

Proceedings of the 2nd ACM International Conference on Nanoscale Computing and Communication

Boston, Massachusetts, USA, September 21-22, 2015

ACM NANOCOM 2015

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Table of Contents – ACM NANOCOM 2015

Session 1: Molecular Communications I

1. *Source Addressing and Medium Access Control in Bacterial Communication Networks*, Bhuvana Krishnaswamy and Raghupathy Sivakumar (Georgia Institute of Technology, USA)
2. *Impact of Receiver Molecular Circuits on the Performance of Reaction Shift Keying*, Hamdan Awan, Chun Tung Chou (University of New South Wales, Australia)
3. *Channel Modeling and Analysis for Molecular Motors in Nano-scale Communications*, Youssef Chahibi (Georgia Institute of Technology, USA); Ilangko Balasingham (Norwegian University of Science and Technology, Norway)
4. *On the tradeoff between data rate and error probability in discrete microfluidics*, Laura Galluccio, Alfio Lombardo, Giacomo Morabito and Sergio Palazzo, Carla Panarello, Giovanni Schembra (University of Catania, Italy)
5. *Data Rate Performance of Droplet Microfluidic Communication System*, Stefanus Arinno Wirdatmadja, Dmitri Moltchanov, Paul Bolcos, Jari Väliäho, Joose Kreutzer, Pasi Kallio and Yevgeni Koucheryavy (Tampere University of Technology, Finland)

Session 2: Nano-Electromagnetic Communications (Invited)

6. *Energy Detection in THz Nanonetworks in Scattering Environment*, Joonas Kokkonen, Janne Lehtomäki and Markku Juntti (University of Oulu, Finland)
7. *Timing Acquisition for Pulse-based Wireless Systems in the Terahertz Band*, Chong Han and Ian F. Akyildiz (Georgia Institute of Technology, USA); Wolfgang Gerstaecker (University of Erlangen-Nuernberg, Germany)
8. *Remote Detection of Chemical Reactions using Nanoscale Terahertz Communication Powered by Pyroelectric Energy Harvesting*, Eisa Zarepour, Mahbub Hassan and Chun Tung Chou (University of New South Wales, Australia); Adesoji Adesina (ATODATECH LLC, Brentwood, CA, Australia)
9. *Weather Impact on Outdoor Terahertz Wireless Links*, John Federici, Jianjun Ma and Lothar Moeller (New Jersey Institute of Technology, USA)

10. *Enabling Technologies for Real-time 50-Gbit/s Wireless Transmission at 300 GHz*, Tadao Nagatsuma (Osaka University, Japan); Kazutoshi Kato (Kyushu University, Japan); Jeffrey Hesler (Virginia Diodes, Inc., USA)

Session 3: Molecular Communications II

11. *Synaptic Channel Model Including Effects of Spike Width Variation*, Hamideh Ramezani, Ozgur B. Akan (Koc University, Turkey)
12. *Neuronal Communication: Presynaptic Terminals as Transmitter Array*, Angela Sara Cacciapuoti, Marcello Caleffi (University of Naples Federico II, Italy); Alessandro Piras (Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Italy)
13. *Fresnel-Zones-Patterned Nanoparticles as Fluorophore for Tracking of Message Carriers in Touchable Molecular Communication*, Lujiang Qian, Yu Zhou, Fan Yang and Qingfeng Zhang (South University of Science and Technology of China, P.R. China); Rui Wang (The South University of Science and Technology of China, P.R. China); Yifan Chen (South University of Science and Technology of China, P.R. China)
14. *In Silico Experiments of Mobile Bionanosensor Networks for Target Tracking*, Yutaka Okaie, Takuya Obuchi, Takahiro Hara and Shojiro Nishio (Osaka University, Japan)

