

# MESA10

2010 IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications  
July 15-17, 2010, Qingdao, ShanDong, China

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..... February 12, 2010

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.....April 18, 2010

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## Introduction



Mechanical and electrical engineering show an increasing integration of mechanics with electronics and information processing. This integration is between the components (hardware) and the information-driven function (software), resulting in integrated systems called mechatronic systems. The development of mechatronic systems involves finding an optimal balance between the basic mechanical structure, sensor and actuator implementation, automatic digital information processing and overall control for which embedded systems play a key role. The field of embedded systems is getting more and more challenging, and issues in development of embedded software are attracting attention of an increasing number of researchers both in industry and academia. The goal of 6th IEEE/ASME MESA, MESA'10 is to bring together experts from the fields of mechatronic and embedded systems to disseminate the recent advances made in the area, discuss the future research directions, and exchange application experience with respect to the conference themes.

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## Program Topics

- Autonomous Systems and Ambient Intelligence Symposium  
(Chair: *Hyo-Sung Ahn, Gwangju Inst. of Sci. & Tech. (GIST), Korea*)
  - Autonomous systems
  - Robot intelligence
  - Reinforcement learning
  - Multi-agent systems
  - Teleoperation, coordination & distributed control systems
  - Indoor localization
  - Wireless sensor networks
- Autonomic and Distributed Mechatronic and Embedded Systems Symposium  
(Chair: *Yu-Cheng Chou, Chung Yuan Christian University, Taiwan*)

Large-scale distributed mechatronic and embedded systems induce numerous challenges. Resources and applications of these systems must be managed to maximize computation performance and power efficiency while predictable and reliable activities are maintained under circumstances of varying workloads and failures. An autonomic system addresses the challenges by integrating monitoring, analysis, planning, and execution functionalities to achieve self-managing properties. Topics of interest include, but are not limited to, the followings.

  - Fundamental sciences and theories of distributed autonomic systems;
  - Frameworks, principles, and architectures for designing distributed autonomic systems;
  - Hardware and software techniques for implementing distributed autonomic systems;
  - Creative human interfaces for monitoring and controlling distributed autonomic systems;
  - Practices, procedures, and rules to implement, test, and evaluate industrial autonomic systems;

- Applications of distributed autonomic mechatronic and embedded systems;
  - Experiences with existing distributed autonomic systems.
- **Bio-Mechatronics and Bio-sensors Symposium**  
*(Chair: Shane Xie, University of Auckland, New Zealand)*  
 Suitable topics for publication include, but are not limited to:
    - Biomechatronics design, Biomedical robotics, robotics for medical surgery;
    - Rehabilitation robotics, robotics for stroke patients and wearable medical devices, and Assistive technology for injured, elderly and disabled;
    - Microelectronics, health monitoring devices, embedded signal processing, low-power design;
    - Bioelectromagnetism, electrical bioimpedance, implantable electronics;
    - Biorobotics, biomaterials, Bio-related MEMS, nanotechnologies, and Biomechanical devices;
    - New materials, new sensing and actuation technology for biomechatronic systems;
    - Medical imaging and visualisation, simulation and navigation, virtual reality, intuitive command and control systems, haptics and sensor technologies;
    - Biomechatronic system modelling, simulation of biosystems, system identification;
    - Advanced control algorithms and methods for improving system performance.
- **Cyber-Physical Systems and Cooperative Systems Symposium**  
*(Chair: Stephen S. Nestinger, Worcester Polytechnic Institute, USA)*  
 In recent years, the combination of physical systems and networks has brought to light a new generation of engineered systems: Cyber-Physical Systems (CPS). CPS is informally defined as: "Computational thinking and integration of computation around the physical dynamic systems form Cyber-Physical Systems (CPS) where sensing, decision, actuation, computation, networking and physical processes are mixed." CPS is foreseen to become a highly researched area harnessing the 20th century IT revolution in the years to come. CPS applications can be found in medical devices and systems, patient monitoring devices, automotive and air traffic control, advanced automotive systems, process control, environmental monitoring, avionics, instrumentation, oil refineries, water usage control, cooperative robotics, manufacturing control, buildings, etc.  
 Main Topics:
    - Human-centric Cyber Physical Systems (CPS)
    - Enabling embedded components in CPS
    - New mission scenarios of CPS
    - Cooperative Sensing policy in CPS
    - Cooperative Actuation policy in CPS
    - Mobility (e.g. mobile sensors and mobile actuators) in CPS
    - Information sharing and agreement in CPS
    - Random delay effects and communication management in CPS
    - Virtualization and virtual organization (VO) in CPS
    - Complexity measures for CPS
    - Multi-scale analysis of CPS; Scale-free network structure of CPS
    - Applications (environmental, ecological etc.)
- **Development, Verification, Debug Tools for Mechatronic & Embedded Systems Symposium**  
*(Chair: Jia Xu, York University, Canada)*  
 Manuscripts are solicited on topics that are broadly related to the design, development, building, configuration, customization, testing, verification, debugging, analysis, modeling and simulation of mechatronic and embedded systems and applications. Topics include, but are not limited to the following:
    - Software and hardware systems, environments, tools and tool chains that aid in the design, development, building, configuration, customization, testing, verification, debugging, analysis, modeling and simulation of mechatronic and embedded systems and applications, such as system design tools, system verification tools, system diagnostic tools, system modeling tools, integrated development environments, compilers, assemblers, cross tool chains, debuggers, emulators and simulators, software simulations of hardware components, board support packages, etc;
    - Methodologies, strategies, techniques, practices, in the design, development, building, configuration, customization, testing, verification, debugging, analysis, modeling and simulation of mechatronic and embedded systems and applications;
    - Experience reports, comparison studies and surveys, lessons learned, challenges, problems and issues, insights, concerns, future trends, in the design, development, building, configuration, customization, testing, verification, debugging, analysis, modeling and simulation of mechatronic and embedded systems and applications;
- **Embedded Computer Vision Symposium**  
*(Chair: Peter Rössler, University of Applied Sciences Technikum Wien, Austria)*
    - Algorithms devoted to embedded computer vision
    - Analysis of computer vision problems that are specific to embedded and mechatronic systems

