

P R A S A N N A B A L L A L

OBJECTIVE

A full time position in research relating to Wireless Communication Networks, Sensor Networks, Embedded Systems, Digital Signal Processing, Control System Design and Mobile and Pervasive Computing.

EDUCATION

August 05-Current University of Texas at Arlington, USA
PhD (Electrical Engineering) (*GPA 4.0 / 4.0*)

August 03-August 05 University of Texas at Arlington, USA
MS EE (Electrical Engineering) (*GPA 3.6 / 4.0*)
Thesis – “Structure and decision in mobile wireless sensor networks”

June 98-June 02 Bombay University (Mumbai), India
BE (Electronics and Telecommunication) (*GPA 4.0 / 4.0*)
Final Project – “Design and implementation of land based radio locators”

RELEVANT COURSES

Digital Signal Processing, Digital Image Processing, Neural Networks, Discrete Transforms, Intelligent Control Systems, Robotics, Control System Design, Fundamentals of Telecommunication Systems, Telecommunication Network Design, Computer Networks, Digital Communication, Statistical Signal Processing, Random Signal and Noise, Fuzzy Logic Systems, Nonlinear Adaptive Control, Microelectromechanical Systems (MEMS), Embedded Microcontrollers, DSP Microprocessors, Wireless Sensor Networks, Mobile Cellular Systems, VHDL.

PROFESSIONAL EXPERIENCE

Automation & Robotics Research Institute, Fort Worth, USA
Laboratory Manager / Research Associate

- Worked on NSF, National Instruments and ARO funded research to simulate and analyze performance of decision making algorithms.
- Wrote proposals for research based grants.
- Designing and developing algorithms and prototype vehicles for wide area surveillance and reconnaissance using mobile wireless sensor networks. Designing and developing protocols for energy efficient wireless sensor networks.

University of Texas at Arlington, Dept. of Electrical Engineering, USA
Teaching Associate

- Teaching Associate and Lab Instructor for electrical engineering capstone course – Control System Design.
- Taught classes and held Matlab and LabVIEW tutorial sessions.

University of Texas at Arlington, Dept. of Electrical Engineering, USA

Teaching Assistant

- Teaching Assistant for electrical engineering Graduate Level course – Statistical Pattern Recognition.

IndiaGames Pvt Ltd, Mumbai, India

Software Programmer

- Designing and developing PC based and Mobile phone based games. Programming involved Java and Macromedia Flash.

Retort Software Pvt Ltd, Mumbai, India

Software Programmer / Project Intern

- Designing and implementing land based radio tracking systems. Design and building directional antennas for tracking radio transmitters. Developing simulation tools in C++.

RESEARCH

In my years of research at Distributed Intelligence & Autonomy Laboratory (Automation and Robotics Research Institute, Fort Worth), I was involved in research on topics of secure task-planning and decision-making for mobile sensor networks. Extensive simulations and implementation for dynamic resource allocation and collaborative exploration, map building and security were done. I worked on development of novel approaches for deadlock avoidance and routing mechanisms for systems where multiple resources are available for the same task. Also, a new matrix formulation for decision-making in WSN using Dempster Shafer evidence theory was developed.

My research also focused on energy efficiency in wireless sensor networks. A new energy efficient protocol developed by us called UC-TDMA was successfully implemented for applications such as condition based maintenance in our testbed.

I was particularly involved in the following research grants:

Army Research Office: DAAD 19-02-1-0366; ARO W91NF-05-1-0314

National Science Foundation: IIS-0326505; CNS-0421282,

Singapore SERC TSRP grant 0421120028,

National Instruments Lead User grant,

Texas ARP grant 14-748779.

ACADEMIC PROJECTS

Digital Signal Processing - Projects dealing with basics of DSP such as Convolution, Filtering and Smoothing of digital data using Matlab & LabVIEW. Various projects for optimal estimation, Kalman filtering, FFT, Wiener filtering and statistical signal processing, Dempster-Shafer, Wavelets and Filter Banks, etc.

Digital Image Processing - Projects in Image Compression and Enhancement using Matlab's Image Processing Toolkit.

Intelligent Control Systems – Decision making systems, anti-windup controllers, servo control, path planning for non-holonomic mobile robots, Condition Based Monitoring of machines: involved in projects for fault detection, prognosis and diagnosis of fault

conditions of machines, Discrete Event Systems: Petri nets, finite state machines.

Control System Design – LabVIEW based Speed control of three DC motors using single analog output PCI 1200 DAC channel. Design of second order transfer function using RC and OpAMP model, controlling the output signal using PID controller. RC and OpAMP circuit simulated using Pspice.

Nonlinear Adaptive Control - Nonlinear adaptive control of robotic manipulators using nonlinear feedback linearization with neural networks, sliding control and backstepping.

Embedded Microcontrollers - PC based device control embedded system using DMX512 protocol. Microchip PIC 18F452 was used for the project.

Fuzzy Logic - Sensor fusion and Ad Hoc network routing decision using Fuzzy Logic controller.

Wireless Sensor Networks - Design and implementation of RSSI based grid localization of wireless sensors using LabVIEW and Crossbow Technologies Mica2 sensors.