Session 4: Nano-Electromagnetic Communications I

15. *A Vertical Methodology for the Design Space Exploration of Graphene-enabled Wireless Communications*, Sergi Abadal (Universitat Politècnica de Catalunya & Nanonetworking Center in Catalonia, Spain); Albert Mestres Sugranes (Universitat Politècnica de Catalunya, Spain); Ignacio Llatser (Vodafone Chair for Mobile Communication Systems, Germany); Eduard Alarcon (Technical University of Catalunya, Spain); Albert Cabellos-Aparicio
16. *Pulse Position Coding for Information Capacity Promotion in Electromagnetic Nanonetworks*, Xin-Wei Yao, Xiao-Gang Pan, Cheng Zhao, Chao-Chao Wang and Wan-Liang Wang (Zhejiang University of Technology, P.R. China); Shuang-Hua Yang (Loughborough University, United Kingdom)
17. *Forwarding Schemes for EM-based Wireless Nanosensor Networks in the Terahertz Band*, Hang Yu, Bryan Ng and Winston K.G. Seah (Victoria University of Wellington, New Zealand)
18. *CORONA: A Coordinate and Routing system for Nanonetworks*, Angeliki Tsioliariidou (Foundation for Research and Technology, Greece); Christos Liaskos

(Institute of Computer Science, Foundation of Research and Technology, Hellas, Greece); Sotiris Ioannidis (Foundation for Research and Technology - Hellas, Greece); Andreas Pitsillides (University of Cyprus, Cyprus)

19. *Scalability of Network Capacity in Nanonetworks Powered by Energy Harvesting*, Raul G. Cid-Fuentes (Universitat Politècnica de Catalunya & Georgia Institute of Technology, Spain); Sergi Abadal (Universitat Politècnica de Catalunya & Georgia Institute of Technology, Spain); Albert Cabellos-Aparicio (Universitat Politècnica de Catalunya, Spain); Eduard Alarcon

Session 5: Work in Progress

20. *Adaptive Threshold Variation Algorithm for Diffusion-based Molecular Communication*, Peng He (University of Electronic Science and Technology of China, P.R. China); Yuming Mao (SCIE, P.R. China); Qiang Liu (University of Electronic Science and Technology of China, P.R. China); Kun Yang (University of Essex, United Kingdom)
21. *An Algorithmic Framework for Shape Formation Problems in Self-Organizing Particle Systems*, Zahra Derakhshandeh (Arizona State University, USA); Robert Gmyr (University of Paderborn, Germany); Andrea Richa (Arizona State University, USA); Christian Scheideler (Paderborn University, Germany, Germany); Thim Strothmann (University of Paderborn, Germany)
22. *Error Correcting Models for Functional Characterization of Deoxyribozymes*, Elebeoba May (University of Houston, USA)
23. *Photonic reservoir computing approaches to nanoscale computation*, Andrew Katumba (Gent University & IMEC, Belgium); Peter Bienstman (Gent University - imec, Belgium); Joni Dambre (Gent University, Belgium)
24. *Internet of Nano Things for Dairy Farming*, Kriti Bhargava (Telecommunications Software & Systems Group, Waterford Institute of Technology, Ireland); Stepan Ivanov (Waterford Institute of Technology & TSSG, Ireland); William Donnelly (WIT, Ireland)
25. *Going for large scale with nano-wireless simulations*, Nicolas Boillot (Université de Franche-Comté, FEMTO-ST, Centre National de Recherche Scientifique (CNRS), France); Dominique Dhoutaut (Université de Franche-Comté, France); Julien Bourgeois (UFC/FEMTO-ST Institute, France)

Session 6: Molecular Communications (Invited)

26. *Arrival Modeling and Error Analysis for Molecular Communication via Diffusion with Drift*, Huseyin Birkan Yilmaz (Yonsei University, Yonsei Institute of

