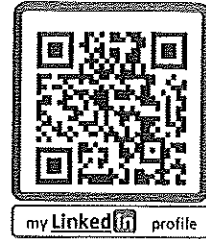# Navid Negahbani

Profile

Main Positions/Companies
- ✓ R&D Manager, QC, Design and Project Manager/ Rancati Srl.
- ✓ PhD Researcher/ Politecnico di Milano.
- ✓ Lecturer/ Azad University, Daneshpajoohan University, Ragheb University.
- ✓ Chairman, Supervisor for control and robotics group/ Control Saneat Sepanta Company.

Key competences
- ✓ Expertizes: Study, Design, Analysis, Programming.
- ✓ Methodologies: Dynamic and vibration analysis, Multi-body dynamics, Mechanical systems modelling, Control systems, Model identification, Linear and nonlinear control, Optimization, Technical drawing and standards, Mechanics of robotic manipulators, Error estimation.
- ✓ Tools: Matlab, Simulink, SimMechanics, Adams, SolidWorks, Python, Fortran, Arduino IDE, R, LabVIEW, Ansys, Microsoft Office, LATEX, MicroPython.

Education

Jan. 2012- Mar. 2015 — **Ph.D. in Mechanical Engineering (Dynamics and vibration analysis in mechanical system and vehicle) (in English)**
Politecnico di Milano, Milan (Italy)
- Thesis title: "Design of a 6-DoF floating motion simulator for hardware-in-the-loop wind tunnel tests on nautical components."

Sep. 2006- Nov. 2008 — **M.Sc. in Mechanical Engineering (Applied Design)**
- Azad University-khomeinishahr Branch, Esfahan, (Iran)
- Final Thesis: "Dynamics and control analysis of snake-like robot and path planning"

Sep. 1998- Feb. 2003 — **B.Sc. in Mechanical Engineering (Heat & Fluids)**
- Azad University-khomeinishahr Branch, Esfahan (Iran)

Professional Experience – 13 Years of experience

R&D, Design and Project Manager, and QC |Nov. 2015 – present (5 years)

Rancati Srl

Project description/Main tasks
- ✓ Scheduling the time tables for the projects, monitoring and management of the project teams, cost estimating and developing the budget, ensuring customer satisfaction, managing reports and necessary documentation
- ✓ Developing concepts, products and solutions; Research, design and evaluating materials, assemblies, processes and equipment; Improve the products and design the new products; Design the fully automatic production line.

Main results
- ✓ Decreasing the delay.
- ✓ Increasing the benefits.

Tools/Technical environment
- ✓ Solidworks, Microsoft Word, Excel, Access, Fenice (SQL Program), Python, Matlab, Arduino IDE, MicroPython.

PhD Researcher | Jan. 2012- Mar. 2015 (3 years)

Politecnico di Milano

Design of a 6-DoF floating motion simulator for hardware-in-the-loop wind tunnel tests on

nautical components

Project description/Main tasks
In PhD thesis has been addressed project of a parallel kinematic machine that emulates the action of the sea: the architecture of the machine has been chosen according to the specifications provided by the wind tunnel; kinetostatic optimization was

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performed with genetic algorithms in MATLAB environment; the dimensioning of the motor-reducer was conducted downstream of a dynamic simulation of the motion in large in Simulink, whereas the operating conditions more severe; ADAMS MSc software was used for vibration analysis in small movement.

In this thesis, ball-screw drive and belt drive actuators are considered and a 6 Degrees of Freedom (DoF) parallel robot with prismatic actuated joints is used as application case. A mathematical model of the ball-screw drive and belt drive are proposed considering the most influencing nonlinearities: sliding-dependent flexibility, backlash, and friction. Using this model, the most critical poses of the robot with respect to the kinematic mapping of the error from the joint- to the task-space, are systematically investigated to obtain the workspace positional and rotational resolution, apart from control issues. The error sensitivity analysis will do with respect to the most influencing nonlinearities parameters. Finally, a nonlinear adaptive robust control algorithm for trajectory tracking is described and simulated.

Main results

- ✓ The methodology used for the preliminary design of a machine for simulating the sea wave behaviour by using the hardware-in-the-loop in wind tunnel.
- ✓ Optimal geometrical parameters of robots were found considering kinetostatic performance index.
- ✓ Actuators were analysed for dynamic problems with considering nonlinear parameters.
- ✓ Robot control through the required task with proposed adaptive-robust control method.

Tools/Technical environment

- ✓ Matlab, (mfile, Simulink, Simmechanics)
- ✓ ADAMS MSc
- ✓ Microsoft word, LATEX.

Chairman and supervisor of control and robotics group |Jan. 2009 – Jan. 2012 (3 years)

Control Saneat Sepanta Company
Fields: Robotics, Mechatronics and Automation

Project description/Main tasks

- ✓ Consultant in automation and robotics.
- ✓ Teaching the robotics and engineering software such as Matlab and Ansys.
- ✓ Mechanical design for robots, control design for automation systems, vibration and dynamics analysis for automation systems.

Tools/Technical environment

- ✓ Matlab, Simulink, Ansys.