- Design methods and tools for computer vision applications aimed at embedded systems
- Real-time aspects, performance and low-power issues of embedded computer vision systems
- Verification methods for mission-critical embedded computer vision systems
- Sensors for embedded computer vision
- Platforms (DSP, GPU, FPGA, ASIC, SoC, Multi-core, ...) for embedded computer vision systems
- Hybrid/distributed models and architectures for embedded computer vision
- Applications of embedded computer vision.

- **Embedded System Infrastructure and Theory Symposium**

*(Chair: Horauer Martin, University of Applied Sciences Technikum Wien, Austria)*

Embedded systems are single-purpose computers built into a larger system for the purposes of controlling and monitoring the system, often with real-time computing constraints. They are usually embedded as part of a complete device including hardware and mechanical parts. The design and validation of reliable systems under environmental and economic constraints poses a lot of research challenges. Hence, the symposium on Embedded Systems Theory and Infrastructure is dedicated to research issues and applications in this context.

Manuscripts are solicited in the following topics but not limited to:

- Design and Validation of Embedded Systems
- Models of Embedded Computation and Formal Methods
- Networked Embedded Systems
- System-on-Chip and Network-on-Chip Design
- Hardware/software co-design
- Power-aware Design issues
- Real-time
- Operating System & Middleware Support
- Software Architectures for Embedded Systems
- Embedded Systems Applications

- **Fractional Order Dynamic Systems and Controls**

*(Chair: Yan Li, Ph.D, Faculty of School of Control Science and Engineering, Shandong University)*

Why Fractional Calculus? Many real dynamic systems are better characterized using a non-integer order dynamic model based on fractional calculus or, differentiation or integration of non-integer order. Traditional calculus is based on integer order differentiation and integration. The concept of fractional calculus has tremendous potential to change the way we see, model, and control the nature around us. Denying fractional derivatives is like saying that zero, fractional, or irrational numbers do not exist. The topics of interest of this Symposium include, but are not limited to:

- Stability of Fractional Order Systems
- Fractional Order Control
- Theory of Fractional Calculus

- **Diagnosis and Monitoring in Mechatronic Systems Symposium**

*(Chair: Wen Chen, Wayne State University, USA)*

The aim of this symposium is to seek new theories and methods, and potential applications and various experiments of monitoring and diagnosis in mechatronic systems. Papers with fault diagnosis emphasized in applications are particularly welcome.

Manuscripts are solicited in the following topics but not limited to:

- Survey of recent development of fault diagnosis and monitoring in mechatronic systems;
- Modeling and fault diagnosis;
- New theories, methods and applications of fault diagnosis;
- Fault detection and identification;
- Fault-tolerant control, and experimental research on diagnosis and control for mechatronic systems.

- **Mechatronic and Embedded System Applications Symposium**

*(Chair: Emanuele Frontoni, Polytechnic Univ. of Marche, Italy)*

Contributions in theories/ technologies/ methodologies and, particularly, applications are welcome.

The symposium covers, but is not limited to, the following topics:

- Challenges, requirements, model problems, and constraints associated with various application domains
- Use of mechatronic and embedded technologies in meeting particular system requirements, performance, scalability, reliability, and security
- Assessments of mechatronic and embedded technologies for particular application domains
- Technology transition lessons learned;
- Applications in intelligent transportation systems;
- Applications in intelligent manufacturing and automation systems;
- Applications in underwater, flying and aerospace systems;
- Applications in medical systems.

