WUWNet’16

The 11th ACM International Conference on Underwater Networks & Systems

October 24–26, 2016
Shanghai, China
http://www.wuwnet.org
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About WUWNet

The oceans cover 71% of the Earth’s surface and represent one of the least explored frontiers; yet, the oceans are integral to climate regulation, nutrient production, oil retrieval, and transportation. Also, water systems in general are of vital importance to life on Earth and commerce. For these reasons, there is significant interest in monitoring aquatic environments for scientific, environmental, commercial, safety, and military purposes.

WUWNet is the premier venue for research and development bringing real-time, in-situ sensing and actuation to this aquatic world. The goal of this conference is to bring together researchers and practitioners in areas relevant to underwater networks and systems. Thus, many aspects of the networking protocol stack - from the physical layer to the application layer and the various system issues - will be represented at this conference. The objective is to serve as a forum for presenting state-of-the-art research and development, for exchanging ideas and experiences, and for facilitating interactions and collaborations.

The conference will span three days, including presentations of keynote speeches, plenary talks, technical papers, and posters/demos. The scope of the WUWNet conference covers a broad range of research directions relevant to underwater networks and network-related signal processing, communications, systems, and applications. Specific topics of interest include, but are not limited to:

- Underwater network and system architectures
- Efficient underwater communications (including acoustic, optical, RF, and wired, etc.), with techniques from the physical layer to the application layer
- Underwater acoustic modeling and signal processing
- Cooperative underwater communications, including, PHY, MAC, routing, and data transfer, etc.
- Networked underwater robotics and systems, such as localization, navigation, security, communication & coordination, or human operator interaction.
- Coordinated energy harvesting systems and power systems for underwater networks and systems
- Energy-efficient algorithms, and protocol design for underwater networks, as well as signal/image processing and communication systems
- Operating system and middleware support for underwater networks and systems
- Applications that broadly address underwater networks and systems, including coordinated underwater vehicles
- Modeling, simulation, and testbeds for underwater systems and platforms
- Experimental results from underwater networking, signal/image processing and communications field trials
- Application requirements for underwater networks, signal/image processing and communication systems presented by end users
Foreword

Welcome to the 11th ACM International Conference on Underwater Networks and Systems (WUWNet) in Shanghai, China!

This year marks the third time WUWNet has been held outside of North America, after successful similar gatherings in Taiwan (2013) and Italy (2014). In many ways it represents a well-deserved recognition for the breadth and depth of research that is being performed in underwater networks and network-related signal processing, communications, systems, and applications in China. We are grateful to the team in Shanghai for their efforts in making this event a reality and for organizing the meeting. We are equally grateful to the WUWNet steering committee and advisory board for the guidance and support that they have provided in making this meeting possible.

The Technical Program Committee has selected a diverse and strong set of papers for presentation, which includes 8 full papers, 13 short papers, and 32 extended abstracts/position papers. To facilitate discussion, in addition to the 25- and 15-minute talks for the full and short papers, each of the extended abstracts/position papers will be given 6 minutes for oral presentation. The accepted papers cover topics ranging from underwater communication, networking, localization, synchronization, vehicles, and controls to simulators, testbeds, and application studies. Many of the papers deal with theoretical advances in underwater networks and systems, but there is a strong trend towards applied research, both in terms of testing these theories in deployed networks, and developing novel underwater systems and using them in real-life applications.

The program is divided into seven different technical sessions, covering underwater wireless communication, networking protocols, signal processing, vehicles, systems, applications, simulation studies, and field experiments. In addition, we have a session dedicated to highly rated papers from which participants will select a best student paper award. This is in addition to an award for the best student paper focused on experiments that is given in memory of Giovanni Toso. Finally, we have two keynotes by world renowned scholars in the field, two plenary talks, poster/demo session and a panel discussion on the smart ocean technology.

WUWNet’16 would not have been possible without the help of an exceptionally strong and engaged organizing committee, all members of which played critical roles in various stages of the conference – thank you all! We also would like to gratefully acknowledge Laurel Technologies Co. Ltd., SeaTech China Co., Ltd., Nantong Lanpeng Information Technology Co., Ltd., Shanghai RICHTECH Engineering Co., Ltd., Suzhou Acoustic Origin Transducer Corporation, and Suzhou Soundtech Oceanic Instrument Ltd. for financial support. We also wish to give special thanks to ACM and the ACM Special Interest Group on Mobility of Systems, Users, Data, and Computing (SIGMOBILE) for their continued support and ASC (Acoustical Society of China), for the strong promotion of our conference in the acoustic community.

