Konstantinos Tountas

Graduate Student - Research/Teaching Assistant
Telecommunications Division
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Education

- **Master of Science** (2-year program)
  School of Electronic and Computer Engineering, Technical University of Crete, Chania, Greece, est. Aug. 2016
  (Oct. 2014 - Present)

  Thesis: *"Algorithms and Network Architecture for Scatter Radio Networking and Localization."*

- **Engineering Diploma** (5-year program)
  School of Electronic and Computer Engineering, Technical University of Crete, Chania, Greece, Aug. 2014
  (Sep. 2009 - Oct. 2014)

  Thesis: *"Implementation of Frequency Division Multiple Access Digital Backscatter Sensor Network."*
  Brief Description: "Study of backscatter radio system and implementation of backscatter sensor network using frequency division multiple access (FDMA). Design of a low-cost, low-power semi-passive tags for dense backscatter sensor networks. Utilization of linear block codes for range extension of the backscatter link."
  Thesis Supervisor: Associate Prof. Aggelos Bletsas.
  GPA : 7.3/10.0.

Awards and Distinctions

- **Undergraduate Fellowship Award**, Office of Sponsored Research, awarded to the top 10% of class. Technical University of Crete, for the academic year 2009-2010.

- **Student Travel Grant Award**, EuCAP 2015, April 2015: K. Tountas, A.G. Dimitriou, A. Bletsas, J. N. Sahalos, "Mobility Increases Coverage of RFID Library Systems",*European Conference on Antennas and Propagation (EuCAP) 2015*, Lisbon, Portugal, Apr. 2015.

Research Interests

- Wireless Communication.

- Software-Defined Radio Wireless Networks.

- Estimation Theory.

- Backscatter Radio and RFID Systems.

- Wireless Sensor Networks for Environmental Applications.

- Embedded Systems.

- Channel and Source Coding.

Academic & Work Experience

1. Graduate Researcher, *Telecom Lab, ECE Department, Technical University of Crete*, Oct. 2014 – Present.

2. Graduate Researcher, *ERC-04-BLASE Research Project "Backscatter Networks for Large-Scale Environmental Sensing,"* executed in the context of the Education & Lifelong Learning Program of General Secretariat for Research & Technology (GSRT) of Greece, and funded through European Union-European Social Fund and national funds, Oct. 2014 – Oct. 2015.

3. Graduate Researcher, *Research Project "Intelligent Library Managements Systems Using Radio Frequency Identification,"* funded by , the Cyprus Research Promotion Foundation (RPF) and the Structural Funds of the European Union (EU), Nov. 2014 – Jan. 2015.

4. Teaching Assistant at the "Telecommunications Systems II" course, *School of E.C.E., Technical University of Crete*, Spring semester 2015.

5. Teaching Assistant at the "Analysis and Design (Synthesis) of Telecom Modules" course, *School of E.C.E., Technical University of Crete*, Spring semester 2010, Fall semester 2010, Fall semester 2011, Fall semester 2012 and Fall semester 2014.

6. Undergraduate Researcher, *ERC-04-BLASE Research Project "Backscatter Networks for Large-Scale Environmental Sensing,"* executed in the context of the Education & Lifelong Learning Program of General Secretariat for Research & Technology (GSRT) of Greece, and funded through European Union-European Social Fund and national funds, Dec. 2012 – Oct. 2014.

7. Undergraduate Researcher, *Telecom Lab, School of E.C.E., Technical University of Crete*, Jan. 2010 – Oct. 2014.

Journal Publications

1. E. Kampianakis, J. Kimionis, K. Tountas, C. Konstantopoulos, E. Koutroulis, A. Bletsas, "Wireless Environmental Sensor Networking with Analog Scatter Radio & Timer Principles", *IEEE Sensors Journal* (SENSORS), vol. 14, no. 10, pp. 3365 - 3376, Oct. 2014.

2. A. Bletsas, A. Vlachaki, E. Kampianakis, G. Sklivanitis, J. Kimionis, K. Tountas, M. Asteris and P. Markopoulos, "Building the low-cost digital garden as a telecom lab exercise," *IEEE Pervasive Computing*, vol.12, no.1, pp.48–57, Jan. 2013.

Conference Publications

1. K. Tountas, P. N. Alevizos and A. Bletsas, "Bistatic Architecture Provides Extended Coverage and System Reliability in Scatter Sensor Networks", *Fifth International Eurasip Workshop on RFID Technology*, Rosenheim, Germany, Oct. 2015.

2. K. Tountas, A.G. Dimitriou, A. Bletsas, J. N. Sahalos, "Mobility Increases Coverage of RFID Library Systems", *European Conference on Antennas and Propagation (EuCAP) 2015*, Lisbon, Portugal, Apr. 2015 (**Student Travel Grant Award**).

3. P. Alevizos, N. Fasarakis, K. Tountas, N. Agadakos, N. Kargas and A. Bletsas, "Channel Coding for Increased Range Bistatic Backscatter Radio: Experimental Results", *RFID Technology and Applications (RFID-TA 2014)*, Tampere, Finland, Sept. 2014.

4. E.Kampianakis, J. Kimionis, K. Tountas, A. Bletsas, "A Remotely Programmable Modular Testbed for Backscatter Sensor Network Research", *RealWSN*, Como, Italy, Sep. 2013.

5. E. Kampianakis, J. Kimionis, K. Tountas, C. Konstantopoulos, E. Koutroulis, and A. Bletsas, "Backscatter Sensor Network for Extended Ranges and Low Cost with Frequency Modulators: Application on Wireless Humidity Sensing", *IEEE International Conference on Sensors 2013*, Baltimore, MD, USA, Nov. 2013. **Received a "Best paper distinction" and invitation for publication to the IEEE Sensors Journal**.

