Eleftherios Kampianakis

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EDUCATION

- **Diploma** (5-year program)
  Department of Electronics and Computer Engineering, Technical University of Crete, Chania, Greece, Oct. 2010.
  Diploma Thesis: "Custom Over The Air Programmable Embedded Radios."
  Thesis description : Creation of a wireless network using low power , 8 bit microcontrollers and low power sdr IC's that will be utilized as a telecomunications testbed and as an easy to use wireless sensor network.
  Supervisor : Assistant Prof. Aggelos Bletsas.
  GPA: 7.18/10.0.

- **Master of Science degree**
  Department of Electronics and Computer Engineering, Technical University of Crete, Chania, Greece Est. Mar. 2013.
  Master Thesis: "Scatter Radio Sensor Network with Analog Frequency Modulation Principles."
  Thesis description: Development of ultra low-cost, ultra low-power and scalable sensor network, operating with bi-static backscatter principles.
  Supervisor : Assistant Prof. Aggelos Bletsas.
  Exp. GPA: 10.0/10.0.

AWARDS AND DISTINCTIONS

- **Best diploma thesis award** on the IEEE VTS & AESS Joint Greece Chapter Final/Diploma Thesis Competition.
- Award and funding from the National Center Of Environment and Sustainable Development (NCESD) to the TUC solar car team, "Hephaestus".
- Honorary award from the Technical University of Crete for the work of the TUC solar car team, "Hephaestus".
- 2nd place in the pan-cretan olympic weightlifting championship, preliminary category.

Research Interests

- Design/Synthesis of telecommunication modules.

- Ubiquitous computing.

- RFID/Backscatter communication.

- Software defined radios (SDR).

- RF/Microwave Engineering.

- Embedded devices for bioengineering applications.

- Embedded programming, firmware and application development for WSN Nodes.

- Design and implementation of solar modules and panels.

Publications

Journals

1. E. Kampianakis, J. Kimionis, K. Tountas, G. Sklivanitis, J. Kimionis, K. Tountas, C. Konstantopoulos, E. Koutroulis and A. Bletsas, "Wireless Environmental Sensor Networking with Analog Scatter Radio & Timer Principles," Special Issue of the IEEE Sensors Journal, Accepted for publication, to appear in 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, 2012.

3. C. P. Providakis, E. V. Liarakos, and E. Kampianakis, "Non-destructive wireless monitoring of early-age concrete strength gain using an innovative electromechanical impedance sensing system", Hindawi Smart Materials Research Journal, 2013.

Conferences/Workshops

1. S. N. Daskalakis, S. D. Assimonis, E. Kampianakis, A. Bletsas. "Soil Moisture Wireless Sensing with Analog Scatter Radio, Low Power, Ultra-Low Cost and Extended Communication Ranges", IEEE Sensors 2014, Barcelona, Spain. (submitted)

2. S. D. Assimonis, E. Kampianakis, and A. Bletsas. "Microwave Analysis and Experimentation for Improved Backscatter Radio," IEEE EuCAP 2014.

3. E. Kampianakis, S. D. Assimonis, and A. Bletsas. "Network Demonstration of Low-cost and Ultra-low-power Environmental Sensing with Analog Backscatter," IEEE RWW-WiSNet 2014.

4. 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 SENSORS 2013.

5. E. Kampianakis, J. Kimionis, K. Tountas, and A. Bletsas. "A Remotely Programmable Modular Testbed

for Backscatter Sensor Network Research," REALWSN 2013.

6. C. Konstantopoulos, E. Kampianakis, E. Koutroulis, and A. Bletsas. "Wireless Sensor Node for Backscattering Electrical Signals Generated by Plants," IEEE SENSORS 2013.

7. 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," 2nd International Workshop in Sensing Technologies in Architecture, Forestry and Environment (ECOSENSE) 2011, Belgrade, Serbia, Apr. 2011.

Academic & Work Experience

- Research Assistant, Telecom Lab, Technical University of Crete, BLASE project (2012 – present).

- Research Assistant, Biochemical Engineering and Environmental Biotechnology (B.E.E.B) Lab, Technical University of Crete, Ulixes project (2012 – 2013).

