Welcome to Brescia, Italy, for the IEEE Sensors Applications Symposium 2012

Welcome to the IEEE Sensors Applications Symposium (SAS-2012) in Brescia, Italy. This year, we return to Europe, after our very successful conference in Texas in 2011. This is the seventh SAS, and with more than one-hundred submissions and 57-papers being presented in 14-sessions (including keynote and a special Session), it is clear that the conference has emerged as a premier forum for sensor developers, users and innovators. The theme of the symposium remains the same – to address novel approaches and emergent applications in sensor technology. The papers that are being presented cover the areas of biosensors and arrays, smart sensors and standards, sensor networking, MEMS and nanosensors, virtual sensors, homeland security, multisensor data fusion, non-destructive evaluation and remote sensing, integrated system health management (ISHM) and commercial development.

SAS also remains truly international in its scope and attendees – with over 59% of the authors coming from IEEE Region-8 (Europe, the Middle East and Africa), over 24% from Region-10 (Asia/Pacific) and about 12% from the United States. As a consequence, Associate Technical Program Chairs from these regions were appointed to support the Technical Program Chair. Approximately 40-reviewers from all over the world spent considerable time in reviewing the submissions and ensuring the quality of the conference.

The next three days will be busy and hopefully productive for you as you engage with your co-authors and colleagues in the field of sensors and sensor applications. If you have any suggestions for improving SAS, please talk to one of the organizers and let them know. The size and format of this symposium is meant to encourage informal interactions – so please take advantage of this special environment at SAS.

Here're some SAS-2012 highlights that you can look forward to:

- In the keynote address on Tuesday morning, Professor Guido Faglia from the University of Brescia will present his plenary talk entitled "Nanoscience and Nanotechnology for advanced Metal Oxides Gas Sensors

- In the special session on Tuesday afternoon, four short presentations will provide a brief overview on the state of the art on four topics of interest in commercial development

- Brescia is an important area in Italy for sensor production, especially for industrial applications. The participants can talk with our sponsors about trends in sensor applications for industry during the Tuesday's lunch

- The reception on Tuesday evening will be in the city Museum of Santa Giulia. A bus will bring participants close to the Museum and a guided tour will precede an aperitif.

- The banquet on Wednesday evening will be at Villa Baiana in Franciacorta, with a visit and aperitif in the wine cellars.

- Travel and best-paper awards will be presented to student authors, with the support of the IEEE Instrumentation & Measurement Society.

- A Special Issue in the IEEE Transactions on Instrumentation & Measurement which will contain up to ten papers selected on the basis of the results of regular peer review of the manuscripts submitted for consideration by the participants of SAS-2011.

About our host city: Brescia

Brescia's origins can be traced to the Bronze Age, but the city's importance began later when it was the capital of the Cenomani Gauls of Brixia (1000 BC). By 187 BC the Romans ruled the area, but it was only in 49 BC, under Julius Caesar, that Brescia obtained full Roman citizenship. Through following barbarian invasions, Frankish domination of Charlemagne, annexation to the Lombard league, the Venetian Republic, the Cisalpine Republic, the Austrian Empire and, finally, in 1859, the Kingdom of Italy, Brescia has a very complex history. Now it is an important industrial city and it is famous for its museums, like Santa Giulia or Italy's largest Museum of Arms, in the Castle on the Hill of Cidneo, in the middle of the city. Franciacorta, in the surrounding of Brescia, is famous for white sparkling wine and has a famous outlet for Italian fashion.

SAS 2012 Organizing Committee

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KEYNOTE

Nanoscience and Nanotechnology for advanced Metal Oxides Gas Sensors

Guido Faglia
Associate Professor of Experimental Physics
SENSOR Lab
University of Brescia and CNR-IDASC, Department of Physics and Chemistry for Materials and Engineering
Via Valotti 9
25133 Brescia, Italy

Abstract: Metal oxide nanowires are single crystalline materials featuring nanosized cross section, high aspect ratio, high crystalline degree and lateral surfaces terminating with well defined crystalline planes. These peculiarities and the way to exploit them in functional devices featuring innovative properties has been widely studied by several authors working in fields including electronics, optoelectronics, mechanics, energy harvesting, bio- and gas-sensing.

