Invited speakers:

IT1 : Future Technology and Market Developments for Unmanned Maritime Vehicles

Mr. Bob Nugent

Vice President, Advisory Services, AMI International, USA

Abstract:

The paper forecasts technological and market developments that will shape the future role and demand for unmanned maritime vehicles (UMV), to include unmanned underwater vehicles (UUV) and unmanned surface vehicles (UMV) over the next decade. We will begin with a review of the current UMV market by application/mission segment, technology and vehicle type, covering UUVs, both autonomous (AUV) and remotely operated (ROV), as well as USVs. Will then examine improvements in power and communications technologies that will change the UMV market in the coming decade and blur some of the current capability and design differences between commercial and military UMV markets. The paper will consider the thesis that improvements in UMV power and communications technologies will, following a trajectory seen in the UAV market, lead to growth in demand for UMVs in the civil, military and security sectors. These UMVs would be capable of augmenting manned platforms in conventional Anti-Surface, Anti-Submarine, and Anti-Air naval operations. However, AMI market and technical research suggests that the next decade of changing patterns of world economic and commercial maritime activity, and continuing technological limitations will limit the growth potential for weaponized UMVs. Rather, the period will see more demand among a broader customer base of commercial, security, and military users for hybrid UMVs optimized for port/harbor/facility security and environmental survey and exploration rather than combat missions. We will conclude with future UMV market forecast scenarios in a "high-medium-low" framework for both commercial and defense applications. These market scenarios predict significant increases in UMV sales and use, but temper some overly optimistic forecasts currently being made for these vehicles in both commercial and military/security sectors. The prospects of integration of scientific research and theoretical results in the robotics field (regularly publicized at the AROB symposia) with practical development and use of unmanned systems, especially in maritime domain, will be discussed too.

Biography:

Bob Nugent joined AMI in Bremerton WA in 2007 as a Senior Consultant following a 22 year career as a US naval officer. In 2010 he relocated to Northern Virginia as Vice President of Advisory Services to head up AMI's Washington DC Operations Office. He advises on defense, naval, maritime, C4/ISR, aerospace, and unmanned systems markets. Bob has been quoted and published on naval, defense and economic issues in CNBC, Defense News, Naval Forces Magazine, Singapore Straits Times, BBC, Al-Jazeera and a wide range of national and regional media around the world. He has also presented papers at naval industry expos and conferences in the US, Europe and Asia. Bob's skill sets include strategic planning, competitive assessment, business development and capture, defense systems, tactics, and platform analysis; and market and risk research. Bob earned undergraduate degrees at New Mexico State University and attended the U.S. Naval Postgraduate School and Defense Language Institute, where he studied Russian. He graduated with distinction from the U.S. Naval War College in 2004 and received an M.B.A from Marymount University in Arlington, Virginia in 2007. His last Navy assignment was as Director of Command and Control overseeing major C4ISR programs on the U.S. Navy's acquisition staff in the Pentagon. Bob has also served as Assistant Naval Attache in Moscow, current intelligence department head on the U.S. Navy staff in London, and in analytic and watch officer assignments in Hawaii, South Korea, and Japan. His operational assignments included duty as an Intelligence Officer afloat with expeditionary and aviation units. Bob is married to Nancy Smedberg of McLean, Virginia where they live with their 7 children. Bob has been an adjunct university instructor in Economics and Accounting and a youth athletics coach.

IT2 : JAEA Robotics' Emergency Response to FUKUSHIMA-DAIICHI Accident

Mr. Shinji Kawatsuma

Japan Atomic Energy Agency, Japan

Abstract:

Japan Atomic Energy Agency (JAEA) developed Nuclear Emergency Response Robotics, two RESQ-A, a RESQ-B, a RESQ-C and a RaBOT, in 2001 after JCO criticality accidents occurred, and a Remote operated vehicle (ROV) for Glove Box dismantling cold test in 2008. It is very sorry that RESQ-A, RESQ-B and RESQ-C could not work because of lack of budget when the Fukushima-Daiichi accident occurred by a big earthquake and a huge Tsunami on March 11th 2011, that RaBOT was abandoned from the view point of Practicality, and that ROV could work but was in the facilities damaged by the earthquake.

