LLC - USA

Review of Experimental Work in Biomimetic Foils.

M. Triantafyllou, A. Techet, F. Hover - Massachusetts Institute of Technology - USA

The Relation of Conducting Polymer Actuator Material Properties to Performance.

P. Madden¹, J. Madden², P. Anquetil¹, N. Vandesteeg¹, I. Hunter¹

(1) Massachusetts Institute of Technology - USA

(2) University of British Columbia - CANADA

Computational Modeling in Bio-Hydrodynamics: Trends, Challenges and Recent Advances.

R. Mittal - The George Washington University - USA

PHYSIOLOGY AND NEURAL CONTROL OF MOVEMENT IN AQUATIC ANIMALS:

Physiology and Neural Control Movement in Aquatic Animals: Introduction and Roadmap

F.A. Mussa-Ivaldi - Northwestern University - USA

Section A: Control Problems Solved by a Fish's Body and Brain: A Review.

J.E. Colgate and K. Lynch - Northwestern University - USA

Section B: Structure, Function and Neural Control of Pectoral Fins in Fishes.

M. Westneat¹, D. Thorsen¹, J. Walker², M. Hale³.

(1) Field Museum of Natural History - USA

(2) University of Southern Maine - USA

(3) University of Chicago - USA

Section C: Neuromechanical Design and Active Sensory Systems In Animals.

M. MacIver - California Institute of Technology - USA

Section D - Neural Primitives for Motion Control

Ferdinando A. Mussa-Ivaldi and Sara A. Solla - Northwestern University - USA

Section E: The Olivo-cerebellar Circuit as Universal Motor Control System.

Radolfo Llinas, E. Leznik, V. Makarenko. - New York University -Medical School - USA

Biologically-Inspired Control of Perception-Action Systems: Helical Klinotaxis in 2D Robots.

J. Long¹, A. Lammert¹, J. Strother², M. McHenry³

(1) Vassar College - USA

(2) University of California, Berkeley - USA

(3) Harvard University - USA

NATURAL and ARTIFICIAL MUSCLES:

Force Generation for Locomotion of Vertebrates: Skeletal Muscle Overview.

A. King¹, D. Loisel², P. Kohl¹

(1) University of Oxford - UK

(2) University of Auckland - NEW ZEALAND

Principles of Actuation in the Muscular System of Fish.

L. Rome - University of Pennsylvania and The Marine Biological Laboratories - USA

Electroactive Polymer Artificial Muscle for Underwater Robotics.

S. Stanford, R. Pelrine, R. Kornbluh, Q. Pei - SRI International - USA

Ionometric Electro-Active Polymer Artificial Muscle - Overview.

J. Paquette and K. Kim - University of Nevada, Reno - USA

INTEGRATED SCIENCE and TECHNOLOGY:

Conceptual Design for the Construction of a Biorobotics AUV Based on Biological Hydrodynamics.

F. Fish¹, G. Lauder², R. Mittal³, A. Techet⁴, M. Triantafyllou⁴, J. Walker⁵, P. Webb⁶

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(3) George Washington University - USA

(4) Massachusetts Institute of Technology - USA

(5) University of Southern Maine - USA

(6) University of Michigan - USA

Biomimetic Active Control of Propulsor Noise Using Conducting Polymers.

D. Opila, P. Madden and B. Schmid - Massachusetts Institute of Technology - USA

Polymer Actuated Variable Camber Foils.

J. Madden¹, B. Schmid¹, R. Botha⁴, M. Hechinger⁴, S. Lafontaine¹, P. Madden³, F. Hover², I. Hunter³

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(4) University of British Columbia - CANADA

Towards a Conceptual Model of a Bio-robotic AUV Part 1: Pectoral Fin Hydrodynamics.

R. Mittal¹, I. Akhtar¹, M. Bozkurtas¹, F. Nijjar²

(1) The George Washington University - USA

(2) University of Illinois at Urbana-Champaign - USA

Open-Loop and Feedback Pectoral Fin Control of Biorobotic AUV.

S. Singh and A. Simha - University of Nevada, Las Vegas - USA

Harvesting Electrical Energy with Electroactive Polymers - Part I. Biomechanical and Physiological

Considerations. L. Rome, E. Goldman R. Sprague - University of Pennsylvania and The Marine Biological Laboratories - USA

Harvesting Electrical Energy with Electroactive Polymers - Part II. Material, Device, and System

Considerations. Q. Zhang, H. Hofmann, Y. Liu, and K. Ren - The Pennsylvania State University - USA

Design and Projected Performance of a Flapping Foil AUV.

S. Licht, V. Polidoro, M. Flores, F. Hover, and M. Triantafyllou - Massachusetts Institute of Technology - USA

HIGH LIFT BIO-BASED DEVICES and SENSORS:

Pectoral Fin Motions for Vehicle Control.