- Research Assistant, Telecom Lab, Technical University of Crete, Noptilus project (2010 – 2011).

- Research Assistant, Drilling Engineering and Fluid Mechanics Lab, Technical University of Crete, Pithagoras II project (2010 – 2011).

- Research Assistant, Applied Mechanics Lab, Technical University of Crete, Thales project (2008 – 2009).

- Teaching Assistant in the Technical University of Crete for Classes:
    1. Telecommunication Systems II. (2012)
    2. Signals and Systems. (2011)
    3. Synthesis and Analysis of Telecom Modules. (2012)
    4. Synthesis and Analysis of Telecom Modules. (2011)

- Developer and Administrator of `www.beeb.enveng.tuc.gr`. (2012 – present)

- Administrator of `www.sedhk.gr`. (2009 – 2011)

- Teaching assistant for Microsoft Office Seminars. (2 seminar series – 2006, 2007)

- Tutoring classes in C, Java, Matlab, Fortran programming.

Technical Skills

- Embedded Systems: Real-time systems design and prototyping (Silabs C8051 MCUs, TI/Chipcon Embedded radios).
- Programming Languages/Software Development Tools: C/C++, Java,Python, UNIX shell scripting, MySQL, flex, bison, CORBA, Java RMI, IDL.
- Application Software: TEX (LATEX, BibTEX), Microsoft Office, OpenOffice, Apple iWork, Adobe CS5 Design Suite.
- Software Development Tools: Mathworks Matlab, Microsoft Visual Studio, Eclipse IDE, Apple Xcode.

- Computer Aided Manufacturing: EAGLE PCB design, AutoCAD.
- Design and fabrication of solar panels using composite materials.
- Operating Systems: Microsoft Windows, Apple Mac OS X, Linux.

Selected projects

- **Novel, Ultra Low Power, Low Cost, Scalable Backscatter Sensor Network for Measuring Relative Humidity (Ongoing MSc Thesis):** My master thesis regards the development of an ultra low-cost, ultra low-power and scalable sensor network, operating with bi-static backscatter principles. A wireless sensor tag that utilizes modulation via reflection has been developed. It achieves communication via the backscattering of a carrier emitted by an Silabs Si1000 radio in a tag-reader range of over 100m while consuming 0.5mW for transmission. The tag modulates relative environmental humidity (RH) with an 1.9%RH RMS error. Moreover, each tag implements a scalable frequency division multiple access scheme that allows development of large sensor networks. For the puposes of this work, we developed along with John Kimionis an over-the-air programmable backscatter testbed is developed that utilizes the bootloader developed for my diploma thesis. This project was developed for the purposes of the research project BLASE.

  Project Homepage: `www.blase.tuc.gr`

- **Design and implementation of an indoor audio localization system:** 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. This project was developed for the purposes of the research project NOPTILUS.

  Project Homepage: `http://www.telecom.tuc.gr/?aggelos/tel412fall2011/`

- **RF Link for the Municipal Water Supply Company of Chania:** Together with John Kimionis, we implemented a point-to-point RF link for the Municipal Water Supply Company of Chania. Water tank level data from a already-installed sensor had to be transmitted wirelessly to the Company's facilities, as there was no infrastructure for current-loop cables installation. The distance between the two nodes utilized was about 450 meters. One wireless node served as the transmitter, utilizing on-chip Analog to Digital Converter and simple circuitry to acquire sensor data. The information was transmitted to a second node, which output the sensor's measured value on a digital port. A custom Digital to Analog Converter was built, plus a Voltage Controlled Current Source, to achieve output of 4-20mA current values, in order to ensure compatibility with the Company's PLC units. Protocol-specific functions were implemented, such as alerts of broken link and/or sensor, in the form of 0mA output current. The nodes along with the respective circuitry were packaged in high quality waterproof IP65 boxes to prevent dust and water from affecting the electronics. It is noted that the project was designed using industrial standards and the link implemented functional until now.