In this presentation I'll focus on gas-sensors, showing the potentialities of these nanomaterials to the field.

In the first part I will review the working principle of chemiresistor devices and the affinity between the nanowire structure and the key points underlying the design of highly performing sensing layers.

In the second part I will present the work done in my lab concerning the synthesis of different metal oxides, such as SnO2, ZnO, CuO, with nanowire structure, their integration into functional layouts and their gas-sensing properties. To show the potentialities of this technology in gas sensing and compare it with thin films traditionally employed in the field I'll focus on security application, in particular the detection of chemical warfare agents (CWAs) simulants. The presentation will be developed addressing the sensor performance in terms of sensitivity, selectivity and stability.

I'll conclude introducing innovative devices based on surface ionization phenomena, featuring high selectivity to compounds with low ionization energy and high proton affinity such as amine groups contained in drugs. Yet, benefits arising from the use of nanostructured materials and nanofabrication techniques will be pointed out.

Guido Faglia is involved in the study of preparation of metal oxide semiconductors MOX as thin films and quasi monodimensional nanostructures and their functional characterization. He has been involved in European Commission Projects since 1992 in basic and applied physics research on semiconductors and their application in interdisciplinary fields from sensing to (opto)electronics and energy. He has a relevant working experience with many other international institutions like NATO, European Space Agency ESA, and the International Association for the Promotion of Co-operation with Scientists from the New Independent States (NIS) of the Former Soviet Union INTAS. During his career Guido Faglia has published 135 articles on International Journals with referee (http://www.researcherid.com/rid/E-6991-2010) and was co-author of dozens of invited talks at international congresses.

His H-factor is 32 (source ISI and Goggle Scholar). He is a referee of many international journals among which Advanced Materials, Angewandte Chemie, Advanced Functional Materials and Sensors and Actuators B.

Tuesday, February 7

8:10 **Registration Opens**

9:00 **Welcome and Introductory Remarks**
Room: ATA *Session Chairs: Shreekanth Mandayam & Alessandra Flammini*

9:20 **KEYNOTE: Nanoscience and Nanotechnology for advanced Metal Oxides Gas Sensors**
Room: ATA
Guido Faglia (University of Brescia)

10:00 - 12:20 **Session: Biosensors and Arrays I**
Room: ATA *Session Chair: Shreekanth Mandayam*

10:20 **Assessment of VOCs in air using sensor array under various exposure conditions**
Andrzej Szczurek (Wroclaw University of Technology, Poland)
Monika Maciejewska (Wrocław Universsity of Technology, Poland)

10:40 **Break**

11:00 **Wideband capacitive Energy Harvester Based On Mechanical Frequency-Up Conversion**
Salar Chamanian (University of Tabriz, Iran)
Manouchehr Bahrami (Tabriz University, Iran)
Reza Pakdaman Zangabad (Sabanci University, Turkey)
Mohamad Khodaei (University of Tabriz, Iran)
Payam Zarbakhsh (Islamic Azad University of Ahar, Iran)

11:20 **A Microfluidic Gas Analyzer for Selective Detection of Biomarker Gases**
Mohammad Paknahad (Faculty of Electrical and Computer Engineering, K. N. Toosi University of Technology, Iran)
Vahid Ghafarinia (Isfahan University of Technology, Iran)
Faramarz Hossein-Babaei (K.N. Toosi University of Technology, Iran)

11:40 **Effect of Glucose(C6H12O6) Addition on Piezoelectric Properties for Sensing Applications**
Ali Jasim Mohammed Al-Jabiry (Al-Mustansiriyah University - College of Science, Iraq)
Marwa Abdul Muhsien Hassan (Al-Mustansiriyah University - College of Science, Iraq)

