

Saleh Tabandeh

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Canadian Citizen

HIGHLIGHTS OF QUALIFICATIONS AND ACHIEVEMENTS

- 6+ years academic and hands-on experience in Electrical, Mechanical, and Software development of Robotic systems from the conceptual design to prototype validation, including:
 - Robot modeling, and simulation
 - Controller development
 - Robot path planning and trajectory optimization
 - Embedded systems design and development
 - Power circuits design and analysis
 - Digital circuit design and analysis
 - PCB design
 - PLC programming
- In-depth knowledge of theory, implementation and application of optimization techniques, including Genetic Algorithms, direct search algorithms, hill-climbing methods, Hybrid Genetic Algorithm/local search methods
- Strong leadership, communication, and presentation skills; developed through cooperative research with industrial partners
- Proven problem solver, ability to think critically, and to work independently as well as within multi-disciplinary teams in high stress environments and under tight deadlines

EDUCATION

PhD, Mechanical and Mechatronics Engineering **2005 – 2009**

Supervised by Dr. Christopher Clark and Dr. William Melek, University of Waterloo, Canada

- **Thesis:** “Development of Task-Based Configuration Optimization Algorithms for Modular and Reconfigurable Robots, Using Multi-Solution Inverse Kinematic Solvers”

MASc. Electrical Engineering **2002**

Specialization: Electrical Machines and Power Electronics, University of Tehran, Iran

- **Thesis:** “Development of a Sensorless Position Control Method for Switched Reluctance Electric Motor Drives”

BASc. Electrical Engineering **1999**

University of Tehran, Iran

- **Thesis:** “Theory and Applications of Interphase Power Controllers”

EXPERIENCE

PROFESSIONAL EXPERIENCE

Electronics and Control Design Engineer: Sterner Automation Ltd. (part time) **2005 - 2007**

- Implemented and designed digital microcontroller-based control circuits for robotic applications
- Programmed and tested embedded control systems for robot control
- Designed Printed Circuit Boards (PCB)

Electrical Design Engineer: Iran Arvin and Consultants **2002 - 2004**

- Designed electrical, control, and instrumentation systems for manufacturing and refinery plants
- Managed project timeline and performed quantitative and qualitative analysis to estimate required resources and budget of project milestones

ACADEMIC EXPERIENCE

Research Assistant: University of Waterloo, Waterloo, Ontario, Canada

2005 – 2009

Robotic manipulator design and implementation

- Designed and integrated Modular and Reconfigurable Robotic systems (MRRs) from concept to actual prototype, including stages of part selection, control architecture design, hardware design, PCB design, and firmware development
- Implemented distributed independent joint control architecture for robotic manipulators
- Developed firmware for embedded systems with applications in control of robotic systems, on PIC18 family microcontrollers using HI-TECH PICC
- Modeled robotic manipulators dynamically and kinematically, using Simulink and Matlab
- Devised control algorithms for robotic systems
- Programmed Omron CPM1A PLCs, using Ladder diagrams

Algorithms

- Employed a wide range of optimization techniques for solving numerous engineering problems
- Applied optimization algorithms for automated kinematic design of manipulators, using a novel Genetic Algorithm/Gradient-based hybrid optimization method
- Developed fast “multi-solution” Inverse Kinematic solvers for generalized serial robotic manipulators, using Genetic Algorithms and Gradient-based optimization algorithms
- Proposed path planning and trajectory optimization methods by incorporating multiple solutions of the inverse kinematic problem

Academics

- Lectured classes and instructed labs as a teaching assistant for “Introduction to Microprocessors and Digital Logic”
- Supervised graduate and undergraduate students in control firmware development and robotic manipulator fabrication
- Reviewed articles as invited reviewer for several robotics Journals, including Robotica and Springer journal of computational optimization and applications

Research Assistant: University of Tehran, Iran

1999 – 2002

- Proposed and implemented sensorless motion control methods for switched reluctance motors
- Designed and simulated servo drives and control circuits for switched reluctance motors, using Matlab, Simulink and Protel

PERTINENT COURSEWORK

Robotics: Kinematics, Dynamics and control
Non-Linear Systems
Algorithm Design
General Theory of Electrical Machines
Digital Logic and Microprocessors
Fuzzy Systems

Multi-Variable Control Systems
Optimization Algorithms
Power Circuit Design and Analysis
Design of Electrical Machines
Artificial Intelligence
Design of Intelligent Systems

COMPUTER SKILLS

- Programming: C/C++ , .NET (C#), Python
- Research packages: Matlab, Simulink, MathCad, Maple
- Design Packages: Orcad, Protel, Altium DXP, AutoCAD
- Operating systems: UNIX, Linux, Windows
- Other: 3D studio Max

AWARDS

- Natural Sciences and Engineering Research Council - Industrial Post Graduate Scholarship (NSERC IPS), value of \$42,000, May 2004 – May 2006
- University of Waterloo Research Assistantship award, value of \$19,000/year, Sept 2006 – Aug 2009
- University of Waterloo Graduate Student Scholarship, value of \$1,000, total of 4 times, May 2004 – Dec 2008
- Best Session Presentation Award – 2006 IEEE Congress on Computational Intelligence, Vancouver, Canada
- Teaching Assistant Excellence Award, Spring 2000

PUBLICATIONS

- S. Tabandeh, W. Melek, and C. Clark. An Adaptive Niching Genetic Algorithm Approach for Generating Multiple Solutions of Serial Manipulator Kinematics with Applications to Modular Robots. *Cambridge University Press, Robotica*, doi: 10.1017/S0263574709005803.
- S. Tabandeh, C. Clark, and W. Melek. Obtaining Multiple Solutions of the Inverse Kinematics Problem for Serial Modular and Reconfigurable Robots. *Robotics and Autonomous Systems*, under review.
- S. Tabandeh, C. Clark, and W. Melek. A Memetic Algorithm Approach for Solving the Task-Based Configuration Optimization Problem. *Under preparation*.
- S. Tabandeh, C. Clark, and W. Melek. Task-based Configuration Optimization of Modular and Reconfigurable Robots using a Multi-solution Inverse Kinematics Solver. *in the 2nd International Conference on Changeable, Agile, Reconfigurable and Virtual Production (CARV2007), Toronto, Canada*, July 22-24, 2007.
- S. Tabandeh, W. Melek, and C. Clark. A Genetic Algorithm approach to solve for multiple solutions of Inverse Kinematics using adaptive niching and clustering. *Proceedings of the 2006 IEEE World Congress on Computational Intelligence*, July 16, pp.1815-1822.
- S. Tabandeh, and S. Farhangi. Hysteresis-Band Effect on the Performance of SR Motor and Inverter Using Distinct Switching Methods", *10th Iranian Conference on Electrical Engineering, ICEE2002, Tabriz, Iran*, May 2002.