We hope that you find the research presented at WUWNet 2016 inspiring and thought provoking. WUWNet has always been the premier venue for underwater networking and systems research, and we have little doubt that this will continue this year and going forward.
Payman Arabshahi, Dajun Sun, and Wen Xu  
WUWNet’16 General Chairs

Mandar Chitre and Xiaoli Ma  
WUWNet’16 Technical Program Committee Chairs
WUWNet’16 Program

Sunday, October 23, 2016 (Day 0)

05:00pm - 07:00pm  Registration

Monday, October 24, 2016 (Day 1)

08:00am - 08:50am  Registration/Breakfast

08:50am - 09:05am  Opening Remarks (15 min) (Xiaoli Ma and Dajun Sun)

09:05am - 09:55am  Keynote Speech I (50 min) (Session Chair: Payman Arabshahi)
“Emerging Underwater QoS Requirements and the U/W SDN Architecture”
Speaker: Prof. Mario Gerla (University of California, Los Angeles)

09:55am - 10:20am  Best Experimental Student Paper in Memory of Giovanni Toso (25 min)

- Design and Evaluation of a Low-Cost Acoustic Chamber for Underwater Networking [Full Paper]
  Francesca Meneghello and Filippo Campagnaro (University of Padova, Italy); Roei Diamant (University of Haifa, Israel); Paolo Casari (IMDEA Networks Institute, Spain); Michele Zorzi (Università degli Studi di Padova, Italy)

10:20am - 10:35am  Break (15 min)

10:35am - 11:45pm  Technical Session I: Underwater Modem Design, Adaptive and Cognitive Communications (Session Chair: Zheng Peng)
  1 Full Paper (25 min each), 1 Short Papers (15 min each) and 5 Extended Abstracts (6 min each). Total: 70 min.

- Acoustic Modem for Micro AUVs: Design and Practical Evaluation [Full Paper]
  Christian Renner (Hamburg University of Technology, Germany); Alexander J. Golkowski (University of Lübeck, Germany)

- A Dynamic Spectrum Decision Algorithm for Underwater Cognitive Acoustic Networks [Short Paper]
  Deqing Wang and Youfeng Zhang (Xiamen University, P.R. China); Xiaoyi Hu (Communication Engineering Department of Xiamen University, P.R. China); Rongxin Zhang, Wei Su and Yongjun Xie (Xiamen University, P.R. China)

- Statistical QoS-Driven Power Allocation Over Underwater Cognitive Acoustic Networks [Extended Abstract]
  Jingqing Wang (Texas A&M University, USA); Xi Zhang (Texas A&M University, ECE Department, USA)

- Real-Time Transceiver Implementation for SC-FDE Acoustic Modems [Extended Abstract]
  Lin Li, Qunfei Zhang, Lifan Zhang and Yang Zhang (Northwestern Polytechnical University, P.R. China)

- A LTE-based Communication Architecture for Coastal Networks [Extended Abstract]
Yanli Xu, Shengming Jiang and Feng Liu (Shanghai Maritime University, P.R. China)

- **Multiple-input Multiple-output Under-ice Acoustic Communication in Shallow Water [Extended Abstract]**
  Xiao Han, Jingwei Yin and Ge Yu (Harbin Engineering University, P.R. China)

- **WaterCom: Connecting Research Configurations with Practical Deployments [Extended Abstract]**
  Ciaran Mc Goldrick (Trinity College Dublin, Ireland); Enrique Segura and Tianyan Wu (UCLA, USA); Mario Gerla (University of California at Los Angeles, USA)

11:45 pm - 01:00 pm  
**Lunch (Posters/Demos Setup)**

01:00 pm - 02:15 pm  
**Technical Session II: Best Paper Candidate Session**  
(Session Chair: Payman Arabshahi)  
1 Full Paper (25 min each) and 2 Short Papers (25 min each). Total: 75 min.

- **Chirp-Based LPD/LPI Underwater Acoustic Communications with Code-Time-Frequency Multidimensional Spreading [Full Paper]**
  Emrecan Demirors and Tommaso Melodia (Northeastern University, USA)

- **Autonomous Acoustic Trigger for Distributed Underwater Visual Monitoring Systems [Short Paper]**
  Antonella Wilby (University of California, San Diego, USA); Ethan Slattery (University of California Santa Cruz, USA); Andrew Hostler (California Polytechnic State University & University of California, San Diego, USA); Ryan Kastner (University of California, San Diego, USA)

- **An Adaptive Control Law for Controlled Lagrangian Particle Tracking [Short Paper]**
  Sungjin Cho and Fumin Zhang (Georgia Institute of Technology, USA)

02:15 pm - 02:30 pm  
**Break**

02:30 pm - 04:25 pm  
**Technical Session III: Underwater Systems, Experiments, & Communication**  
(Session Chair: Jintao Wang)  
2 Full Papers (25 min each), 3 Short Paper (15 min each) and 3 Extended Abstracts (6 min each). Total: 115 min.