6. A. Bletsas, A. Vlachaki, E. Kampianakis, G. Sklivanitis, J. Kimionis, K. Tountas, M. Asteris and P. Markopoulos, "Towards precision agriculture: Building a soil wetness multi-hop WSN from first principles," invited paper, in *Second International Workshop in Sensing Technologies in Agriculture, Forestry and Environment (ECOSENSE) 2011*, Belgrade, Serbia, Apr. 2011.

Technical Skills

- Embedded Systems: Real-time systems design and prototyping (Silabs C8051 MCUs and Wireless Radios, TI/Chipcon Embedded radios, TI MSP430 MCU, Gumstix and Raspberry Pi Linux-based computers), Software/Hardware co-design for FPGAs (Xilinx ISE/EDK, Altera MaxPlus II), Software Defined Radio (NI USRP + GNURadio).

- Programming Languages: C/C++, Python, Java, Android SDK, HTML, JavaScript, PHP, MySQL, Flex, Bison.

- Computer-Aided Design Tools: CadSoft Eagle, Magic VLSI, SPICE/PSPICE, Autodesk AutoCAD.

- Software Development Tools: Mathworks MATLAB, Microsoft Visual Studio, Eclipse IDE.

- Hardware Development Tools: VHDL language with Xilinx ISE, Embedded Systems prototyping with Xilinx EDK.

Selected coursework

- Detection and Estimation Theory, Machine Learning, Probabilistic Graphical Models & Inference
- Coding Theory, Analysis and Design of Telecom Modules, Wireless Communication, Convex Optimization

Selected Projects

- **Backscatter Radio and Sensing**: Implementation of backscatter radio, RF tags, and software-defined RFID reader.
  During my studies, I design and implement a **scatter** sensor network (i.e. transmission by means of signal reflection instead of active radiation). Working with an experimental setup consisting of a RF carrier emitter (battery aided MCU + active radio), a Software Defined Radio (SDR) receiver and 25 prototype semi-passive tags (battery aided MCU + RF transistor), I managed to encode and transmit real sensor data to the SDR receiver.
  Complete scatter sensor nodes were designed and build in-house, in Telecom Lab. The nodes consist of three separate printed circuit boards: a scatter communication board, a power-board and a sensor board. The scatter comm. board consists of a Silabs C8051F930 MCU, a RF Transistor, an oscillating crystal. Pinouts for sensors and MCU programming are also on-board. Moreover, the power-board consists of a voltage source selection circuit, choosing between a solar panel and a coin battery. For the sensing part, a board containing multiple sensors (illuminance, temperature, plant electrical potential, soil moisture and air humidity) was constructed. The sensed data are encoded with a linear block code and are transmitted by means of reflection to a SDR receiver.
  Processing of the received backscattered waveforms is done on a SDR platform using either USRP N200 or USRP E-100, on the hardware side (RF Front End & ADC) and C++ and Python for the signal processing, on the software side.

  Project Homepage: `http://users.isc.tuc.gr/~ktountas/projects.html`

- **Software Defined Radio & WSNs**: Experimentation on Software-Defined Radio (SDR) platforms to study various communication schemes. In particular, wireless sensor network nodes and SDR base stations. Various active radio modulation schemes of the iCubes (TI CC2500 transceiver) and Si1004 (Silabs Embedded Radio transceiver) are explored. The receivers consist of NI USRPs, on the hardware part and either C++ and Python or Matlab on the signal processing part.
  Recent work includes constructing multi-user non-coherent backscatter FSK receiver on USRP N200 and E-100, utilizing the GNU-Radio framework and C++ and Python.

  Project Homepage: `http://users.isc.tuc.gr/∼ktountas/projects.html`

- **Indoor Audio GPS**: The Indoor Audio GPS is a simple localization testbed using acoustic waves and the iCubes Wireless Sensor Network platform.
  The goal is to localize a moving vehicle indoors with low-cost communication hardware. The system consists of four parts: 4 ceiling (anchor) nodes, the vehicle to be localized, a coordinator node and a PC. The vehicle is a toy-car equipped with a microphone, an acoustic bandpass filter and a C8051f320 Development Kit, interfaced to a CC2500 radio module. Location is estimated with the use of convex optimization algorithms running on a PC. The provided testbed is designed with low-cost, custom audio ranging electronics, RF communication and easy-to-use, Matlab interface that allows quick experimentation with various localization algorithms.

  Project Homepage: `http://www.telecom.tuc.gr/∼aggelos/tel412_fall2011/`

- **The iCubes Project**: Development of low-cost, energy-efficient RF transceivers for Wireless Sensor Networks, called "The iCubes".
  The wireless nodes consist of a SiLabs C8051F320 MCU, a TI/Chipcon CC2500 radio module, along with a battery holder and sensor connectors, placed on a Printed Circuit Board (PCB) designed by our group and soldered in-house. Routing protocols, sensor software interfaces and other applications have been developed. A multi-hop WSN on ECE department's roof garden has been tested, to evaluate the performance of iCubes in environmental applications.
  The iCubes started as a term project of the "TEL404 Analysis & Design (Synthesis) of Telecom Modules" course during the Spring 2010 semester. Since then, the group has continued to develop node firmware and applications. Furthermore, a new, optimized version of iCubes is being prepared.
  Low-power custom humidity sensors have been also developed and interfaced to the iCubes. The iCube/humidity sensor pair was presented after invitation in Ecosense 2011, Belgrade on April.

  Project Homepage: `http://www.telecom.tuc.gr/∼aggelos/tel404_spring2010/`

Languages

- English   Excellent, University of Michigan, Certificate of Proficiency in English.
- German   Very Good, Goethe Institute Zertificat Certificate.
- Greek   Native Speaker.
- Norwegian   Learning.