- **Mechatronic and Embedded Systems in Education Symposium**  
(Chair: *Zhaoqing Wang, Zhejiang Sci-Tech University, China*)  
Innovations in course, curriculum, laboratory development  
Development of teaching tools and innovative teaching strategies  
Integration of emerging technologies into the undergraduate and graduate programs
  
- **Mechatronic and Embedded Systems for Renewable Energy Systems Symposium**  
(Chair: *Uriel A. Rosa, University of California, Davis*)  
Common forms of renewable energy sources are solar, wind, hydro, geothermal, biofuels, tidal, biomass, or hybrid. The discontinuous nature of some sources or the need of conversion to more desirable sources present some challenges for the design and implementation of renewable energy systems. Mechatronic and embedded systems may play a fundamental role in regulating and controlling these unique systems, or processes.  
Some suggested topics for this symposium may be as follows:
  - Modeling of Renewable Energy Systems (RES)
  - Design, analysis and control of RES
  - Energy harvesting, storage and conversion devices
  - Remote and mobile applications
  - Emerging Mechatronic and Embedded technology for RES
  
- **Mechatronic Control and Electrical Vehicular Systems Symposium**  
(Chair: *Chengbin Ma, Univ. of Michigan-Shanghai Jiaotong Univ. Joint Institute, Shanghai Jiaotong Univ. Joint Institute, China*)  
The ever-increasing demand from industry for higher efficiency, speed, accuracy and also higher safety at lower cost presents challenges not only to the product design itself but also the control performance.  
Nowadays the mechatronic systems are beginning to predominate both in industry and emerging new energy technologies, such as electric vehicles, wind power generators, fuel cells, etc. The mechatronic control is playing a growing important role in generating simpler and reliable systems with excellent cost performance.  
The goal of the symposium is to bring together experts on mechatronic control from different areas to present new research results and perspectives on the future of the field.  
Manuscripts are solicited in the following topics but not limited to:
  - Advanced mechatronic control (software-/hardware-based);
  - Analysis, modeling and simulation of mechatronic control system;
  - Nonlinearity compensation in mechatronics;
  - Mechatronics in advanced manufacturing;
  - Mechatronic control in new energy systems.
  
- **Robotics and Mobile Machines Symposium**  
(Chair: *Kong Xianwen, Heriot-Watt University, UK*)
  - Novel robots;
  - Robots with legs and metamorphic structures;
  - Reconfigurable robots;
  - Biomedical devices;
  - Man-machine interface and applications;
  - Underwater robots and swimming robots;
  - Space robots;
  - Path planning and navigation;
  - Mobile robots and applications.
  
- **Sensors and MEMS Symposium**  
(Chair: *Ja Choon Koo, Sungkyunkwan University, Korea*)
  - Optical Sensors
  - Force Sensors
  - Acoustic Sensors
  - Multi-axis Force & Torque Sensors
  - Encoder Applications
  - RF Sensors
  - Smart Material Sensors
  - Sensor Fusion
  - Self-sensing Actuator
  - MEMS Application for Sensors and Actuators
  - New MEMS Equipment for Sensors and Actuators
  - Robotic Applications
  
- **Sensor Networks and Networked Embedded Systems Symposium**  
(Chair: *Bo Chen, Michigan Technological University, USA*)  
Technology is taking us to a world where numerous networked devices interact with the physical

world in multiple ways and at multiple scales. This symposium seeks theoretical and experimental research papers in the areas of sensor networks and networked embedded systems. The symposium covers, but not limited to, following topics:

- Network architecture and protocols
- Software platforms and development tools
- Self-organization, scalability, and synchronization
- Routing and data dissemination
- Quality of service
- Energy conservation and management
- Data processing, storage and management
- Mobile ad hoc networks
- Bio-inspired sensor networks
- Vehicle control networks
- Sensor network applications

- Small Unmanned Aerial Vehicle Technologies and Applications (SUAUTA) Symposium  
(Chair: YangQuan Chen, Utah State University, USA)

In recent years, new developments in MEMS sensors, embedded systems, wireless technologies as well as cognitive sciences and artificial intelligence make it possible to use small and affordable unmanned aerial vehicles (UAVs) in both military and civilian applications. While the UAV market so far has been mainly driven by military and security applications, this new generation of UAVs also has the potential to generate a broader range of civilian applications like in- and outdoor surveillance, disaster management, agriculture, remote sensing etc. However, there are still many unsolved problems in the area of small UAVs like the design of vehicles with a higher degree of intelligence and autonomy, the integration in the airspace, sense and avoidance technologies or the coordination of teams of small UAVs, to mention only a few. This symposium aims at presenting latest results in small UAV research and application. Manuscripts are solicited in the following topics but not limited to:

- Fixed wing small UAV technologies;
- Rotary wing small UAV technologies;
- Low cost UAV platforms;
- Low cost IMU and autopilot development;
- State Estimation for small UAVs;
- Vision-based navigation for small UAVs;
- Multi-UAV cooperative navigation and cooperative control;
- Small UAV software architectures;
- Small UAV as flying sensors and applications;
- Student UAV/UAS competitions.

## Paper Submission Requirements

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Manuscripts must be electronically submitted through the conference website <http://www.asmemesa.org>. Submitted manuscripts should be at most six (6) pages in IEEE two-column format, including figures, tables, and references. Please use the [LaTeX style file](#) or [Microsoft Word template](#) available from the conference website to prepare your manuscript. All submissions MUST be in PDF format.