- **SEANet G2: Toward a High-Data-Rate Software-Defined Underwater Acoustic Networking Platform [Full Paper]**
  Emrecan Demirors (Northeastern University, USA); Jiacheng Shi (Northeastern University, USA); Raffaele Guida and Tommaso Melodia (Northeastern University, USA)

- **Robust Communication in Bursty Impulsive Noise with Rayleigh Block Fading [Full Paper]**
  Ahmed Mahmood and Mandar Chitre (National University of Singapore, Singapore)

- **A Compact Low-Power Underwater Magneto-Inductive Modem [Short Paper]**
  Jean-Francois Bousquet, Andrew A Dobbin and Yibin Wang (Dalhousie University, Canada)

- **R&D of a spread spectrum acoustic communication modem with ranging capability [Short Paper]**
  Weihua Jiang, Feng Tong and Yuehai Zhou (Xiamen University, P.R. China)
Mobile Underwater Acoustic Communication Based on Hyperbolic Frequency Modulation Signal [Short Paper]
Juntao Yu; Yuanxin Xu; Yifan Gu; Rui Yu; Tongchen Wang (Zhejiang University, P.R. China)

Experimental evaluation of NNCLMS sparse channel estimation for shallow water acoustic communication [Extended Abstract]
Xiuling Cao; Feiyun Wu; Feng Tong (Xiamen University, P.R. China)

Spatial Channel Model for Underwater Wireless Optical Communication Links [Extended Abstract]
Yuhan Dong, Xuelong Mi and Yiqing Zhou (Tsinghua University, P.R. China)

Yuhan Dong, Xuelong Mi and Yiqing Zhou (Tsinghua University, P.R. China)

04:25pm - 05:30pm  Poster/Demo Session
05:30pm - 07:00pm  Welcome Reception
Tuesday, October 25, 2016 (Day 2)

08:00am - 08:50am  Registration/Breakfast

08:50am - 09:40am  Keynote Speech II (50 min) (Session Chair: Wen Xu)
“High Date Rate Underwater Acoustic Communications and Relative UUV Techniques”
Speaker: Prof. Jianguo Huang (Northwestern Polytechnical University)

09:40am - 10:10am  Technical Session IV: Systems and Platforms
(Session Chair: Jingwei Yin)
2 Short Papers (15 min each). Total: 30 min.

- Pilot-subcarrier Based Impulsive Noise Mitigation for Underwater Acoustic OFDM Systems [Short Paper]
  Peng Chen and Yue Rong (Curtin University, Australia); Nordholm Sven (Curtin University of Technology, Australia)

- Time Reversal Acoustic Communication of Mobile Platform Using Doppler Correction Without Resampling [Short Paper]
  Weihua Jiang, Feng Tong and Dongsheng Chen (Xiamen University, P.R. China)

10:10am - 10:30am  Break (20 min)

10:30am - 11:50pm  Technical Session V: Coding, MAC, and Networking
(Session Chair: Zheng Peng)
1 Full Paper (25 min each), 2 Short Papers (15 min each) and 4 Extended Abstracts (6 min each). Total: 80 min.

- Predicting the performance of a dual-band bi-directional transceiver for shallow water deployments [Full Paper]
  Jean-Francois Bousquet and Xiao Liu (Dalhousie University, Canada)

- Handshake Triggered Chained-Concurrent MAC Protocol for Underwater Sensor Networks [Short Paper]
  Danfen Zhao, Guiyang Lun and Mingshen Liang (Harbin Engineering University, P.R. China)

- Protocol Design and Implementation based on Hierarchical State Machine for Underwater Acoustic Networks [Short Paper]
  Hua Yu, Shanshan Mao and Fangjiong Chen (South China University of Technology, P.R. China); Weineng Xie (Thinkputer Technology Corporation, P.R. China); Junjie Wang and Jiewen Zheng (South China University of Technology, P.R. China); Zhi Gao (Ericsson Mobile Data Applications Technology R&D, P.R. China)