- Convergence Technology & Bogazici University, Korea); Chan-Byoung Chae (Yonsei University, Korea); Burcu Tepekule and Ali E. Pusane (Bogazici University, Turkey)
27. *Smart antennas for diffusion-based molecular communications*, Luca Felicetti, Mauro Femminella and Gianluca Reali (University of Perugia, Italy)
28. *On the Statistics of Reaction-Diffusion Simulations for Molecular Communication*, Adam Noel, Karen C Cheung and Robert Schober (University of British Columbia, Canada)
29. *Towards Autonomous Control of Molecular Communication in Populations of Bacteria*, Chieh Lo and Guopeng Wei (Carnegie Mellon University, USA); Radu Marculescu (CMU, USA)

Session 6: Nano-Electromagnetic Communications II

30. *The Effects of Nanosensors Movements on Nanocommunications*, Muhammad Agus Zainuddin (University of Franche-Comte, Indonesia); Eugen Dedu (FEMTO-ST, France); Julien Bourgeois (UFC/FEMTO-ST Institute, France)
31. *Nano-wireless Communication for Microrobotics: bridging the gap*, Ludovico Ferranti (Sapienza University of Rome, Italy); Francesca Cuomo (University of Rome Sapienza, Italy)
32. *Joint Cooling and Information Transmission for Board-to-Board Communications*, Anna Volkova, Dmitri Moltchanov, Vitaly Petrov and Yevgeni Koucheryav (Tampere University of Technology, Finland)
33. *Kilo-core Wireless Network-on-Chips (NoCs) Architecture*, Avinash Kodi, Md Ashif I Sikder, Dominic DiTomaso and Savas Kaya (Ohio University, USA); David W Matolak (University of South Carolina, USA); Soumyasanta Laha (Ohio University, USA); William Rayess (University of South Carolina, USA)
34. *Quantum Memory Management Systems*, Caglar Koca and Ozgur B. Akan (Koc University, Turkey)

General Chairs' Message

It is our great pleasure to warmly welcome you all to the 2nd ACM International Conference on Nanoscale Computing and Communication (ACM NANOCOM 2015), which is held in Boston on September 21st – 22nd, 2015.

The conference is the second of its series that is held annually in order to develop and foster a new communication and computing paradigm that is at the nanoscale. We have witnessed tremendous advancements in nanotechnology over the last few decades, which have led to developments of novel materials and components that can be assembled into nanomachines. These nanomachines are not only developed from man-made components but also encompass natural cells that can be artificially programmed through synthetic biology, in order to perform certain functionalities. While all these developments provide new opportunities, the miniature size of nanomachines also means they have limited functionalities. However, integrating computing, communication as well as networking capabilities between these nanomachines can further expand their functionalities and lead to novel applications. The future scientific and technological advances will lead to enabling technologies supporting the more reliable and robust design of nanomachines and their integration as functional components into networks and systems. The resulting improvements in our ability to transmit information to and from nanomachines, and implement control within themselves, will open new opportunities in the field of medicine, biotechnology, pharmaceuticals, industry, as well as the military. Therefore, the aim of ACM NANOCOM is to bring together researchers with diverse backgrounds including communication engineering and networking, computer science, molecular biology, information theory, physics, nanotechnology, as well as nanobioscience, in order to realize this vision.

We are very fortunate this year to have put together a great organizing committee who has worked tirelessly to ensure the success of the conference.

This year's conference will have three keynote speakers who are Rahul Sarpeshkar, Peng Yin, and Nader Engheta. Each of the keynote speakers are highly respected researchers in their area, and we believe their presentations will lead to interesting discussions. We thank all three for devoting their time to attend and present at the conference.

