

## CURRICULUM VITA

### S. Mostapha Kalami Heris

Control Engineering Department,  
School of Electrical Engineering,  
Khaje Nasir Toosi University of Technology

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### Education

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#### Ph. D. Candidate

*September 2008 – Present*

#### **Electrical Engineering** (Major option in Control Engineering)

Control Engineering Department, School of Electrical Engineering,  
Khaje Nasir Toosi University of Technology, Tehran, Iran

*Thesis: Evolutionary Filtering*

*Advisor:* Dr. Hamid Khalouzadeh

#### M. Sc.

*September 2006 – September 2008*

#### **Electrical Engineering** (Major option in Control Engineering)

Electrical Engineering Department,  
Ferdowsi University of Mashhad, Mashhad, Iran

*Thesis: Analysis of Reinforcement Learning in Markov Decision Processes as Discrete-Time Dynamics*

*Advisors:* Dr. Naser Pariz and Dr. Mohammad-Bagher Naghibi Sistani

#### B. Sc.

*September 2001 – September 2006*

#### **Electrical Engineering** (Major option in Control Engineering)

Control Engineering Department, School of Electrical Engineering,  
Tabriz University, Tabriz, Iran

*Thesis: Identification of Linear Time-Invariant systems using Nichols Chart data*

*Advisor:* Dr. Ghasem Alizadeh and Mr. Modjtaba Khalidji

#### High School Diploma

*September 1997 – June 2001*

#### **Mathematics and Physics**

Shahid Ghazi Tabatabayi High School, Tabriz, Iran

Ranked 1<sup>st</sup> among students of High School

Distinguished as Elite Student in Eastern Azerbaijan Province (September 2001)

### Research Interests

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#### Control Engineering

- Intelligent Control Systems
- Multivariable Control Systems
- Robust Control
- Control of Mechanical Systems
- Stochastic Optimal Control
- Fractional Order Systems
- Control of Natural Systems

#### Artificial Intelligence

- Evolutionary Algorithms
- Swarm Intelligence
- Reinforcement Learning
- Fuzzy and Neural Systems

#### Mathematics

- Fractional Calculus
- Mathematics of Continuity

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## Honors and Awards

1 <sup>st</sup> Rank of <b>Khwarizmi Festival</b> <i>November 2000</i>	Award of 2 <sup>nd</sup> <i>Khwarizmi Festival of Iranian Youth</i> , Tehran, Iran in <b>Mathematics Branch</b> At the age of 17 Innovating <b>Structural Mathematics</b> , a complete study of extension of some mathematical concepts, e.g. periodic functions, Fourier series and integrals, Laplace transform, polynomial-based calculus and multi-valued numbers
2 <sup>nd</sup> Rank of Iran and 1 <sup>st</sup> of Eastern Azerbaijan <b>Khwarizmi Festival</b> <i>November 1999</i>	Award of 1 <sup>st</sup> <i>Khwarizmi Festival of Iranian Youth</i> , Tehran, Iran in <b>Mathematics Branch</b> At the age of 16 Innovating <b>Complete Numbers</b> , an extension of complex numbers set to 3-dimensional numbers set, namely Complete Numbers Set
<b>Elite Student</b> of Eastern Azerbaijan <i>September 2001</i>	Distinguished as Elite Student among all students of Eastern Azerbaijan Province

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## Publications and Submissions