- A Multi-channel MAC Protocol in Underwater Acoustic Sensor Networks [Extended Abstract]
  Junho Cho and Ho-Shin Cho (Kyungpook National University, Korea)

- A New MAC Based on RTT Prediction for Underwater Acoustic Networks [Extended Abstract]
YanKun Chen (South China University of Technology, P.R. China); Fei Ji, Quansheng Guan, Fangjiong Chen and Hua Yu (South China University of Technology, P.R. China)

  Hao Chen, Huifang Chen, Min Deng and Lei Xie (Zhejiang University, P.R. China)

- **A Cooperative ARQ-based MAC Protocol for Underwater Wireless Sensor Networks [Extended Abstract]**
  Hee-won Kim and Ho-Shin Cho (Kyungpook National University, Korea)

11:50am - 01:15pm  Lunch, Poster/Demo Session (Cont.)

01:15pm - 01:45pm  **Plenary Speech I (30 min) (Session Chair: Xiaoli Ma)**
  *Toward the Internet of Underwater Things: A Roadmap*
  Speaker: Prof. Tommaso Melodia (Northeastern University)

01:45am - 02:40pm  **Technical Session VI: Underwater Vehicles and Applications**
  (Session Chair: Chengbing He)
  1 Full Paper (25 min each) and 5 Extended Abstracts (6 min each). Total: 55 min.

- **Building a Data Base of Ocean Channel Impulse Responses for Underwater Acoustic Communication Performance Evaluation: Issues, Requirements, Methods and Results [Full Paper]**
  T. C. Yang; Shan-Ho Huang (Zhejiang University, P.R. China)

- **Time and Frequency Domain Analysis and Measurement Results of Varying Acoustic Signal to Determine Water Pollutants in St. Petersburg Bay [Extended Abstract]**
  Sadia Ahmed (University of South Florida, USA)

- **Towards Multi-Functional Light-Weight Long-Term Real-Time Coastal Ocean Observation System [Extended Abstract]**
  Zhenfeng Jiang, Yanming Ma and Jiali Chen (Nantong Smart Ocean Industry Research Institute, P.R. China);
  Zigeng Wang (University of Connecticut, USA); Zheng Peng (City College of New York, USA); Jun Liu
  (Jilin University, P.R. China); Guitao Han (Nantong Smart Ocean Industry Research Institute, P.R. China)

- **Operational Conditions of an Unmanned Aerial Vehicle (UAV) Based Underwater Data Collection System [Extended Abstract]**
  Shengming Jiang, Nan Yao and Xinlei Jin (Shanghai Maritime University, P.R. China)

- **Outage Probability Analysis for Unmanned Underwater Vehicle Based Relaying [Extended Abstract]**
  Zhaohui Liu, Quansheng Guan, Fangjiong Chen and Yun Liu (South China University of Technology, P.R. China)

- **Improved Node Dynamic Cooperation with Network Lifetime Optimization for Underwater Sensor Networks [Extended Abstract]**
  Yuzhi Zhang (Xian University of Science and Technology, P.R. China); Haiyan Wang (Northwestern Polytechnical University, P.R. China); Anyi Wang, Baiping Li and Jun Yao (Xian University of Science and Technology, P.R. China)
2:40pm - 3:00pm  Break (20 min)

3:00pm - 4:00pm  Panel “Smart Ocean: A Buzz Word or Real Trend?”
Mario Gerla, Tommaso Melodia, Fumin Zhang, et al.
(Coordinator: Jun-Hong Cui)

4:00pm - 5:30pm  Poster/Demo Session (Cont.)

6:00pm - 8:00pm  Conference Dinner (Presenting Best Student Paper Award)
Wednesday, October 26, 2016 (Day 3)

08:00am - 08:30am  **Registration/Breakfast**

08:30am - 09:00am  **Plenary Speech II (30 min)** (Session Chair: Xiaoli Ma)
“ZERO Seafloor Observatory, and Resolving Doppler in Underwater Acoustics Communications”
Speaker: Prof. Fengzhong Qu (Zhejiang University)

09:00am - 10:10am  **Technical Session VII: Systems and Experiments**
(Session Chair: Huifang Chen)
1 Full Paper (25 min each) and 7 Extended Abstracts (6 min each). Total: 70 min.