T. Gieseke¹, D. Hrubes¹, A. Yandell², J. Walker³, N. Kato⁴

(1) Naval Undersea Warfare Center - USA

(2) Massachusetts Institute of Technology - USA

(3) University of Southern Maine - USA

(4) Tokai University - JAPAN

Real-time Extraction of Hydrodynamic Flow Characteristics Using Surface Signatures.

S. Mangalam - Tao of Systems Integration, Inc (Tao Systems) - USA

Bio-Inspired Delayed Stall Propulsor.

W. Usab, Jr., J. Hardin, A. Bilanin - Continuum Dynamics, Inc. -USA

The Effect of Chordwise Flexibility on the Thrust and Efficiency of a Flapping Foil.

P. Prempraneerach, F. Hover, M. Triantafyllou - Massachusetts Institute of Technology - USA

KARMAN HARVESTING:

Passive Energy Extraction in the Wake of Bluff Objects by Fish.

D. Beal¹, J. C. Liao², G.V. Lauder², F.S. Hover³, M.S. Triantafyllou³

(1) Naval Undersea Warfare Center - Newport - USA

(2) Harvard University - USA

(3) Massachusetts Institute of Technology - USA

Hydrodynamics of Thrust Production in a Fish-Like Flapping Membrane.

J. Buchholz, J. Jimenez, J. Allen, A. Smits - Princeton University - USA

MECHANISM:

Steady Swimming and Routine Maneuvering by Eels: A Baseline for Biomimetic Undulatory Propulsors.

E. Tytell - Harvard University - USA

BAUV SCIENCE and TECHNOLOGY:

Structure and Mechanics of Non-piscine Control Surfaces.

F. Fish - West Chester University - USA

Kinematics and Performance of Maneuvering Control Surfaces in Teleost Fishes.

J. Walker - University of Southern Maine - USA

Investigations Into the Use of Shape Memory Alloy for the Design of Oscillatory Propulsion System.

N. Shinjo and G. Swain - Florida Institute of Technology - USA

Geometric Methods for Modeling and Control of a Free-Swimming Carangiform Fish Robot.

K. Morgansen - University of Washington - USA

Forces and Flow Visualization of a Three-Dimensional Flapping Foil.

K. McLetchie, M. Flores, F. Hover, A. Techet, M. Triantafyllou - Massachusetts Institute of Technology - USA

FISH MODELING:

Drag Reduction of an Elastic Fish Model.

K. McLetchie - Massachusetts Institute of Technology USA

Numerical Calculation of Hydrodynamic Characteristics of Rigid and Flexible Oscillating Tuna-Tail.

Su Yu-min, Dong Tao, Pang Young-jie, Huang Sheng, Xu Yu-ru - Harbin Engineering University - PEOPLE'S
REPUBLIC OF CHINA

LIQUID CRYSTAL ARTIFICIAL MUSCLE:

Nematic Liquid Crystal Elastomers As Artificial Muscle Materials

J. Naciri, A. Srinivasan, W. Sandberg, R. Ramamurti, and B. Ratna - Naval Research Laboratory - USA

STUDENT PAPERS:

Student Paper Competition Winners:

A Chemical Sensor to Aid in the Search for Underwater Archaeological Sites.

J. Mathieu - Massachusetts Institute of Technology - USA.

S²BHCA - Multiple AUV's Cooperation Oriented Control Architecture.

You Guangxin, Harbin Engineering University - PEOPLE'S REPUBLIC OF CHINA

Biomimetic Active Control of Propulsor Noise Using Conducting Polymers.

D. Opila, P. Madden and B. Schmid - Massachusetts Institute of Technology - USA

Drag Reduction of an Elastic Fish Model.

K. McLetchie - Massachusetts Institute of Technology - USA

Student Papers - Poster Session:

Application of Fuzzy Sliding Mode Control to the Motion Control of a Remotely Operated Vehicle

Hua-Nan Yu, Jian-Cheng Liu, Li-rong Wang - Harbin Engineering University
PEOPLE'S REPUBLIC OF CHINA

Variable Structure Control (VSC) of an Autonomous Underwater Vehicle

Li-Rong Wang, Jian-Chen Liu, Hua-Nan Yu - Harbin Engineering University
PEOPLE'S REPUBLIC OF CHINA

Applied Navigation System of "SY-1" Small AUV

Li Lu, Wan Lei - Harbin Engineering University
PEOPLE'S REPUBLIC OF CHINA

Fault Diagnosis of Actuator Faults Using STF in Autonomous Underwater Vehicle

Liu Jiancheng, Wang Lirong, Gan Yong, Xu Yuru - Harbin Engineering University
PEOPLE'S REPUBLIC OF CHINA

Research on Control and Programming in the Recovery of Autonomous Underwater Vehicle

Gao Yinghui, Wang Fei, Xu Yuru - Harbin Engineering University
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