The 6th International Workshop on Wireless Communications and Networking in Extreme Environments (WCNEE 2022)

Tuesday, 31 May, 2022 ● 11:30 – 17:30 PST ● Marina Del Rey, LA California

Wireless communications and networking in extreme environments such as underwater, underground, rural areas, intra-body, in flight and in space have been attracting growing interest from both academia and industry in an effort to conquer the last frontier for wireless technologies. In recent years, underwater wireless networks have attracted significant attention for military and commercial applications including oceanographic data collection, disaster prevention, tactical surveillance, offshore exploration, and pollution monitoring. Unmanned aerial systems that are autonomously networked can assist humans in extreme or difficult-to-reach environments as well as provide cost-effective wireless connectivity for devices without infrastructure coverage. Underground wireless networks could enable applications such as precision agriculture, pipeline fault diagnosis, mine disaster rescue, concealed border patrol, and crude oil exploration, among others. Wireless networked systems of intra-body sensors and actuators could play a key role on real-time monitoring and medical treatment of chronic diseases such as diabetes, as well as enable automated drug administration and targeted drug delivery. Satellite (mega-)constellations could improve communications and ongoing monitoring of Earth phenomena ranging from weather and climate to disaster management. Rural areas remain underserved by increasingly core societal applications.

Despite the obvious differences, underwater, aerial, underground, intra-body, rural and space wireless networks share common core research challenges that arise from the harsh nature of the propagation medium (fading, absorption, scattering, multipath) and the inaccessible nature of the environment. As a result, conventional communication and networking techniques do not “scale up” in extreme communication environments mainly due to the excessive propagation losses of traditional wireless technologies and the financial limitations of operating far from “grids”. The goal of the WCNEE workshop, now in its 6th edition, is to bring together academic researchers and industrial players to share their research findings and technical contributions, from the physical all the way to the application layer in realizing underwater, aerial, underground, intra-body, rural and space wireless communication networks with a focus on bridging the gaps between theory, algorithms, prototypes, testbeds, demonstration and production networks. WCNEE will also facilitate discussions about modeling and characterizing propagation and wireless network performance in such diverse environments based on real-world data measurements.

Steering Committee:
Stella N. Batalama (Florida Atlantic University, USA)
Tommaso Melodia (Northeastern University, USA)
Dimitris A. Pados (Florida Atlantic University, USA)
Panos P. Markopoulos (Rochester Institute of Technology, USA)

Workshop Organizers:
Sasitharan Balasubramaniam (University of Nebraska-Lincoln, USA)
Emrecan Demirors (Northeastern University, USA)
Zhangyu Guan (SUNY at Buffalo, USA)
George Sklivanitis (Florida Atlantic University, USA)

9:30 – 10:30
DCOSS'22 Keynote

10:30 – 11:00
Coffee Break

11:30
WCNEE'22 Opening Session
Chairs: Sasitharan Balasubramaniam, Emrecan Demirors, Zhangyu Guan

11:30 – 12:30
Keynote Session
Chair: Sasistharan Balasubramaniam
Professor Urbashi Mitra, Gordon S. Marshall Chair in Engineering, University of Southern California, USA

12:30 – 14:00
Lunch Break

14:00 – 15:40
Session 1
Chair: Emrecan Demirors

A Middleware for Digital Twin-Enabled Flying Network Simulations Using UBSim and UB-ANC
Sabarish Krishna Moorthy, Ankush Harindranath, Maxwell E. McManus, Zhangyu Guan, Nicholas Mastronarde (University at Buffalo, The State University of New York, USA) Elizabeth Serena Bentley, Michael Medley (U.S. Air Force Research Laboratory, USA),

Intelligent Routing Framework Based on D* Lite for Resilient Aerial Networks
Talip Tolga Sari, Gokhan Secinti (Istanbul Technical University, Turkey)

SynchroSim: An Integrated Co-Simulation Middleware for Heterogeneous Multi-Robot Systems
Emon Dey, Jumman Hossain, Nirmalya Roy, (University of Maryland Baltimore County, USA), Carl Busart (Army Research Laboratory, USA)

Digital Twin Driven Blockchain Based Reliable and Efficient 6G Edge Network
Mehmet Ozgen Ozdogan (Istanbul Technical University & Aselsan Inc., Turkey), Levent Carkacioglu (Aselsan Inc., Turkey), Berk Canberk (Istanbul Technical University, Turkey)

15:40 – 16:00
Coffee Break

16:00 – 17:15
Session 2
Chair: Zhangyu Guan

5G Space Communications Lab: Reaching New Heights
Oltjon Kodheli, Jorge Querol, Abdelrahman Astro, Sofia Coloma, Loveneesh Rana, Zhanna Bokal, Sumit Kumar, Carol Martinez Luna, Jan Thoemel, Juan Duncan, Miguel Olivares Mendez, Symeon Chatzinotas, Bjorn Ottersten (University of Luxembourg, Luxembourg)

Multi-Physics Analysis of Electromagnetic Wave Propagation and Photothermal Heating in Human Tissues at Terahertz and Optical Frequencies
Innem V.A.K. Reddy, (University at Buffalo & King Abdullah University of Science and Technology, USA), Josep Jornet (Northeastern University, USA)

RSS-Based Localization Using a Single Robot in Complex Environments
Hongzhi Guo, Irvin Quartey, Cameron Green (Norfolk State University, USA)

17:15 – 17:30
WCNEE'22 Closing Session & Awards
Chairs: Sasitharan Balasubramaniam, Emrecan Demirors, Zhangyu Guan