- **A Flexible and Modular Platform for Development of Short-Range Underwater Communication** [Full Paper]
  Gunther Ardelt (Lübeck University of Applied Sciences & CoSA Center of Excellence, Germany); Martin Mackenberg (Luebeck University of Applied Sciences & CoSA Center of Excellence, Germany); Jan Markmann and Tim Esemann (Lübeck University of Applied Sciences & CoSA Center of Excellence, Germany); Horst Hellbrück (University of Applied Sciences Lübeck & CoSA Center of Excellence, Germany)

- **Efficient MAC-Layer Spectrum Sensing Scheme Over Underwater Cognitive Acoustic Networks** [Extended Abstract]
  Xi Zhang (Texas A&M University, ECE Department, USA); Qixuan Zhu (Texas A&M University, USA); Jingqing Wang (Texas A&M University, USA)

- **Fractile-Piecewise Processing Based Spectrum Sensing Algorithms for Underwater Cognitive Acoustics with Impulsive Noise** [Extended Abstract]
  Junshan Luo (National University of Defense Technology, P.R. China); Shilian Wang (National University of Defence Technology, P.R. China); Wei Zhang (National University of Defense Technology, P.R. China)

- **Harmonic Potential Field Based Routing Protocol for 3D Underwater Sensor Networks** [Extended Abstract]
  Mingsheng Gao and Zhenming Chen (Hohai University, P.R. China)

- **DoF Achieving Distance Aligned Structure for Layered Underwater Acoustic 2x3x3 X Networks** [Extended Abstract]
  Zhijie Bao, Feng Liu, Shengming Jiang and Shuchao Jiang (Shanghai Maritime University, P.R. China)

- **A Multipath Diversity Combining in Underwater CDMA System** [Extended Abstract]
  Bo-Min Seo and Ho-Shin Cho (Kyungpook National University, Korea)

- **Implementation and Application of Underwater Acoustic Sensor Nodes** [Extended Abstract]
  Huifang Chen, Ying Zhang, Zhongyue Chen and Wen Xu (Zhejiang University, P.R. China)

- **A Simulator for Swarm AUVs Acoustic Communication Networking** [Extended Abstract]
  Guannan Li (University of Chinese Academy of Sciences & Shenyang Institute of Automation, CAS, P.R. China); Jun Liu (Jilin University, P.R. China); Xue Wang (Shenyang Institute of Automation, CAS & Northeast University, P.R. China); Hongli Xu (Shenyang Institute of Automation, Chinese Academy of Sciences, P.R. China); Jun-Hong Cui (University of Connecticut & Jilin University, USA)
10:10am - 10:25am  | Break (15 min)

10:25am - 12:00pm  | Technical Session VIII: Data Processing, Localization and Security  
(Session Chair: Jun Liu)  
3 Short Papers (15 min each) and 8 Extended Abstracts (6 min each). Total: 95 min.

- **On-Surface Wireless-Assisted Opportunistic Routing for Underwater Sensor Networks [Short Paper]**  
Miaomiao Liu, Fei Ji, Quansheng Guan, Hua Yu, Fangjiong Chen and Gang Wei (South China University of Technology, P.R. China)

- **AUV Dead-Reckoning Navigation Based On Neural Network Using a Single Accelerometer [Short Paper]**  
Yanxin Xie and Jun Liu (Jilin University, P.R. China); Jun-Hong Cui (University of Connecticut & Jilin University, USA)

- **Optimal Method for USBL Underwater Acoustic Positioning by Combining TDOA and TOA [Short Paper]**  
FangSheng Zhong (Key Laboratory of Wireless-Optical Communications Chinese Academy of Sciences, P.R. China); Wuyang Zhou (University of Science and Technology of China, P.R. China)

- **A Novel Indirect Localization Scheme for Underwater Wireless Sensor Networks [Extended Abstract]**  
Yuhan Dong, Chen Cheng, Rui Wang and Zheng Li (Tsinghua University, P.R. China)

- **A Method Based on Time-Frequency Masking for MFSK Underwater Acoustic Communication Signal Enhancement [Extended Abstract]**  
Yang Yu; Peng Han; Xiaomin Zhang (School of Marine Science and Technology, Northwestern Polytechnical University)

- **An Effective Method for Underwater Target Radiation Signal Detecting and Reconstructing [Extended Abstract]**  
Jie Qi (School of Information Science and Engineering, Xiamen University, P.R. China); Zheng Cao (School of Information Science and Engineering, Xiamen University, P.R. China); Haixin Sun (Xiamen University, P.R. China)

- **A Novel M-ary Differential Underwater Acoustic Direct Sequence Spread Spectrum Communication System [Extended Abstract]**  
Gangqiang Zhang; Xudong He; Junkai Liu (Science and Technology on Underwater Acoustic Antagonizing Laboratory, P.R. China)

