Vincent CHALVET

Design and Control of (μ)-Mechatronic Systems

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Born: 9$^{\text{th}}$ August, 1984 (35 years old)
Nationality: French
Status: married, 2 child

Research Interest

Mechatronic systems design and control, microsystems, robotics, compliant structures, trajectory planing, machine learning.

Current position

PostDoctoral fellow in U2IS unit of ENSTA-Paris, supervised by David Filliat.
Decision making for autonomous vehicles using Deep reinforcement learning.

Education and diploma

2013	Ph.D. Diploma in *Automatic Control* from University of Franche-Comté, Besançon, FRANCE. Defended on 8$^{\text{th}}$ March, 2013.
2009	Master diploma from University of Franche-Comté in *Mechatronics and Microsystems*.
2008	Engineer diploma in *Mechatronics* from ENSMM (National Engineering Institute in Mechanics and Microtechnologies), Besançon, FRANCE.
2005 - 2008	Student at ENSMM.
2002 - 2005	Student at Lycée Victor Hugo, Caen, FRANCE. *Classe Préparatoire aux Grandes Écoles*: intensive preparation for the national competitive entrance examination to french engineering schools.

Professional Experience

February 2019 - today
>PostDoc at ENSTA Paris. *Analysys of deep reinforcement learning performances for autonomous vehicles decision making.*

October 2018 - February 2019
>Self-employed legal status : Consultant in design and control of complex mechatronic systems.

December 2017 - August 2018
>PostDoc at Ecole Nationale d'Ingénieurs de Saint-Étienne. *design of a new tool for early defect detection in leather process using image processing.*

May 2015 - August 2017
>PostDoc position in SUTD (Singapore University of Technology and Design). *Design optimization of variable stiffness actuator for lower limb prosthetics.*

March 2014 - April 2015
>PostDoc position in AS2M dpt. of FEMTO-ST Institute. *Microfabricated multi-degree-of-freedom actuated and sensorized platform for nanoscale characterisation.*

March 2013 - February 2014
>PostDoc position in AS2M dpt. of FEMTO-ST Institute. *Modeling and control of a Scanning Thermal Microscopy (SThM) nanoprobe.*

October 2009 - March 2013

> Ph.D Student position in microrobotics at FEMTO-ST Institute. *Design, Fabrication and Control of a planar, non-redundant MEMS digital microrobot.*
> Under the supervision of Philippe Lutz and Yassine Haddab.

November 2008 - May 2009

> *7 month* - Master position at FEMTO-ST Institute. *Robotic Calibration of a Micromanipulation station using a microspectrometer.*

February 2008 - July 2008

> *6 month* - Graduation project in Sato Laboratory of TDU (Tokyo Denki University), JAPAN. *"Vibration reduction of experimental model of pantograph support system using an impact damper".*

September 2006 - February 2007

> *5 month* - Training course at ABB in Paris. *I introduced the SolidWorks CAD software in the mechanical research consultancy.*

Scientific Production

International journal	8 (TRO 2013, JMM 2015, PhysicaB 2015, JMR 2015)
International conference	3 (ICRA 2011, AIM 2014, ICRA 2017)
Book chapters	3 (Springer 2012, Hermes science 2013, Wiley & Son 2013)
Patent	1 (2011, international extension in 2012)

Teaching Experience

Teaching assistant in first and second year at ENSMM (**190h**)
- Automatic control (practical work, Bac+3)
- Advanced Automatic Control (practical work, Bac+4)
- Introduction to microcontroler for automatic control (practical work, Bac+4)

Teaching assistant in 4th year at ENISE (**78h éq TD**)
- Introduction to automatic control process (Magistral course, Bac+4)
- Linear control (practical work, Bac+3,Bac+4)

Teaching assistant in 4th year at Telecom Paris (**13.5h**)
- Artificial Intelligence : Advanced machine learning (TP, Bac+5)

Area of Expertise

Technical Skills
Cleanroom microfabrication process
- silicon process (photolithography, metal sputtering, dry etching)
- PZT process (photolithography, metal sputtering, bonding, dry etching)

Language
English	fluent
Japanese	average skills
Chinese	beginner
French	native language

Computer skills

Simulation	Octave/Matlab-Simulink, Scilab, Ansys, Mathematica, Maple
Programming	C/C++, Python, Java
CAD	SolidWorks, Catia, LayoutEditor
Other	LaTeX, GNU/Linux, UNIX shell scripts, Blender, Arduino, Raspberry Pi, ROS

Participation to scientific life

Conferences/Journals reviewing (ICRA,AIM,Micromachines,RCIM,BioRob)

Scientific event: *La nuit des chercheurs 2011*, scientific popularization on microrobotics.

radio interview / my thesis in 180s.