According to status and condition of the accident at Fukushima-Daiichi, JAEA have modified ROV and two RESQ-A to JAEA-1, JAEA-2 and JAEA-3, and prepared Robotics Control vehicles.

JAEA has provided Robotics and Robotics Control vehicle to TEPCO and is continuously supporting TEPCO for plant restoration.

The summary and lesson learned of Robotics' emergency response to Fukushima-Daiichi accident, would be presented.

Biography:

Shinji Kawatsuma is a senior Principal Engineer and General Manager of Remote and Robotics Engineering Office, Department of Partnership Operation for Plant restoration, Headquarters of Fukushima partnership Operation, Japan Atomic Energy Agency (JAEA).

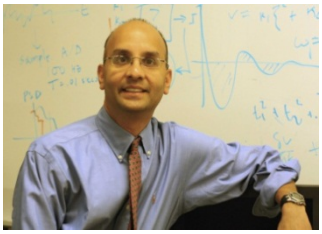
He is responsible for JAEA support in the field of Remote and Robotics to FUKUSHIMA-DAIICHI accident, Nuclear Emergency Response Robotics of JAEA and basic research and development in the field of Remote and Robotics in JAEA.

He served as General Manager of Backend cooperation office and was responsible for promoting of decommissioning and waste management in JAEA.

He began his career as engineer in Power reactor and Nuclear fuel development Corporation (PNC), to develop Bilateral-Servo-Manipulator, and research Radiation Resistance Technology, Man-Machine-Interface. He has been assigned to Oak Ridge National Laboratory as an exchange engineer for co-developing remote maintenance system including servo manipulator.

He received his bachelor of Mechanical Engineering from Waseda university.

IT3 : Using Robots to Understand Natural Behavior



Dr. Sanjay S. Joshi

Ph.D. Associate Professor,
College of Engineering University of California, Davis, USA

Abstract:

Since its beginnings, robotics has been inspired by animal and human behavior. However, more recently, roboticists and biologists have been using robots as new tools to better understand animal behavior itself. These new biorobots are not meant to look and move like real animals in all respects. Rather, they are designed to test specific biological hypotheses and lend insight into the complexity of natural behavior. In our lab, we are building artificial rat pups that have helped discover the factors responsible for the emergence of both individual and group rat pup behavior patterns. A central theme in this research is the emergence of behavior from the interaction of brain, body, and environment. In another project, we are building robotic squirrels to interact with live rattlesnakes, to study predator-prey interaction. These squirrel models have already helped discover the first-known infrared communication in the animal world. New versions of the robot are currently being used in natural environments to collect long-term information on squirrel and snake behavior. As robotics and biology researchers continue to work together, robotics tools will surely facilitate a deeper understanding of natural behavior.

Biography:

Sanjay Joshi is currently Associate Professor of Mechanical and Aerospace Engineering at the University of California, Davis where he directs the Robotics, Autonomous Systems, and Controls Laboratory. This interdisciplinary laboratory studies natural and artificial control systems and robotics, with applications in medicine, biology, and space exploration. Dr. Joshi received a BS from Cornell University in 1990, and MS/PhD from UCLA in 1992/1996, all in Electrical Engineering. After his doctoral work, he became a member of the technical staff at the NASA Jet Propulsion Laboratory in Pasadena, California where he designed spacecraft control systems for NASA missions and performed research for the Mars robotics program. After joining academia, he began applying autonomous robotics to the study of animal behavior, cognition, and communication. From 2010-2011, he was Visiting Associate Professor in the Department of Neurology, Columbia University College of Physicians and Surgeons, New York City.