12:00 **IPT Charged Wireless Sensor Module for River Sedimentation Detection**
Dulsha Abeywardana (The University of Sri Jayawardenepura, Sri Lanka)
Aiguo P. Hu (University of Auckland, New Zealand)
Nihal Kularatna (University of Waikato, New Zealand)

12:20 **An Energy-Efficient Power Control MAC Protocol for Wireless Sensor Networks**
Seung-Hyun Oh (Dongguk University, Korea)

12:40 **Exhibits and Lunch**

14:00 - 15:20 **Special Session of Tutorials and Workshops**
Room: ATA *Session Chair: Alessandra Flammini*

14:00 **Energy harvesting and autonomous sensors**
Vittorio Ferrari (University of Brescia)

14:20 **Wireless Sensor Networks for Industrial Applications**
Emiliano Sisinni (University of Brescia)

14:40 **Multi-Sensor System for Greenhouse Automation**
Gourab Sen Gupta (University of Massey)

15:00 **An electronic nose for quality assessment in aerospace industry**
Saverio de Vito (ENEA)

15:00 **Break**

15:40 - 17:20 **Session: Nondestructive Evaluation and Remote Sensing I**
Room: ATA *Session Chair: Deniz Gurkan*

15:40 **Incipient fault detection for electric power transformers using neural modeling and the local statistical approach to fault diagnosis**
Gerasimos Rigatos (Industrial Systems Institute, Greece)
Pierluigi Siano (University of Salerno, Italy)
Antonio Piccolo (University of Salerno, Italy)

16:00 **Design of a Remote Electrical Conductivity Measurement Sensor Based on Pulsed Eddy Current Technology**
Ehsan Shameli (Exponent Failure Analysis Associates, USA)

16:20 **Non-Intrusive Measurement of the Active Power in Induction Heating Systems through the Proximate Magnetic Field**
Marcel Stamate (Politehnica University of Bucharest, Romania)

16:40 **Diagnosis of Induction Motor Rotor Faults Based on Finite Element Evaluation of Voltage Harmonics of Coil Sensors**
Virgiliu Fireteanu (Politehnica University of Bucharest, Romania)
Petrica Taras (Politehnica University of Bucharest, Romania)

17:00 **Elemental analysis of coal by means of Laser Induced Breakdown Spectroscopy (LIBS) technique**
Sergio Musazzi (Ricerca Sistema Energetico, Italy)
Elena Golinelli (Ricerca Sistema Energetico, Italy)
U. Perini (Ricerca Sistema Energetico, Italy)
F. Barberis (Ricerca Sistema Energetico, Italy)
G.A. Zanetta (Ricerca Sistema Energetico, Italy)

17:20 **Departure for Visit to Brescia Musuem and Welcome Aperitif**

Wednesday, February 8

8:30 **Registration Opens**

9:00 - 10:20 **Sensor Networking and Applications I**
Room: ATA *Session Chair: Deniz Gurkan*

9:00 **Intelligent Sensor Hub Benefits for Wireless Sensor Networks**
Michael Stanley (Freescale Semiconductors, France)
Stephane Gervais Ducouret (Global Manager for Sensors & Freescale Semiconductors, France)
Jon T Adams (Freescale Semiconductors, France)

9:20 **The Recursive Time Synchronization Protocol for Wireless Sensor Networks**
Muhammad Akhlaq (King Fahd University of Petroleum & Minerals, Saudi Arabia)
Tarek Rahil Sheltami (KFUPM, Saudi Arabia)

9:40 **Parallel-plate capacitance sensor for nondestructive measurement of moisture content of different types of wheat**
Chari V Kandala (USDA, USA)
Naveen Puppala (USDA, USA)

10:00 **Plug-in Electric Vehicle Battery Sensor Interface in Smart Grid Network for Electricity Billing**
Sofia Shahid (University Of Houston, USA)
Karthik Ram Narumanchi (University Of Houston, USA)
Deniz Gurkan (University of Houston, USA)

