Andrea Brugnoli

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Academic Positions

University of Twente **Enschede**
Post-Doctoral researcher *November 2020-November 2022*
Numerical methods for coupled port-Hamiltonian fluid-structure dynamics
ERC Advanced grant. Principal investigator: Stefano Stramigioli

Education

ISAE-Supaero **Toulouse**
PhD in Automatic Control *2017-2020*
A port-Hamiltonian formulation of flexible structures: modelling and symplectic finite element discretization.
Supervisors: Daniel Alazard, Valérie Pommier-Budinger and Denis Matignon.

Université Paris Saclay/ Supélec **Paris/Toulouse**
Research Master in automatics and image processing *2016–2017*
Courses: inverse problem, advanced dynamics of flexible structures, parameter estimation.

ISAE-Supaero **Toulouse**
Double degree in aerospace and astronautical engineering *2015–2017*
Specialisation in applied mathematics and advanced automatics: multidisciplinary optimisation, high performance computing, control of flexible structures.

Politecnico di Milano **Milan**
Master in space engineering, 110/110 cum laude *2014–2017*
Courses: orbital mechanics, structural dynamics and control, thermochemical propulsion.

Politecnico di Milano **Milan**
Mechanical Engineering Degree, 110/110 cum laude *2011–2014*
Courses: finite element method, mechanical vibrations, numerical methods for engineering.

Experiences

Institut CIFAR **Toronto, Canada**
Summer school in Artificial Intelligence and Reinforcement Learning *July 2021*

ITA-Instituto Tecnológico de Aeronáutica **São José dos Campos**
Visiting researcher *January 2019, 4 months*
Collaboration with Flavio Cardoso-Riberio on numerical methods for port-Hamiltonian systems.

CNES-Centre national des études spatiales **Toulouse**
Internship *2017, 6 months*
Analysis of dismissed satellites subjected to solar pressure to identify stable and periodic pointing configurations.

Politecnico di Milano in partnership with Danieli S.p.A **Milan**
Bachelor project *2014, 3 months*
Dynamics of a forging manipulator. Project selected for the final presentation at Danieli.

Languages

English: fluent

French: fluent

Spanish: intermediate

Portuguese: intermediate

Italian: native speaker

Computer skills

Softwares and platforms: Simulink, Abaqus, Inventor, Solid Works, Labview

Languages: Python (especially FEM librairies: FEniCS and Firedrake), Matlab, Java, C, LaTeX

OS: Linux environment (Fedora, Ubuntu)

Awards

Fondation ISAE-SUPAERO
PHD Thesis Award *2021*

Politecnico di Milano
Partial tuition fee waiver for academic merit. *2011-2016*

References

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Publications

International journal articles

[1] A. Brugnoli, D. Alazard, V. Pommier-Budinger, and D. Matignon. Port-Hamiltonian formulation and symplectic discretization of plate models. Part I: Mindlin model for thick plates. *Applied Mathematical Modelling*, 75:940 – 960, Nov 2019. https://doi.org/10.1016/j.apm.2019.04.035.

[2] A. Brugnoli, D. Alazard, V. Pommier-Budinger, and D. Matignon. Port-Hamiltonian formulation and symplectic discretization of plate models. Part II: Kirchhoff model for thin plates. *Applied Mathematical Modelling*, 75:961 – 981, Nov 2019. https://doi.org/10.1016/j.apm.2019.04.036.

[3] A. Brugnoli, D. Alazard, V. Pommier-Budinger, and D. Matignon. Port-Hamiltonian flexible multibody dynamics. *Multibody System Dynamics*, 51(3):343–375, Mar 2021. https://doi.org/10.1007/s11044-020-09758-6.

[4] A. Brugnoli, D. Alazard, V. Pommier-Budinger, and D. Matignon. A port-Hamiltonian formulation of linear thermoelasticity and its mixed finite element discretization. *Journal of Thermal Stresses*, 44(6):643–661, May 2021. https://doi.org/10.1080/01495739.2021.1917322.

[5] A. Brugnoli, G. Haine, A. Serhani, and X. Vasseur. Numerical approximation of port-Hamiltonian systems for hyperbolic or parabolic PDEs with boundary control. *Journal of Applied Mathematics and Physics*, 9:1278–1321, 2021. https://doi.org/10.4236/jamp.2021.96088.

[6] F. Califano, R. Rashad, A. Dijkshoorn, L. Groot Koerkamp, R. Sneep, A. Brugnoli, and S. Stramigioli. Decoding and realising flapping flight with port-Hamiltonian system theory. *Annual Reviews in Control*, 51:37–46, 2021. https://doi.org/10.1016/j.arcontrol.2021.03.009.

[7] A. Brugnoli, R. Rashad, and S. Stramigioli. Dual field structure-preserving discretization of port-Hamiltonian systems using finite element exterior calculus. *arXiv preprint arXiv:2202.04390*, 2022. To appear in Journal of Computational Physics.

International conferences with proceedings

[8] A. Brugnoli, D. Alazard, V. Pommier-Budinger, and D. Matignon. Partitioned finite element method for the Mindlin plate as a port-Hamiltonian system. In *3rd IFAC Workshop on Control of Systems Governed by Partial Differential Equations CPDE 2019*, pages 88 – 95, Oaxaca, MX, 2019.

[9] A. Brugnoli, D. Alazard, V. Pommier-Budinger, and D. Matignon. Interconnection of the Kirchhoff plate within the port-Hamiltonian framework. In *2019 IEEE 58th Conference on Decision and Control (CDC)*, pages 6857–6862, 2019.

[10] F. L. Cardoso-Ribeiro, A. Brugnoli, D. Matignon, and L. Lefèvre. Port-Hamiltonian modeling, discretization and feedback control of a circular water tank. In *2019 IEEE 58th Conference on Decision and Control (CDC)*, pages 6881–6886, 2019.

[11] A. Brugnoli, F. L. Cardoso-Ribeiro, G. Haine, and P. Kotyczka. Partitioned finite element method for structured discretization with mixed boundary conditions. *IFAC-PapersOnLine*, 53(2):7557–7562, 2020. 21st IFAC World Congress.

[12] A. Brugnoli, D. Alazard, V. Pommier-Budinger, and D. Matignon. Structure-preserving discretization of port-Hamiltonian plate models. *IFAC-PapersOnLine*, 54(9):359–364, 2021. 24th International Symposium on Mathematical Theory of Networks and Systems MTNS 2020.

[13] A. Brugnoli, R. Rashad, F. Califano, S. Stramigioli, and D. Matignon. Mixed finite elements for port-Hamiltonian models of von Kármán beams. *IFAC-PapersOnLine*, 54(19):186–191, 2021. 7th IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control LHMNC 2021.

[14] K. Cherifi and A. Brugnoli. Application of data-driven realizations to port-Hamiltonian flexible structures. *IFAC-PapersOnLine*, 54(19):180–185, 2021. 7th IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control LHMNC 2021.

[15] R. Rashad, F. Califano, A. Brugnoli, F. P. Schuller, and S. Stramigioli. Exterior and vector calculus views of incompressible Navier-Stokes port-Hamiltonian models. *IFAC-PapersOnLine*, 54(19):173–179, 2021. 7th IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control LHMNC 2021.

International conferences without proceedings

[16] A. Brugnoli, D. Matignon, G. Haine, and A. Serhani. Numerics for physics-based PDEs with boundary control: the partitioned finite element method for port-Hamiltonian systems. In *SIAM Conference on Computational Science and Engineering (CSE21)*, Virtual conference, 2021.