- **Distributed Sensor Layout Optimization for Target Detection with Data Fusion [Extended Abstract]**  
Zhongyue Chen, Wen Xu and Huifang Chen (Zhejiang University, P.R. China)

- **On the Probability of Finding a Receiver in an Ellipsoid Neighborhood of a Sender in 3D Random UANs [Extended Abstract]**  
Jiasheng Fan, Fang-Jiong Chen, Quansheng Guan, Fei Ji and Hua Yu (South China University of Technology, P.R. China)

- **Coverage Control Study of Mobile UWASNs Nodes Based on Particle Swarm Optimization Algorithm [Extended Abstract]**  
Chaoping Dong, Longxiang Guo and Jingwei Yin (Harbin Engineering University, P.R. China)
On Analyzing Eavesdropping Behaviors in Underwater Acoustic Sensor Networks [Extended Abstract]

Hong-Ning Dai (Macau University of Science and Technology, Macao); Hao Wang (Norwegian University of Science and Technology, Aalesund, Norway); Hong Xia (Guangdong University of Technology, P.R. China); Zibin Zheng (The Chinese University of Hong Kong, Hong Kong); Qiu Wang (Macau University of Science and Technology, P.R. China); Xuran Li (Macau University of Science and Technology, Macao); Xu Zhuge (Norwegian University of Science and Technology, Norway)

12:00pm - 12:10pm    Presenting Best Poster and Demo Awards

12:10pm - 12:15pm    Closing Remarks and Adjourn

12:30pm - 01:30pm    Lunch
Emerging Underwater QoS Requirements and the Underwater SDN Architecture

Mario Gerla

Professor of Computer Science and Department Chairman, Jonathan B. Postel Chair in Networking
Network Research Lab (NRL)
Center for Autonomous Intelligent Networks and Systems (CAINS)
Computer Science Department
University of California, Los Angeles (UCLA)
http://web.cs.ucla.edu/~gerla/

ABSTRACT:

As a result of increasing demands from the off shore industry, Underwater Wireless Network (UWN) has been a special focus of interest in recent wireless communication studies. These new applications present the challenge of QoS requirements to deliver images and video in real time to network operators that remotely control the search and manage the UUV fleets. Qos communications capability is the critical resource in these applications. Currently, acoustics and optics are the two main choices, with the bulk of attention paid to acoustics because of its relative simplicity. Optics has a big bandwidth advantage but, it is much more complex to manage. Aside from its short communication range, optical PHY is typically line of sight, uni-directional and requires relative node localization. Interestingly, these very same properties give optics the potential for covertness. The complementary properties of the two propagation media suggest hybrid solutions. Unfortunately, the design of a hybrid network becomes quickly very complex: MAC, routing and application protocols must be chosen so that they are compatible across the heterogeneous media and moreover they must be matched to time varying applications scenario. In heterogeneous terrestrial networks these problems have been efficiently tackled with Software Defined Networking (SDN) techniques that offer design flexibility by decoupling data plane from control plane.

This talk will describe an underwater SDN architecture, complete with a central network controller that mainly handles routing and movement decisions for each AUV. The control plane uses separate channels from data. The modularity of the system components allows for flexible replacements of technologies including transmission media and associated MAC protocols. A simplified UW SDN architecture has been implementation in the UCLA WaterCom testbed. It will be demonstrated in the evaluation of state-of-the-art acoustic MAC protocols.

BIO:

Dr. Mario Gerla is a Professor in Computer Science at UCLA. During his Ph.D. program at UCLA he worked on early ARPANET protocols under Prof. Leonard Kleinrock. Since joining the UCLA Faculty in 1976, he has contributed to several network designs including wireless (ODMRP and CODECast) and Internet transport (TCP Westwood). He has lead the ONR MINUTEMAN project (2001-2006), designing the next generation scalable airborne Internet. He has developed at UCLA a Vehicular Testbed for safe navigation and intelligent transport. He was elevated to IEEE Fellow in 2002 and was recently recognized with the MILCOM Award (2011), the IEEE Ad Hoc and Sensor Network Award (2011) and the Sigmobile Life Achievement Award (2015)
High Date Rate Underwater Acoustic Communications and Relative UUV Techniques

Jianguo Huang
Fellow of Chinese Society of Acoustics
Member of IEEE Region 10 (Asia-Pacific) Executive Committee
Chair of IEEE R10 Professional Activities Committee
Vice Chair of IEEE China Council
Founder Chair of IEEE Xi’an Section
Northwestern Polytechnical University
Xi’an, Shanxi, China