9:00 - 10:20 **Nondestructive Evaluation and Remote Sensing II**
Room: ATB *Session Chair: Emilio Sardini*

9:00 **Active Crack Indicator with Mechanoluminescent sensing technique**
Nao Terasaki (Advanced Industrial Science and Technology, Japan)
Chenshu Li (National Institute of Advanced Industrial Science and Technology (AIST), Japan)
Lin Zhang (National Institute of Advanced Industrial Science and Technology (AIST), Japan)
Chao-Nan Xu (National Institute of Advanced Industrial Science and Technology (AIST), Japan)

9:20 **Energy Efficient Echo-Hiding Extraction Method Based on Fine Grain Intermittent Power Control**
Takeshi Shiro (Fujitsu Laboratories Ltd., Japan)
Hironobu Yamasaki (Fujitsu Laboratories Ltd., Japan)
Katsuhiro Yoda (Fujitsu Laboratories Ltd., Japan)
Yasuhiro Watanabe (Fujitsu Laboratories Ltd., Japan)

9:40 **Photolithography-based realization of Frequency Steerable Acoustic Sensors on PVDF substrate**
Emanuele Baravelli (Georgia Institute of Technology & University of Bologna, USA)
Luca De Marchi (University of Bologna, Italy)
Massimo Ruzzene (Georgia Institute of Technology, USA)
Nicolo' Speciale (University of Bologna, Italy)

10:00 **Conductors sag monitoring by means of a laser based scanning measuring system: experimental results**
Elena Golinelli (Ricerca sul Sistema Energetico-RSE S.p.A., Italy)
S. Musazzi (Ricerca sul Sistema Energetico-RSE S.p.A., Italy)
Umberto Perini (Ricerca sul Sistema Energetico-RSE S.p.A., Italy)
F. Barberis (Ricerca sul Sistema Energetico-RSE S.p.A., Italy)

10:20 **Break**

10:40 - 12:20 **Remote Sensing**
Room: ATA *Session Chair: Alessandra Flammini*

10:40 **High availability wireless temperature sensors for harsh environments**
Emiliano Sisinni (University of Brescia, Italy)
Paolo Archetti (GEFRAN S.p.A., Italy)
Marco Manenti (GEFRAN S.p.A., Italy)
Ermete Piana (GEFRAN S.p.A., Italy)

11:00 **Combining Multiple, Inexpensive GPS Receivers to Improve Accuracy and Reliability**
Daniel K Schrader (Purdue University, USA)
Byung-Cheol Min (Purdue University, USA)
Eric Matson (Purdue University, USA)
Eric Dietz (Purdue University, USA)

11:20 **Environment Sensing Using Smartphone**
Siamak Aram (Polytechnic University of Turin, Italy)
Amedeo Troiano (Politecnico di Torino, Italy)
Eros Pasero (Politecnico di Torino, Italy)

11:40 **Multi-frequency ECT Method for Defect Depth Estimation**
Andrea Bernieri (University of Cassino, Italy)
Giovanni Betta (University of Cassino, Italy)
Luigi Ferrigno (University of Cassino, Italy)
Marco Laracca (University of Cassino, Italy)

12:00 **Evaluation of Bluetooth Hands-Free Profile for Sensors Applications in Smartphone Platforms**
Chiara Maria De Dominicis (University of Brescia, Italy)
Daniele Mazzotti (University of Brescia, Italy)
Mario Piccinelli (University of Brescia, Italy)
Stefano Rinaldi (University of Brescia, Italy)
Angelo Vezzoli (University of Brescia, Italy)
Alessandro Depari (University of Brescia, Italy)

10:40 - 12:20 **Homeland Security**
Room: ATB *Session Chair: Deniz Gurkan*

10:40 **UWB Stepped-FM Sensor for Home Security**
Yuki Ota (The University of Kitakyushu, Japan)
Ryohei Nakamura (The University of Kitakyushu, Japan)
Akihiro Kajiwara (University of Kitakyushu, Japan)