DSP Microprocessors - Generation of Pulse Width Modulated Signals, Filtering Techniques and Waveform Generation using Texas Instruments TMS320F2812 Microprocessor.

LabVIEW toolkit for WSN - Toolkit developed in LabVIEW for programming, easy data access and processing of the Crossbow Technologies mica2 sensors.

SOFTWARE SKILLS

Environments: UNIX, MS Windows, TinyOS.

Electronics design: Cadence, Pspice.

Mathematics: MATLAB, Mathematica.

Data acquisition: LabVIEW, MATLAB, Dspace Control Desk, Quanser WinCon, National Instruments, ECP.

Robotics: CRS robots programming kits, PUMA.

Internet: HTML, PHP.

Programming languages: C, C++, NesC, Java, SQL (Oracle 8i), Macromedia Flash ActionScript, JavaScript, BASIC, Pascal, Assembly (Intel 8086 family, Intel 8085).

HARDWARE SKILLS

Basic Lab equipments: Oscilloscopes, Voltmeters, Function Generators, Analyzers, etc.

Data acquisition boards and interfacing: National Instruments, dSpace, Quanser, ECP.

Wireless Sensors: Crossbow Technologies (Mica, Mica2, Micaz, Cricket), Microstrain (V-Link, G-link, SG-Link)

Robots: CRS, PUMA, Cybermotion SR-2, Acroname Garcia, Lyxmotion Hexapod.

PUBLICATIONS

Submitted / Accepted Journals:

P. Ballal, A. Trivedi, V. Giordano, J. Mireles Jr., F. Lewis, "Matrix-based deadlock free dynamic resource assignment in multi-robot systems with multiple missions: Theory and implementation",

submitted to Journal of Intelligent and Robotic Systems, 2007

P. Ballal, F. Lewis, J. Mireles Jr., K. Sreenath, "Deadlock avoidance for free choice multi-reentrant flow lines: Critical siphons and critical subsystems", submitted to IEEE SMC part A, 2007

P. Dang, P. Ballal, F. Lewis, D. Popa, "Real Time Relative and Absolute Dynamic Localization of Air-Ground Wireless Sensor Networks," Submitted to the Journal of Intelligent and Robotic Systems, 2007

Das A.N., Popa D.O., Ballal P., Lewis F.L., "Data-logging and Supervisory Control in Wireless Sensor Networks", in ACIS Int'l Journal of Wireless and Mobile Computing, 2007, to appear

V. Giordano, P. Ballal, F.L. Lewis, B. Turchiano, J.B. Zhang, "Supervisory control of mobile sensor networks: math formulation, simulation, implementation," IEEE Transactions on Systems, Man and Cybernetics, Part B, Volume 36, Issue 4, Aug. 2006 Page(s):806 – 819

Tiwari, A., Ballal, P., and Lewis, F. L. 2007. Energy-efficient wireless sensor network design and implementation for condition-based maintenance, ACM Trans. Sens. Netw. 3, 1, Article 1 (March 2007), 23 pages. DOI = 10.1145/1210669.1210670

Peer Reviewed Conferences:

P. Ballal, F. Lewis, J. Mireles Jr., K. Sreenath, "Deadlock avoidance for free choice multi-reentrant flow lines: Critical siphons and critical subsystems", Proc. Mediterranean Conf. Control & Automation, Athens, Greece, June 2007

P. Ballal, V. Giordano, F. Lewis, "Deadlock free dynamic resource assignment in multi-robot systems with multiple missions: a matrix-based approach", Proc. Mediterranean Conf. Control & Automation, Ancona, Italy, June 2006

P. Ballal, V. Giordano, P. Dang, S. Gorthi, F. Lewis, "A LabView based test-bed with off-the-shelf components for research in mobile sensor networks," Proc. ISIC, Munich, Germany, October 2006

V. Giordano, F.L. Lewis, B. Turchiano, P. Ballal, V. Yeshala, "Matrix computational framework for discrete event control of wireless sensor networks with some mobile agents," Proc. Mediterranean Conf. Control & Automation, Limassol, Cyprus, June 2005. *This paper won an award at MED 05.*

Books and Book Chapters:

V. Giordano, F.L. Lewis, P. Ballal, and B. Turchiano, "Supervisory controller for task management and resource dispatching in mobile wireless sensor networks," in Cutting Edge Robotics, ed. V. Kordic, 2005.

POSTERS PRESENTATIONS

Prasanna Ballal, "Decision-Making in Mobile Wireless Sensor Networks (MWSN)," IEEE MetroCon 2005, Fort Worth, USA, Sep 2005.

Prasanna Ballal, Sankar Gorthi, Aditya Narayan, "Structure & Decision in Mobile Wireless Sensor Networks," ARRI Tech Fest, Fort Worth, USA, Sep 2005.

AWARDS RECEIVED

Recipient of STEM Doctorial Fellowship, University of Texas at Arlington, 2005.

Best Paper Award in the Mediterranean Conference on Control, Italy, 2005.

'Manager of the Month- April, August' by UTA Housing and Management in April 2004.

First Prize Winner in a technical paper presentation on "Fuzzy Logic" at Mumbai University, 2000.

9th in All India Robotics Competition 'Robust' held by IEEE and RAIT, India.

REFERENCES

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