- **Custom Over the Air Programmable Embedded Radios (Diploma Thesis):** During my diploma thesis, I developed hardware, middleware and software towards a custom and low-cost remotely programmable radio network testbed. Such testbed is envisioned as a tool for the telecom researcher to develop, deploy and debug radio network projects and applications. To the best of the my knowledge, this is the first attempt towards a radio network testbed, designed and built in a Greek university from first principles. Key features of the testbed include: simplicity of use, reliability and remote programmability. Furthermore, each carefully designed wireless transceiver node enables environmental sensing and personal computer interfacing at a relatively low cost (€30 bill of materials for each transceiver assuming relatively small quantities), due to in-house design and fabrication. The proposed testbed consists of various software and hardware components designed to facilitate experimental work for the telecom engineer/researcher.

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

- **Hephaestus Solar Car:** I am a founding member of the solar car team of the Technical University of Crete, namely Hephaestus. Until now we have managed to construct a fully functional ultra low power electric car and the cell on which the solar panels will be set up. Several novel ideas were used for this design. Amongst them, construction of semi-flexible solar panels with the use of ultra light materials such as kevlar fibers and non flexible - high efficiency solar cells.

  Project Homepage: `http://solarcar.tuc.gr`

- **Concrete monitoring using embedded devices:** The goal of this project was to create a low cost concrete monitoring system using piezoelectric sensors for research. The method of operation is by measuring the impedance of the sensors while oscillating them in a range of frequencies. I implemented the firmware for the Analog AD5933 firmware in order for the impedance measurements to be taken. Moreover, i implemented a java interface in order for those measurements to be transfered in a remote MySQL database which i also designed. The project was successfully tested under various conditions and it is in operation until now. This project was developed for the purposes of the research project THALES.

- **Hardware implementation of the algorithm for efficient computation of the binary vector that maximizes a Rank–Deficient quadratic form**
  We implemented a part of the algorithm for efficient computation of the binary vector that maximizes a Rank-Deficient quadratic designed by Assistant Professor George N. Karystinos on Field Programmable Gate Array hardware (FPGA). We managed to get an overall 100 speedup indicating that theoretical promises for real time modules implementing the algorithm are feasible.

- **Real time data acquisition for magneto-rheometer system** The goal of this project was to create a real time sensor data acquisition system. The system to be monitored is flexible and innovative magneto-rheometer has been designed and fabricated in the Drilling Engineering and Fluid Mechanics laboratory. It consists of a vertical pipe running across a magnetic field created by an electromagnet. The system is equipped with a coriolis flowmeters and three pressure transmitters. The flow is provided by a peristaltic pump. The pipes which carry the fluid are non-magnetic. The parameters which are monitored are flow rate, density, temperature, pressure, pressure drop and magnetic flux. For the analog to digital conversion of the monitored parameters, a data acquisiton card by National Instruments was utilized and a software script in Matlab was written in order to translate and present the data. This project was developed for the purposes of the research project PITHAGORAS II.

Selected coursework

- Embedded Systems.
  Instructor: I. Papaefstathiou, Grade: 8.0/10.0

- Analysis and Design (Synthesis) of Telecom Modules.
  Textbook: RF Microelectronics, by B. Razavi.
  Instructor: A. Bletsas, Grade: 10.0/10.0.

- Wireless Sensor Networks.
  Instructor: A. Deligiannakis, Grade: 10.0/10.0.

- Distributed Systems.
  Instructor: V. Samoladas, Grade: 10.0/10.0.

- Advanced Reconfigurable Architectures (FPGA).
  Instructor: A. Dollas, Grade: 9.5/10.0.

- Extremely Parallel Computer Architectures (CUDA).
  Instructor: I. Papaefstathiou, Grade: 10.0/10.0.

Languages

- English   Excellent, University of Michigan, Certificate of Proficiency in English.
- German   Good, Goethe Institute Zertifikat.
- Greek   Native Speaker.

Other Interests - Extra Curricular Activities

- Member of the TUC Solar Car Team – "Hephaestus".
- Member of the TUC Wireless Sensor Network "Digital Garden" Team.
- Member of "Kydon" Olympic Weightlifting Team.
- Powerlifting and Olympic Weightlifting.
- Pen and paper roleplaying games (e.g. DnD).

REFERENCES

- **Aggelos Bletsas** (Diploma/MSc Supervisor)
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- **Ioannis Papaefstathiou**
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