Journal Papers	<ul style="list-style-type: none"> <li>• <b>S. Mostapha Kalami</b>, Naser Pariz and Mohammad-Bagher Naghibi Sistani, "Analysis of Reinforcement Learning and optimal policy properties in Grid-world problems: A Discrete-time Control Approach," in <i>Journal of Control</i>, Vol. 3, No. 1, 2009.</li> </ul>
Book Chapters	<ul style="list-style-type: none"> <li>• <b>S. Mostapha Kalami</b>, Mohammad-bagher Naghibi Sistani and Naser Pariz, "Using Control Theory for Analysis of Reinforcement Learning and Optimal Policy Properties in Grid-world Problems," in: D. S. Huang et al. (Eds.), <i>Emerging Intelligent Computing Technology and Applications with Aspects of Artificial Intelligence</i>, Springer, 2009.</li> </ul>
Conference Papers	<ul style="list-style-type: none"> <li>• <b>S. Mostapha Kalami</b>, S. Moosa Ayati and Hamid Khaloozadeh, "Optimal Pattern for treatment and control the AIDS using Genetic Algorithm," in <i>Proceedings of 3<sup>rd</sup> Joint Congress on Fuzzy and Intelligent Systems</i>, 2009.</li> <li>• <b>S. Mostapha Kalami</b>, S. Moosa Ayati and Hamid Khaloozadeh, "Optimal Control of the AIDS using Binary Genetic Algorithm," in <i>Proceedings of 6<sup>th</sup> National Congress on Biotechnology of Iran</i>, 2009.</li> <li>• <b>S. Mostapha Kalami Heris</b>, "H<sub>∞</sub> Control of Active Suspension using Particle Swarm Optimization," in <i>Proceedings of 2<sup>nd</sup> Annual International Conference on Automotive Electronics Industry</i>, 2009.</li> <li>• Masoumeh Atashpaz Gargari and <b>S. Mostapha Kalami</b>, "Approximation of the Electronegativity of Periodic Table Elements using Particle Swarm Optimization," in <i>Proceedings of 12<sup>th</sup> Iranian Students Conference on Electrical Engineering</i>, 2009.</li> <li>• <b>S. Mostapha Kalami</b> and Naser Pariz, "Effect of Learning Coefficients and Population Size on Particle Swarm Optimization," in <i>Proceedings of 3<sup>rd</sup> International Conference on Information and Knowledge Technology</i>, October 2007.</li> <li>• <b>S. Mostapha Kalami</b>, "Modeling of Linear Time-Invariant Systems using Continuous Genetic Algorithm," in <i>Proceedings of 9<sup>th</sup> Iranian Students Conference on Electrical Engineering</i>, September 2006.</li> </ul>

## Conference Papers (continued)

- **S. Mostapha Kalami Heris** and Mohammad-Bagher Naghibi Sistani, "Study of relation between lifetime of controller and optimal decision making in MABP using Reinforcement Learning," in *Proceedings of 2<sup>nd</sup> Joint Conferences on Fuzzy and Intelligent Systems*, 2008.
- **S. Mostapha Kalami** and Hamid Khaloozadeh, "Optimization of the AIDS Treatment and Representing a Novel Combined Dynamic Model of the Infection," accepted in *2<sup>nd</sup> Congress on Applications of Mathematics and Control Theory in Medicine*, 2009.
- **S. Mostapha Kalami** and Hamid Khaloozadeh, "Analysis of Gambling Problem using methods of Reinforcement Learning and Discrete-Time Dynamical systems," accepted in *15<sup>th</sup> Computer Conference of Computer Society of Iran*, 2010.
- **S. Mostapha Kalami** and Hamid Khaloozadeh, "Analysis of the Optimal Treatment Methods of AIDS using Non-Dominated Sorting Genetic Algorithm II (NSGA-II)," accepted in *International Conference of Control, Instrumentation and Automation*, 2010.
- Majid Moavenian, **S. Mostapha Kalami** and Amin Saghafi, "Active isolation of accurate instruments using Particle Swarm Optimization," in *Proceedings of 2<sup>nd</sup> Joint Conferences on Fuzzy and Intelligent Systems*, 2008.
- **S. Mostapha Kalami**, Naser Pariz and Mohammad-Bagher Naghibi Sistani, "Analysis of Reinforcement Learning in Markov Decision Processes as Digital Control Systems," in *Proceedings of 2<sup>nd</sup> Joint Conferences on Fuzzy and Intelligent Systems*, 2008.
- **S. Mostapha Kalami**, Hamid Khaloozadeh, "Multi-Objective Optimal Treatment Strategies of AIDS Based on a New Model of Infection Dynamic using NSGA-II," submitted to *IEEE Multi-Conference on Systems and Control*, Japan, 2010.
- Reza Shahnazi, **S. Mostapha Kalami**, and Hamid Khaloozadeh, "Smooth Optimal Control for a Class of Switched Systems Based on Fuzzy Theory and Particle Swarm Optimization," submitted to *IEEE Multi-Conference on Systems and Control*, Japan, 2010.