Research assistant | Mar. 2007– Dec. 2008 (1 year)

Azad University Khomeinishahr Branch
Design and Fabrication of Snake Like Robot

Project description/Main tasks

- ✓ Dynamic analysis of a 20 DoF system (snake-like robot).
- ✓ The friction force was considered as the Coulomb model and the contacting surface was based on the rectangle shape.
- ✓ Path planning and control analysis of robot by optimum energy.
- ✓ Design and fabrication of the robot.

Main results

- ✓ The robot could travel well through the prescribed curvilinear and linear paths. In addition, the robot was navigated from a point outside toward the desired paths.
- ✓ Fabricating the robot.

Tools/Technical environment

Matlab, genetic algorithm, pattern search method, Lagrange method, optimal PID controller.

Research assistant | Feb. 2009– Feb. 2010 (1 year)

Azad University Khomeinishahr Branch
Tandem cold rolling mill optimization

Project description/Main tasks

- ✓ Best inter-stand tension stress and exit thickness for achieving optimal energy in each roller motor.

Main results

- ✓ Presenting a methodology for the problem of determining the settings in tandem cold rolling mill.

✓ Finding the optimal thickness with the aim of reduction in power consumption.

<u>Tools/Technical environment</u>

Matlab, genetic algorithm, pattern search method, rolling engineering.

Lecturer| Set. 2007– Jan. 2012 (5 years)

Azad University Khomeinishahr Branch, Esfahan (Iran)

Azad University Majlesi Branch, Esfahan (Iran)

Daneshpajoohan Institute, Esfahan (Iran)

Ragheb Esfahani Institute, Esfahan (Iran)

<u>Courses taught at these Universities:</u>
✓ Dynamics, Automatic Control, Robotics, Mechanical Vibrations, Dynamics of Machinery, Strength of Material, Statics, Computer Programming, Vibration & Dynamics of Machinery Laboratory, Strength of Material Laboratory, Fluid Dynamics Laboratory, Heat Transfer Laboratory, Maintenance.

<u>Courses level:</u>
✓ BSc students in mechanical engineering.

Languages	• English: Fluent • German and French: Willing to improve • Italian: Limited Fluency • Persian: Native
Personal skills	• Result oriented; quality oriented; Tactful and articulate; Problem solving; Team leader; Planning strategically; Able to identify critical issues; Good team player, Good teacher, Ability to work under pressure, Perseverance and motivation, Confidence.

Publications

Navid Negahbani, Hermes Giberti, and Enrico Fiore, *"Error Analysis and Adaptive-Robust Control of a 6-DoF Parallel Robot with Ball-Screw Drive Actuators,"* Journal of Robotics, vol. 2016, Article ID 4938562, 15 pages, 2016. doi:10.1155/2016/4938562

Negahbani N., Giberti H., Ferrari D. (2016) *A Belt-Driven 6-DoF Parallel Kinematic Machine.* In: Kerschen G. (eds) Nonlinear Dynamics, Volume 1. Conference Proceedings of the Society for Experimental Mechanics Series. Springer, Cham

F. Aghadavoodi, N. Negahbani, *"Tandem Cold Rolling Mill Optimization Coupled with Inter-Stand Tension Stress and Exit Thickness by Using Genetic Algorithm"*. Journal of Solid Mechanical Engineering, Vol. 3, No.2, p.p: 61-72, 2011 Iran.

Mechanics book, F. Aghadavoodi, S. Lenjan Nejad, H. Taimori, N. Negahbani. Daneshpajoohan and Arkan-e- danesh publishers, Esfahan, Fall 2010, ISBN: 978-600-5672-28-2

M.Ghayour, N. Negahbani, " *Motion Analysis of a Snake-Like Robot on Horizontal Surface: by Considering the Coulomb Elliptical Friction Modeling and Utilizing the Path of Serpenoid Curve"*, Mechanics & Aerospace Journal, Iran. ISSN: 5707-1609,.2010

M.Ghayour, N. Negahbani, A. Nakhaei, " *Design and Fabrication a Snake Like Robot with Lateral Motion and Test this Motion"*, ICME 2010, Noshirvani Technology University, Babol, Iran, March 2010

M.Ghayour, N. Negahbani, A. Nakhaei, " *Controlling of Wheel-Less Snake-Like Robot: By Considering the Coulomb Elliptical Friction Model and Utilizing the Path of Serpenoid Curve"*, IEEE ISIE 2009 - IEEE International Symposium on Industrial Electronics, July 2009, Seoul, South Korea

M.Ghayour, N. Negahbani, A. Nakhaei, " *Controlling of Wheel-Less Snake-Like Robot by Considering the Coulomb Elliptical Friction Model* ", ISME 2009, Tehran University, Iran, May 2009.

M.Ghayour, N. Negahbani, A. Nakhaei, *"Dynamics and Control Analysis and Fabrication of Snake Like Robot"*, ICME 2009, Birjand University, Iran, March 2009

N. Negahbani, M. Ghayour, *"Dynamics Analysis and Path Control of a Snake Like Robot"*, Majlesi Journal of Mechanical Engineering, Vol. 2, No.2, p.p: 61-72, February 2009, Iran.

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