Design of web-site for MicroControl 2012 workshop .

Participating in organization of internatinal conference AIM2014 (Besançon).

Coordination of the automatic control part of Nanoheat project.

Award

2nd place (ex æquo) GDR-robotique PhD Thesis award (2013).

Publications

Journal Paper

[J1] - D.J. Braun, **V. Chalvet**, T.-H. Chong, S.S. Apte and N. Hogan, "Variable Stiffness Spring Actuators for Low Energy Cost Human Augmentation" - *IEEE Transactions on Robotics (TRO)*, Vol. 35, No. 6, pp. 1435-1449, 2019.

[J2] - D.J. Braun, **V. Chalvet**, and A. Dahiya, "Positive-Negative Stiffness Actuators" - *IEEE Transactions on Robotics (TRO)*, Vol. 35, No. 1, pp. 162-173, 2018.

[J3] - **V. Chalvet** and D.J. Braun, "Algorithmic design of low power variable-stiffness mechanisms" - *IEEE Transactions on Robotics (TRO)*, Vol. 33, No. 6, pp. 1508-1515, 2017.

[J4] - **V. Chalvet** et D.J. Braun, "Criterion for the design of low power variable stiffness mechanisms" - *IEEE Transactions on Robotics (TRO)*, Vol. 33, No. 4, pp. 1002-1010, 2017.

[J5] - **V. Chalvet**, Y. Haddab and P. Lutz, "Trajectory planning for micromanipulation with a non redundant digital microrobot: shortest path algorithm optimization with a hypercube graph representation" - *ASME Journal of Mechanisms and Robotics*, Vol. 8, No. 2, pp. 021013, 2016.

[J6] - **V. Chalvet**, D. Habineza, M. Rakotondrabe and C. Clévy, "Presentation and characterization of novel thick-film {PZT} microactuators" - *Physica B: Condensed Matter*, 2015.

[J7] - A. Bienaimé, **V. Chalvet**, C. Clévy, L. Gauthier-Manuel, T. Baron and M. Rakotondrabe, "Static / dynamic trade-off performance of PZT thick film micro-actuators" - *Journal of Micromechanics and Microengineering (JMM)*, Vol. 25, No. 7, pp. 075017, 2015.

[J8] - **V. Chalvet**, Y. Haddab and P. Lutz, "A microfabricated planar digital microrobot for precise positioning based on bistable modules" - *IEEE Transactions on Robotics (T-RO)*, Vol. 29, No. 3, pp. 641-649, 2013.

Conference Paper

[C1] - T.-H. Chong, **V. Chalvet** and D.J. Braun, "Analytical conditions for the design of variable sitffness mechanisms.", *in IEEE International Conference on Robotics and Automation (ICRA)*, Singapore, May 2017.

[C2] - H. Hussein, **V. Chalvet**, Y. Haddab, P. Lutz, P. Le Moal and G. Bourbon, "Design optimization of bistable modules electrothermally actuated for digital microrobotics.", *IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, Besançon, FR, July 2014, pp. 1273-1278.

[C3] - **V. Chalvet**, A. Zarzycki, Y. Haddab and P. Lutz, "Digital microrobotics based on bistable modules: design of a non-redundant digital micropositioning robot", *in IEEE International Conference on Robotics and Automation (ICRA)*, Shanghai, ZH, May 2011, pp. 3628-3633.

Book Chapters

[BC1] - Y. Haddab, **V. Chalvet** and M. Rakotondrabe, "Approches de commande en boucle ouverte pour les micro-manipulateurs flexibles à base de matériaux actifs" in "Robotique Flexible" - Edited by Mathieu Grossard, Nicolas Chaillet and Stéphane Régnier, Hermes Science, ISBN 9782746245099, June 2013.

[BC2] - Y. Haddab, **V. Chalvet** and M. Rakotondrabe "Open-Loop Control Approaches to Compliant Micromanipulators", "in Flexible Robotics" (eds M. Grossard, N. Chaillet and S. Régnier) - John Wiley & Sons, Inc., Hoboken, NJ USA. doi: 10.1002/9781118572016.ch4, August 2013.

[BC3] - Y. Haddab, **V. Chalvet**, Q. Chen and P. Lutz, "Digital Microrobotics using MEMS technology" in "Advanced Mechatronics and MEMS Devices", Springer, ISBN 978-1-4419-9984-9, August 2012.

Patent

[P1] - **V. Chalvet**, Y. Haddab, A. Zarzycki and P. Lutz, "Microrobot, and associated control method, simulation method, and computer programs", WO/2012/104546 - Filing Date: January 2012.