ABSTRACT:

Underwater acoustic communications (UAC) is the most efficient wireless communication in the ocean. It’s an important technique for the marine exploration and ocean security. In UAC short range high date rate (HDR) UAC and UAC networks are the one of more attractive research areas. Also unmanned underwater vehicle (UUV) becomes an active field and more popular used tool. In this lecture mainly to introduce the new development for HDR-UAC and relative techniques combined with UUVs. The difficulty of UAC is mainly due to the complicated acoustic channel. The characteristics of acoustic channel are analyzed and related methods to overcome the disadvantage are introduced. The criterions to evaluate the performance of UAC system are presented. Next combined with UUV, relative UAC characteristics and difficulties are investigated, and adopted communication techniques are described. Several research results in the ocean and lakes are reported. In the last the recent research and more interested topics are introduced.

BIO:

Jianguo HUANG, Professor in signal processing and wireless communication, the Fellow of Chinese Society of Acoustics, adjunct professor of Shanghai Jiaotong University, member of IEEE Region 10 (Asia-Pacific) Executive Committee, Chair of IEEE R10 Professional Activities Committee, Vice Chair of IEEE China Council, founder Chair of IEEE Xi’an Section. He also was the former Dean of the College of Marine Engineering, director of State Key Laboratory of Underwater Information Processing and Control and director of the Institute of Oceanic Science and Information Processing in Northwestern Polytechnical University (NPU) in China.

In 1985--1988, he was a visiting scholar doing research on modern spectral estimation in the University of Rhode Island, USA. In 1998, as a visiting professor he conducted the joint research on high resolution parameter estimation in State University of New York at Stony Brook, USA. He has been invited by the universities and companies to deliver the lectures in USA, United Kingdom, Canada, Australia, Japan, Singapore and Hong Kong.

He is the founder of IEEE ICSPCC and one of the founders and a member of the Steering Committee of IEEE ChinaSIP and honorary Chair of IEEE ChinaSIP2013. He has served as General or TPC Chair/Co-Chair in many international conferences, including IEEE ICSPCC2011-16, IEEE TENCON2013, IEEE ICCSN2011, IEEE ICIEA2009 and ICAIT2009, ACM WUWNet2013.

He has been in charge of more than 40 projects of state, national science foundation, and ministries. For the achievements of research in theory and applications he obtained 20 awards from state, ministries and province. He has obtained the 1st and 2nd grade National Scientific and Technical Progress Award of China in 1985 and 2008 respectively for his contribution in unmanned underwater vehicle with jointly active and passive acoustic homing system as well as the contribution in underwater acoustic communication in UUV. He also obtained the 1st, 2nd and 3rd grade of Scientific and Technical Progress Award from Education Ministry, Industry Ministries and Province in China in 2002, 2003, 2007, 2008, 2009 and 2010 respectively. His research has been published more than 400 journal articles and 120 international conference papers. He has published 5 books: including ‘Digital Signal Processing’, ‘Modern Spectral Estimation’ and ‘Discrete Time Signal Processing’. He was recognized as the “2008 Chinese Scientist of the Year” and obtained IEEE Asia-Pacific “2015 Outstanding Volunteer Award”.

16 | P a g e
Toward the Internet of Underwater Things: A Roadmap

Tommaso Melodia

Associate Professor
Department of Electrical and Computer Engineering
Director
Wireless Networks and Embedded Systems Laboratory
Northeastern University
422 Dana Hall, Boston, MA 02115
http://www.ece.neu.edu/people/melodia-tommaso

ABSTRACT:
Existing underwater acoustic modems and networks are not (yet) citizens of the Internet. There are still severe limitations in terms of achievable data rates, reliability, flexibility in architectural design, as well as interoperability and standardization that are slowing adoption of underwater wireless networking technology beyond traditional application scenarios. This talk will discuss a roadmap towards developing a new generation of underwater networks. We will discuss recent work conducted by my research group as well as a series of open research problems that will need to be addressed to enable underwater networks that are faster, more flexible, and easier to deploy, reconfigure, and control.