11:00 **Preparation and Characterization of Conductive Sensors Based on Potassium and Silver Hollandite**
Ada Fort (University of Siena, Italy)
Marco Mugnaini (University of Siena, Italy)
Santina Rocchi (University of Siena, Italy)
Valerio Vignoli (University of Siena, Italy)
Francesco Bertocci (University of Siena, Italy)
Michele Gregorkiewitz (University of Siena, Italy)
Simone Meroni (Dipartimento di Scienze della Terra, Italy)

11:20 **Sensors exploitation in Supply Chain Management for French Homeland Security**
Omar Gaci (ISEL, France)
Hervé Mathieu (LITIS Laboratory, France)

11:40 **Thermal Transient Characteristics of Microhotplates in Gaseous Sensor Arrays with Silicon Aerogel for Heat Insulation**
Mohammad Madani (University of Louisiana at Lafayette, USA)
Tan Pham (University of Louisiana at Lafayette, USA)
Nian-Feng Tzeng (University of Louisiana at Lafayette, USA)

12:00 **Target Classification in Wireless Sensor Network Using Particle Swarm Optimization**
Khaled Gharaibeh (Yarmouk University, Jordan)
Abdullah Yaqot (University of Science and Technology, Yemen)

12:20 – 13:20 **Lunch**

13:20 - 15:00 **Biosensors and Arrays II**
Room: ATA *Session Chair: Shreekanth Mandayam*

13:20 **Elderly-care Monitoring Sensor Using Stepped-FM UWB Scheme**
Mitsugu Otsu (The University of Kitakyushu, Japan)
Ryohei Nakamura (The University of Kitakyushu, Japan)
Akihiro Kajiwara (University of Kitakyushu, Japan)

13:40 **Remote monitoring of vital signs in patients with chronic heart failure, sensor devices and data analysis perspective**
Sergio Saponara (University of Pisa, Italy)
Massimiliano Donati (University of Pisa, Italy)
Tony Bacchillone (University of Pisa, Italy)
Luca Fanucci (University of Pisa, Italy)
Isabel Sanchez-Tato (CITIC, Spain)
Cristina Carmona (Fundaction CITIC, Spain)
Pierluigi Barba (CAEN, Italy)

14:00 **Smart Vest for Posture Monitoring**
Emilio Sardini (University of Brescia, Italy)
Mauro Serpelloni (University of Brescia, Italy)
Marco Ometto (University of Brescia, Italy)

14:20 **Analysis of an Electromechanical Generator Implanted in a Human Total Knee Prosthesis**
Vincenzo Luciano (University of Brescia, Faculty of Engineering, Italy)
Emilio Sardini (University of Brescia, Italy)
Mauro Serpelloni (University of Brescia, Italy)
Gabriele Baronio (University of Brescia, Italy)

14:40 **Smart Audio Sensor on Anomaly Respiration Detection using FLAC Features**
Jiaxing Ye (University of Tsukuba & National Institute of Advanced Industrial Science and Technology (AIST), Japan)
Takumi Kobayashi (National Institute of Advanced Industrial Science and Technology, Japan)
Tetsuya Higuchi (National Institute for Advanced Industrial Science and Technology, Japan)

13:20 - 15:00 **Sensor Networking and Applications II**
Room: ATB *Session Chair: Alessandra Flammini*

13:20 **Performance analysis on the competitiveness of Query processing and Compressive sensing in WSN**
Salema Fayed (Arab Academy for science and Technology, College of Engineering, Egypt)
Sherin M. Youssef (Arab Academy for Science & Technology, Egypt)
Amr El-Helw (Arab Academy for Science and Technology, Egypt)
Akbar Sheikh Akbari (Staffordshire University, United Kingdom)
Mohammad N Patwary (Staffordshire University, Stafford, United Kingdom)
Mansour Moniri (Staffordshire, United Kingdom)

13:40 **Energy-Efficient Visual Monitoring based on the Sensing Relevancies of Source Nodes for Wireless Image Sensor Networks**
Daniel G. Costa (State University of Feira de Santana, Brazil)
Luiz Affonso Guedes (Federal University of Rio Grande do Norte, Brazil)