IT4 : Withstanding Asymmetric Situations in Distributed Dynamic Worlds

Dr. Peter S. Sapaty

Chief Research Scientist, Director of Distributed Simulation and Control of the Institute of Mathematical Machines and Systems, National Academy of Sciences of Ukraine, Ukraine

Abstract:

In our modern dynamic world we are meeting numerous irregular situations where proper reaction could save lives and wealth and protect critical infrastructures. For example, no secret that world powerful armies with traditional system organizations are often losing to terrorists, insurgents or piracy with primitive gadgets but very flexible structures making them hard to detect and fight. And delayed reaction to earthquakes or tsunamis is a result of inadequacy of system organizations too. A novel philosophy and supporting high-level networking technology will be revealed that can quickly react on irregular situations and threats and organize any available human and technical resources into operable systems providing global awareness, pursuing global goals and self-recovering from damages. The approach allows us at runtime, on the fly, to formulate top semantics of the needed reaction on asymmetric events in a special Distributed Scenario Language (DSL), shifting most of traditional organizational routines to automated up to fully automatic implementation, with effective engagement of unmanned systems. This technology, based on gestalt and holistic principles rather than traditional multi-agent organizations will be revealed in detail, with numerous DSL scenarios that can be executed by any mixture of human and robotic components. These include runtime investigation and classification of irregular situations in distributed air, land and maritime environments, launching effective relief or combat missions like fighting collective manned piracy by smart unmanned swarms, and many others. The technology offered provides a unified solution to human-robot interaction and multi-robot behaviors just as a derivative of parallel and distributed interpretation of DSL.

Biography:

Dr Peter Sapaty, Director of Distributed Simulation and Control at the Ukrainian Academy of Sciences, is with networked systems for more than 45 years. Received MSc on calculation and simulation of distributed power networks at Kiev Polytechnic Institute in 1971, and PhD in Computer Science from V.M. Glushkov Cybernetics Center in 1976. Created heterogeneous citywide computer networks from 1969 and parallel supercomputers from mid seventies, chaired international intelligent network management project and simulated dynamic systems like battlefields on distributed computer networks in 1990-98. Worked in Germany, UK, Canada, and Japan as Alexander von Humboldt Foundation fellow, project leader, research professor, department head, and special invited professor, chaired SIG on Mobile Technologies within Distributed Interactive Simulation project in the US. Published more than 150 scientific papers on simulations and management of networked systems. Invented higher-level networking technology used in different countries and resulted in a European Patent and two John Wiley books. Main area of interest: models and languages for coordination and simulation of distributed dynamic systems with application in cooperative robotics, emergency management, infrastructure protection, and terrorism and piracy fight. Peter's individual data is published in Marquis 2010 edition of Who's Who in the World, also in Cambridge 2000 Outstanding Intellectuals of the 21st Century.

IT5 : Human Interface of Robots or Agents via Facial and Word Expression

Prof. Kaoru Sumi

PhD Professor at Future University Hakodate, Hokkaido, Japan

Abstract:

To design an intelligent interactive system, it is necessary to consider how humans feel about the system and establish a good relationship with them. In human robot interaction or human agent interaction, to establish a fifty-fifty relationship between a technical artifact (such as a robot or an agent system) and a human, the power of conviction or influence of the artifact over the human is very important.

To develop an intelligent system using a robot or an agent such as a system that proactively interacts with a user and even changes the user's intention according to the user's circumstances, our project investigated reactions with the user under several situations, considering human robot interaction and human agent interaction using facial and word expressions. Accordingly, we established some rules for making the agent's reaction favorable to the user on the basis of facial expressions and words, and gained some insights into the differences between human robot interaction and human agent interaction.

In this talk, I introduce the possibility of human persuasion by a robot or an agent using facial expressions and emotion words, based on the experimental results.

Biography:

Kaoru Sumi is a professor in the Department of Media Architecture, Future University Hakodate, Japan. Prof. Sumi received her PhD in engineering from the University of Tokyo. Her recent research interests are human computer interaction, persuasive technology, and an application for digital storytelling.

After she received her BS in physics from the Science University of Tokyo, she worked at a telecommunications company. She received her MS in systems management from the University of Tsukuba while she was working there.

She worked at ATR MI&C Research Laboratories, Communication Research Laboratory in Japan, Osaka University, where she researched human computer interaction, knowledge engineering and the application of artificial intelligence. She worked on media informatics and human agent interaction at the National Institute of Information and Communications Technology. She was an associate professor at Hitotsubashi University until last year.