## In Preparation Papers

- Alexey Stakhov and **S. Mostapha Kalami**, "Matrix Cryptography: Theory and Applications," will be submitted to Springer *Journal of Cryptography*.
- **S. Mostapha Kalami**, "A novel method for computing matrix real powers," will be submitted to a Mathematics journal.

## Other Publications

- **S. Mostapha Kalami Heris**, "*Analysis of Reinforcement Learning in Markov Decision Processes as Discrete-Time Dynamics*," as M. Sc. Thesis.  
*For the first time, a theorem is stated and proved about Reinforcement Learning in Grid-world problems within this thesis.*
- **S. Mostapha Kalami Heris**, "*Swarm Intelligence*," as Seminar Course.  
*A full review of Swarm Intelligence algorithms and methods, with a preface about optimization theory and methods is included.*

## Accomplished and Current Projects

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## Particle Swarm Estimator (PSE)

PSE is a new method to estimate the state variables of a stochastic system. This method enhances well-known Kalman Filter and uses benefits of Particle Swarm Optimization method. As well as linear systems, this method can be used to estimate states of non-linear systems.

## Raindrop Optimization Algorithm

This is an optimization algorithm inspired by motion and behavior of raindrops. The simulations show the efficiency of this algorithm in various optimization problems.

Matrix Cryptography	This is a novel cryptographic method and successfully implemented and applied to digital sound signals and digital images. The relevant journal paper is being prepared in cooperation of Prof. Alexey Stakhov.
$\beta$ Transform	This is a new integral transformation, which uses polynomial functions as Kernel. This is one of the results, which the study of fractional calculus yielded, and relates several fields of Mathematics, ranging from Analysis to Number Theory.
Complete Numbers	In this project, which was submitted to <i>Khwarizmi Festival</i> and won award, the extension of Complex numbers to Complete numbers is discussed.
LOR Identity	LOR ( <b>L</b> ogarithm of <b>R</b> oots) identity is an equation which relates the Nichols chart points to logarithm value of poles and zeros of LTI system. This can be used to identify LTI systems and can be applied to loop shaping problems.
Dist-PSO	A new modification of the PSO Algorithm which works with statistical distributions and lies in the group of EDAs.

