UNIVERSITÀ DI PISA

DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

Dottorato di Ricerca in Ingegneria dell'Informazione

Doctoral Course

"An overview of UHF RFID Technology: Past, Present and Future"

Dr. Pavel V. Nikitin

Impinj, Seattle, WA, USA

Short Abstract: UHF RFID (also known as RAIN RFID, by the name of the industry alliance) is a wireless connectivity technology based on passive modulated backscatter. It can deliver tagged item's identity, location, and authenticity and has several advantages compared to barcodes and to other wireless technologies. RFID technology has significantly progressed over the last two decades and now extends beyond pure identification, encompassing sensing, networking, security, and localization capabilities. RFID consumer and business applications now range from supply chain and retail to healthcare and automotive. A solid knowledge of how RFID systems work (protocols, readers, propagation channel, tags, etc.) and associated tradeoffs is important for understanding and optimizing RFID system performance. In this course, we will cover the fundamentals of RFID tags, readers and systems, including examples, experimental measurements, and simple models that can be used for system design and analysis. We will also cover the history of RFID, the present state of the technology, and will discuss the latest technical developments and future research challenges.

Course Contents in brief:

- Radio frequency Identification (RFID) Systems
- RFID applications
- RFID-based sensing and localization

Total # of hours of lecture: 16

References:

[1] K.V.S. Rao ; P.V. Nikitin ; S.F. Lam, "Antenna design for UHF RFID tags: a review and a practical application," *IEEE Transactions on Antennas and Propagation*, 2005, Cited by: Papers (669), Patents (36)

[2] K.V.S. Rao ; P.V. Nikitin ; K.V.S. Rao ; P.V. Nikitin, "Theory and measurement of backscattering from RFID tags," *IEEE Antennas and Propagation Magazine*, 2006, Cited by: Papers (244), Patents (4)

[3] P.V. Nikitin ; K.V.S. Rao ; S.F. Lam ; V. Pillai ; R. Martinez ; H. Heinrich, "Power reflection coefficient analysis for complex impedances in RFID tag design," *IEEE Transactions on Microwave Theory and Techniques*, 2005, Cited by: Papers (206), Patents (1)

[4] P. V. Nikitin ; R. Martinez ; S. Ramamurthy ; H. Leland ; G. Spiess ; K. V. S. Rao, "Phase based spatial identification of UHF RFID tags," *2010 IEEE International Conference on RFID* (IEEE RFID 2010), 2010, Cited by: Papers (166), Patents (4)

CV of the Teacher

Dr. Nikitin received the M.S. in Electrical and Computer Engineering (Summa Cum Laude) from the Utah State University in 1998, and the Ph.D. in Electrical and Computer Engineering, from the Carnegie Mellon University, in 2002. Since 2017, he is Senior Antenna Designer, at Impinj, Seattle, WA, USA. Dr. Nikitin is an Antenna and RF engineer, with 14 years of industrial experience and focus on innovation (35 US patents, 8 European patents) and developing cutting edge wireless technologies and products. Since 2010, he serves as Affiliate Associate Professor at the University of Washington, Electrical Engineering Department, Seattle, WA. He received the IEEE RFID Conference Best Paper Award in 2010 and 2017, and the AMTA Symposium Best Paper Award in 2005.

Room and Schedule

Room: *Aula Riunioni del Dipartimento di Ingegneria dell'Informazione, Via G. Caruso 16, Pisa – Ground Floor*

Schedule:

Day1 – 10 aprile 2019 ore 9:00

Day2 – TBD

Day3 – TBD

Nota: l'orario dettagliato verrà comunicato agli allievi durante il primo giorno di corso.