BIO:
Tommaso Melodia is an Associate Professor with the Department of Electrical and Computer Engineering at Northeastern University in Boston. He received his Ph.D. in Electrical and Computer Engineering from the Georgia Institute of Technology in 2007. He is a recipient of the National Science Foundation CAREER award, and serves in the Editorial Boards of IEEE Transactions on Mobile Computing, IEEE Transactions on Wireless Communications, IEEE Transactions on Multimedia, IEEE Transactions on Molecular, Biological, and Multiscale Communications, Computer Networks (Elsevier), and Smart Health (Elsevier). He will be the technical program chair for IEEE INFOCOM 2018. His research interests are in modeling, optimization, and experimental evaluation of networked communication systems, with applications to software-defined wireless networks, 5G/next generation cellular networks, underwater networks, sensor networks, internet of things, and body sensor networks.
ZERO Seafloor Observatory, and Resolving Doppler in Underwater Acoustics Communications

Fengzhong Qu
Associate Professor
The Institute of Marine Information Science and Technology,
Zhejiang University
Hangzhou, China

http://person.zju.edu.cn/jimqufz/655669.html

ABSTRACT:
To explore the intriguing world undersea, the need for robust and reliable underwater observatory is rapidly growing. A cyber physical system (CPS), which integrates computation with physical processes, utilizing embedded computers and networks for monitor and control, could be applied for this purpose. Cabled seafloor observatory connected with electro-optical cable is a typical solution towards underwater observatory. Underwater sensor network (USN) with modems having a robust and reliable underwater acoustic (UWA) communications capability is another solution for achieving underwater observatory. We have done research in both area. ZERO seafloor observatory, including shore station, junction box, scientific interface instrument module, and various sensors, is deployed in Zhoushan, Zhejiang Province, China, and is now running with its full functionality. Apart from cabled seafloor observatory, we have done research in USN as well. Physical layer techniques accounting for UWA channels are key enablers for USN, especially for resolving Doppler. UWA channels are frequency-selective and time-variant, characterized as doubly spread channels. Compressed sensing based on sparse channel estimation is an important approach for achieving low system overhead, high resolution and low complexity. In addition, filter bank multicarrier communication system, with well-localized time-frequency pulse shaper, provides another insight for mitigating inter-carrier interference (ICI) and inter-symbol interference (ISI).

BIO:
Dr. Fengzhong Qu (S'07-M'10-SM'15) received his B.Sc. and M. Sc. degrees from Zhejiang University, Hangzhou, China, in 2002 and 2005, respectively, both in Electrical Engineering. He received his Ph.D. degree from the Department of Electrical and Computer Engineering at the University of Florida, Gainesville, in 2009.

From 2009 to 2010, he was an adjunct research scholar with the Department of Electrical and Computer Engineering at the University of Florida. Since 2011, he has been with the Ocean College at Zhejiang University, Hangzhou, China, where he is presently an Associate Professor and Associate Chair of the Institute of Underwater Engineering. His current research interests include underwater acoustic communications and networking, and seafloor observatories.
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Contributor List

Xiaoyan Hong  University of Alabama
Xueyuan Zhao  Rutgers University
Yu Han  Northeastern University
Zhaohui Wang  Michigan Technological University
Zheng Peng  City College of New York
Zigeng Wang  University of Connecticut

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Venue

WUWNet’16 will take place at Renaissance Shanghai Yangtze Hotel, located at: 2099 Yan'an West Road, Changning District, Shanghai, China, postal code 200336. The hotel is about 6 miles away from Shanghai Hongqiao International Airport and 40 miles away from Shanghai Pudong International Airport.

To the right is the floor plan of the hotel. The meeting room will be the Yangtze Ballroom 2 Salon A on the third floor, as highlighted on the floor plan.

Transportation

The major international airport in Shanghai is Pudong International Airport. From the airport, buses, metro subway and taxis are available to take you to different locations in the city.

Attractions

As a center for finance, technology, history and culture in China, Shanghai has a lot to offer. Below are some helpful resources for general tourist information:

- http://www.shanghai.gov.cn
- http://www.tripadvisor.com

Famous and popular local attractions include but are not limited to:

- **The Bund or Waitan**: a waterfront area in central Shanghai.
- **Xintiandi**: a car-free shopping, eating and entertainment district of Shanghai.
- **Nanjing Road**: the main shopping street of Shanghai.
- **Yu Garden**: first built in 1559, Yu Garden is a Chinese garden located beside the City God Temple.
- **Jade Buddha Temple**: a Buddhist temple in Shanghai founded in 1882.
- **City God Temple of Shanghai**: a folk temple located in the old city of Shanghai.
- **Oriental Pearl Radio & TV Tower**: a TV tower located at the tip of Lujiazui in the Pudong district by the side of Huangpu River, opposite The Bund, making it a distinct landmark in the area.
- **Shanghai Museum**: a museum of ancient Chinese art, situated on the People's Square in the Huangpu District of Shanghai, China.