## Presentations and Teaching Experience

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Presentations	<ul style="list-style-type: none"> <li>• <b>Seminar on Reinforcement Learning</b>, is held as a part of Periodic Seminars of Control Department, at Control Engineering Department, Faculty of Electrical and Computer Engineering, Khaje Nasir Toosi University of Technology, Tehran, Iran, April 2009.</li> <li>• <b>Workshop on Neural Networks and Medical Applications</b>, is held at Neuro-science Research Center, Medical Science University of Tabriz, Tabriz, Iran, January 2010.</li> <li>• <b>Workshop on Fuzzy Systems and Medical Applications</b>, will be held at Neuro-science Research Center, Medical Science University of Tabriz, Tabriz, Iran, 2010.</li> <li>• <b>Workshop on Evolutionary Computation and Medical Applications</b>, will be held at Neuro-science Research Center, Medical Science University of Tabriz, Tabriz, Iran, 2010.</li> </ul>
Teaching Experience	<ul style="list-style-type: none"> <li>• <b>Discrete-Time Control Systems</b>, as Teacher Assistant, under supervision of Dr. Hamid Khaloozadeh, Spring 2009.</li> <li>• <b>Stochastic Control Systems</b>, as Teacher Assistant, under supervision of Dr. Hamid Khaloozadeh, Spring 2009.</li> <li>• As Director of <b>WikiMatlab</b> (<a href="http://www.wikimatlab.net">http://www.wikimatlab.net</a>) <ul style="list-style-type: none"> <li>○ <b>Computational Intelligence</b> including: <ul style="list-style-type: none"> <li>▪ Artificial Neural Networks</li> <li>▪ Fuzzy Systems</li> <li>▪ Neuro-Fuzzy Systems</li> <li>▪ Evolutionary Computation <ul style="list-style-type: none"> <li>✓ Genetic Algorithms (GA)</li> <li>✓ Evolution Strategies (ES)</li> <li>✓ Genetic Programming (GP)</li> <li>✓ Cultural Algorithms (CA)</li> <li>✓ Artificial Immune Systems (AIS)</li> </ul> </li> <li>▪ Swarm Intelligence <ul style="list-style-type: none"> <li>✓ Particle Swarm Optimization (PSO)</li> <li>✓ Ant Colony Optimization (ACO)</li> </ul> </li> </ul> </li> <li>○ <b>Control Engineering Topics</b> including: <ul style="list-style-type: none"> <li>▪ Linear Control Systems</li> <li>▪ Optimal Control Systems</li> <li>▪ Nonlinear Control Systems</li> <li>▪ Robust Control Systems</li> <li>▪ Stochastic Control Systems</li> <li>▪ Estimation and Filtering Theory</li> </ul> </li> </ul> </li> </ul>

- System Identification and Modeling Techniques
- Multivariable Control Systems
- **Applications of Computational Intelligence Methods** including:
  - Industrial Engineering and Operations Research
  - Optimal Engineering Design
  - Time Series Prediction
- **Statistical Data Analysis and Classification Methods** including:
  - Principal Component Analysis (PCA)
  - Fisher Discriminant Analysis (FDA)
  - Partial Least Squares (PLS)
  - K-Means and its variants
  - Fuzzy Clustering and Artificial Neural Networks
- **Programming Languages and Software Tools**
  - C# Programming (Beginner to Advanced)
  - MATLAB Programming (Beginner to Advanced)
  - Visual Basic .Net Programming (Beginner to Advanced)

## Membership

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National Institute of Elites    Since: September, 2007  
Identifier: 3714

## Language

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- English: *Fluent*
- Farsi: *Perfect*
- Azeri: *Mother Tongue*
- Turkish: *Perfect*

## Skills and Abilities

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### Programming

- Professional programming using *C#* (pronounced C-Sharp), *Visual Basic 6*, *Visual Basic .NET*, *C++* and *MATLAB*
- Fully skilled with *Object-Oriented Programming (OOP)* techniques
- Professional *Microsoft Windows* system programming
- Professional and General-Purpose application development
- Programming hardware related applications to drive and operate several physical devices
- Programming Database related applications
- *ActiveX* programming and *Custom Controller* development
- Standard *Setup* and *Deployment* programming
- Graphical Simulator Design

### Use of Computer

- Professional Operator of *Windows* operation system
- Professional use of
  - *Microsoft Office*, including *Word*, *Excel*, *Visio* and *PowerPoint*
  - *Adobe Photoshop* and *Adobe Illustrator* (Graphics Software)
  - *Adobe Audition* (Digital Sound Processing Studio)
  - *MATHEMATICA* (Advanced Mathematics Software)
  - Programming Integrated Development Environments (IDE) including *Microsoft Visual Studio* and *MATLAB*
- Network Management
- System Security Administration

### Others

- Music Composing
- Writing Poems in *Farsi (Persian)* and *Azeri*