We would like to thank the General Vice-Chair Tommaso Melodia who has taken care of the logistics in setting up the conference in Boston, and has worked very closely with the General Chairs in the organization of the entire event. Our Technical Program Chairs Tadashi Nakano and Ilangko Balasingham and Technical Program Vice-Chairs Josep Miquel Jornet and Massimiliano Pierobon have done an excellent job in putting together a very exciting program. Developing a highly multi-disciplinary technical program is very challenging and in particular for a new area such as nano communication and computing. However, Tadashi, Ilangko, Josep, and Max have worked very closely with the technical program committee in order to solicit high quality papers that will be grouped into seven sessions. A new addition to this year's program is the "*Work in Progress*" session that allows researchers who are at the early stage to present their on-going work to the community. The high level of paper submissions could not have been possible without the help of the Publicity Chairs, Janne Lentomaki and Chun Tung Chou. Both Janne and Chun Tung have promoted the conference by reaching out to diverse communities through timely advertisements in mailing lists as well as contacting individual researchers. We also thank Ahmad Beirami and Albert Cabellos who served as the publication chair and worked closely with the authors and the representatives from the ACM in putting together the conference proceedings. The Sponsorship Chairs, Giacomo Morabito and Robert Schober have also done an excellent job

is attracting sponsorship funds from the EU CIRCLE (*Coordinating European Research on Molecular Communications*) project. The recently launched EU Future and Emerging Technology (FET) CIRCLE project is funded by the European Commission to support molecular communication researchers in develop new programs going forward into the future. We are also highly indebted to Mehmet Can Vuran who has served as the finance chair for the second year in a row, and has worked tirelessly to ensure the expenses are within limits of the conference budget. The logistics of this conference is very important, and we thank Kaushik Chowdhury for his active role as the local organizer. Lastly, we would like to thank the web chair Enrico Santiago for putting together a very nice and informative website.

We are very confident that the 2nd ACM NANOCOM conference will continue its success and will expand and develop into the future. With an exciting technical program, we are certain that the conference will be filled with stimulating discussions as well as exchanges of technical ideas and visions. We would like to thank Prof. Ian F. Akyildiz, the chair of the steering committee, for all his guidance and advice in helping us organize the conference. Finally, we would like to thank all the participants who have travelled from various parts of the world to attend the conference in order to make it a successful event.

Faramarz Fekri and Sasitharan Balasubramaniam
General Co-chairs, ACM NANOCOM 2015

Welcome from the Program Co-Chairs:

Welcome to Boston and to the second edition of the ACM International Conference on Nanoscale Computing and Communication (ACM NANOCOM), September 21-22, 2015. After the success of the first edition, in the second edition of this conference we are proud to host an even larger program that includes 28 regular papers and 6 work-in-progress papers, covering the broad areas of molecular and nano-electromagnetic technologies.

This second edition of the conference remains faithful to its mission of increasing the visibility of nanoscale computing and communication as fast-growing research areas within the wider research community, as well as being a international reference meeting point for researchers with diverse background who share a common interest in paradigms and technologies for the interconnection of nanoscale devices.

This year, the technical program includes novel contributions in nano-electromagnetic technologies - coding schemes, routing protocols, scalability analysis in nanomaterial-enabled wireless communications, nanosensor and microrobotics communications at the nanoscale, and network-on-chip architectures- and molecular communications in the areas of bacterial, molecular motor, and microfluidic communications, neuronal communications and processing, and biosensing at the nanoscale. All these contributions have high inter-disciplinary components, and their authors come from various fields of study such as electrical and electronic engineering, computer science, biology, chemistry, physics, mathematics, bioengineering, biotechnology, materials science and nanotechnology.

We would like to thank the members of the Program Committee who have taken their valuable time to volunteer and provide high quality reviews for the papers. We would also like to thank the General Co-Chairs (Faramarz Fekri, Sasitharan Balasubramaniam) and General Vice-Chair (Tommaso Melodia) for their guidance and support. We would also like to acknowledge the support from the other members of the organizing committee (Giacomo Morabito, Robert Schober, Ahmad Beirami, Albert Cabellos, Kaushik Chowdhury, Chun Tung Chou, Janne Lehtomäki and G. Enrico Santagati) whose tireless contribution made the second edition of the ACM NANOCOM a great success. A special thanks goes also to the Steering Committee, and in particular to Ian F. Akyildiz for his pioneering effort in creating this conference. Finally, our greatest thanks goes to the ACM for supporting a new edition of this exciting initiative!

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