ICQNM 2012

Foreword

The Sixth International Conference on Quantum, Nano and Micro Technologies [ICQNM 2012], held between August 19-24, 2012 in Rome, Italy, continued a series of events covering particularly promising theories and technologies. The conference covered fundamentals on designing, implementing, testing, validating and maintaining various kinds of materials, systems, techniques and mechanisms related to quantum-, nano- and micro-technologies.

Quantum technologies and nano technologies have a great potential to transform communications telecommunications infrastructure and communication protocols, and computers and networking devices. Nanotechnologies and micro-technologies already made their mark on smart materials, nano-medicine, nano-devices, molecular manufacturing, biotechnology, metrology, airspace.

The advancements in material science and computer science have allowed the building, launching and deploying of space exploration systems that continually do more and more as they become smaller and lighter. As an example, carbon nano-tubes have been created that are 250 times stronger than steel, 10 times lighter, and transparent. Similar advances are occurring in glass, plastics and concrete. Spacecraft are being launched, with hulls that are composed of carbon fibers, a light weight high strength material.

Electronic devices, medicine, environment, metrology, aerospace programs, clothes and materials, telecommunications, cryptography, semiconductors, manufacturing, and other domains are impacted by the progress on the areas mentioned above. Particularly, micro imaging, nano-medicine: (drug delivery; nano-particles i.e. viruses; proteins.), bio-nanostructures: (nano-tubes, nano-particles), microsystems, micro fluidics: (including nano-fluidics, modeling; fabrication and application), micro instrumentation / implantable microdevices (miniaturized bio-electronic systems, etc.) and micro sensors benefits from the progress on quantum, nano and micro technologies.

Developing nanoscale-manufactured robots presents fabrication and control challenges. The evolution of mechatronics system and robotic system requires advanced functions for control. Special methods and technologies have been developed to design, analyze, build, controls, and apply micro/nano-robotic systems for biotechnology, medical, information technology, materials, etc. A particular application of nano-robots would be in carrying out projects in hostile environments, utilizing local materials and local energy. Ultra-miniature robotic systems and nano-mechanical devices will be the biomolecular electro-mechanical hardware of future manufacturing and biomedical industry.

Nowadays, there are tremendous attempts to develop new bio-molecular machines, components that can be assembled in nano-devices. Bio-robotics entities are able to manipulate the nano-world components, convey information from the nano/nano to the nano/macro world and navigate at the nano-environment level. Additionally, they are able to self replicate, leading to the bio-robot factory. Protein-based nano-motors and nano-robots, as well as biomolecular components interfaces.

Quantum cryptography uses the uncertainty principle of quantum physics to provide a safe but public means for transmitting vital, secret information. A quantum public key distribution system depends on the uncertainty principle to ensure secrecy. Special protocols correlations and composability algorithms ensure similar functionality as in non-quantum systems. The security related tracks cover a series of events focusing on quantum security aspects. On the quantum protocol side, automated proofs of security and probabilistic model-checking methods have been suggested. Research teams focus on quantum key distribution and aspects related to key composability and correlations. Limitations are mainly related to physical devices and polarization control.

We take here the opportunity to warmly thank all the members of the ICQNM 2012 Technical Program Committee, as well as the numerous reviewers. The creation of such a high quality conference program would not have been possible without their involvement. We also kindly thank all the authors who dedicated much of their time and efforts to contribute to ICQNM 2012. We truly believe that, thanks to all these efforts, the final conference program consisted of top quality contributions.

Also, this event could not have been a reality without the support of many individuals, organizations, and sponsors. We are grateful to the members of the ICQNM 2012 organizing committee for their help in handling the logistics and for their work to make this professional meeting a success.

We hope that ICQNM 2012 was a successful international forum for the exchange of ideas and results between academia and industry and for the promotion of progress in quantum, nano and micro technologies.

We are convinced that the participants found the event useful and communications very open. We also hope the attendees enjoyed the historic charm Rome, Italy.

ICQNM 2012 Chairs:

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Daoyi Dong, University of New South Wales, Australia
Marco Genovese, Italian Metrological Institute (INRIM) -Torino, Italy
Masahito Hayashi, Tohoku University, Japan
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Francois Le Gall, The University of Tokyo, Japan
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