14:00 **Bootstrapping Trust in Networked Measurement Systems with Secure Sensors**
Kristjan V Jonsson (Reykjavik University, Iceland)
Ymir Vigfusson (Cornell University, USA)

14:20 **Multi-objective Evolutionary Algorithms for Energy-Efficiency in Heterogeneous or Networks**
José M. Lanza-Gutiérrez (University of Extremadura, Spain)
Juan A. Gómez-Pulido (University of Extremadura, Spain)
Miguel A. Vega-Rodríguez (University of Extremadura, Spain)
Juan M. Sánchez-Pérez (University of Extremadura, Spain)

14:40 **Design and Simulation of a Novel Capillary-type Thermal Mass Flow Meter**
Reza Pakdaman Zangabad (Sabanci University, Turkey)
Manouchehr Bahrami (Tabriz University, Iran)
Salar Chamanian (University of Tabriz, Iran)
Mohamad Khodaei (University of Tabriz, Iran)
Kasra Pourang (University of Tabriz, Iran)
Mina Heydarlou (University of Tabriz, Iran)

15:00 – 15:20 **Break**

15:20 - 17:00 **Integrated System Health Management**
Room: ATA *Session Chair: Deniz Gurkan*

15:20 **Monitoring Energy Cost Using a Wireless Patch Type Sensor Module with Embedded Algorithm**
Li Meina (Chosun University, Korea)
Kyeung Ho Kang (Chosun University, Korea)
Wang Keun Oh (Chosun University, Korea)
Youn Tae Kim (Chosun University, Korea)

15:40 **Assessing the Health of Sensors Using Data Historians**
Halit Eren (Curtin University of Technology, Australia)

16:00 **Visualization of the Fatigue Crack for Pressure Vessel by Mechanoluminesce Sensor**
Shuqiang Guo (National Institute of Advanced Industrial Science and Technology (AIST), Japan)
Chao-Nan Xu (National Institute of Advanced Industrial Science and Technology (AIST), Japan)
Daisuke Ono (National Institute of Advanced Industrial Science and Technology (AIST), Japan)
Chenshu Li (National Institute of Advanced Industrial Science and Technology (AIST), Japan)
Yoshitaro Sakata (Advanced Industrial Science and Technology, Japan)
Shogo Watanabe (Hydrogen Energy Test and Research Center, Japan)

16:20 **Gyroscopic System for Yaw Channel Control in Aerobatic UAV Helicopters**
Antonio Affanni (University of Udine, Italy)

16:40 **Scenario-based Routing for Sensor Networks Applied to Ambient Navigation Assistance**
Violeta Felea (LIFC, Université de Franche-Comté, France)
Kamal Beydoun (Lebanese University, Lebanon)

15:20 - 17:00 **Multisensor Data Fusion**
Room: ATB *Session Chair: Paolo Ferrari*

15:20 **Reverse Flow Alarm Activation using Electrical Capacitance Tomometric (ECTm) Correlation**
Chaminda Pradeep (Telemark University College & HIT, Norway)
Ru Yan (Telemark University College, Norway)
Saba Mylvaganam (Telemark University College & Faculty of Technology, Norway)

15:40 **Wireless sensor network for berth supervision in marinas**
Roko Krpetic (University of Zagreb, Croatia)
Dinko Oletic (University of Zagreb & Faculty of Electrical Engineering and Computing, Croatia)
Vedran Bilas (University of Zagreb, Croatia)

16:00 **Wireless Sensor Network based Forewarning Models for Groundnut Pests and Diseases**
Yesho Nagaraju (Centre for Development of Advanced Computing, India)
Sowjanya Palli (Centre for Development of Advanced Computing, India)
Santosh Sam Koshy (Center for Development of Advanced Computing, India)
Y.G. Prasad (Centre for Development of Advanced Computing, India)
Naveen Pola (Centre for Development of Advanced Computing, India)

16:20 **A double stage Kalman filter for sensor fusion and orientation tracking in 9D IMU**
Simone Sabatelli (University of Pisa, Italy)
Marco Galgani (University of Pisa, Italy)
Luca Fanucci (University of Pisa, Italy)
Alessandro Rocchi (SensorDynamics, Italy)

16:40 **Design and Development of a Novel Capacitive Sensor Matrix for Measuring Pressure Distribution**
Elisa Marenzi (University of Pavia, Italy)
Remo Lombardi (University of Pavia, Italy)
Gian Mario Bertolotti (University of Pavia, Italy)
Andrea Cristiani (University of Pavia, Italy)
Barbara Cabras (University of Pavia, Italy)

18:00 **Departure for Conference Dinner at Villa Baiana**

Thursday, February 9

8:30 **Registration Opens**

9:00 **Closing Announcements**
Room: ATA *Conference Co-Chairs: Shreekanth Mandayam & Alessandra Flammini*

09:20 - 10:40 **Sensor Networking**
Room: ATA *Session Chair: Deniz Gurkan*

9:20 **Measuring Sensible Heat Flux with High Spatial Density**
Alexander Bahr (Ecole Polytechnique Federale de Lausanne, Switzerland)
Chris Evans (Ecole Polytechnique Fédérale de Lausanne, Switzerland)
Alcherio Martinoli (Ecole Polytechnique Federale de Lausanne, Switzerland)
Hendrik Huwald (Ecole Polytechnique Federale de Lausanne, Switzerland)
Chad Higgins (Ecole Polytechnique Federale de Lausanne, Switzerland)
Marc Parlange (Ecole Polytechnique Federale de Lausanne, Switzerland)

9:40 **Self-orientation of Directional Antennas, Assisted by Mobile Robots, for Receiving the Best Wireless Signal Strength**
Byung-Cheol Min (Purdue University, USA)
John Lewis (Purdue University, USA)
Daniel K Schrader (Purdue University, USA)
Eric T Matson (Purdue University, USA)
Anthony Smith (Purdue University, USA)

10:00 **A Differentiated Reliable Routing Protocol Along With Re-Routing Policy In Wireless Sensor Networks**
Sayyed Majid Mazinani (Imam Reza University, Iran)
Ali Naderi (Islamic Azad University, Iran)

10:20 **Differential Cavity Length Experimental CRDS Sensor Apparatus**
Steven T. Griffin (University of Memphis, USA)
Dylan Willis (University of Memphis, USA)

10:40 **Break**

11:00 - 12:20 **Commercial Development**
Room: ATA *Session Chair: Shreekanth Mandayam*

11:00 **Survey of commercial sensors and emerging miniaturized technologies for safety applications in hydrogen vehicles**
Issam Kerroum (University of Quebec at Trois-Rivières, Canada)
Hatem El Matbouly (Université du Québec à Trois-Rivières, Canada)
Frederic Domingue (Universite du Quebec a Trois-Rivieres, Canada)

11:20 **Pedestrian and Two-wheeler Detection Using Ultra-Wideband Vehicular Radar**
Yuki Okamoto (The University of Kitakyushu, Japan)
Isamu Matsunami (Kitakyushu University, Japan)
Akihiro Kajiwara (University of Kitakyushu, Japan)

11:40 **High Precision Thick-Film Load Cell For Dynamic Force Measurement**
Damiano Crescini (University of Brescia, Italy)

12:00 **A Multi-probe Setup for the Measurement of Angular Vibrations in a Rotating Shaft**
Tommaso Addabbo (University of Siena, Italy)
Ada Fort (University of Siena, Italy)
Marco Mugnaini (University of Siena, Italy)
Santina Rocchi (University of Siena, Italy)
Valerio Vignoli (University of Siena, Italy)
Roberto Biondi (Nuovo Pignone S.p.A., Italy)
Stefano Cioncolini (Nuovo Pignone S.p.A., Italy)