Elisa Capello is Full Professor of Flight Mechanics at Politecnico di Torino, Department of Mechanical and Aerospace Engineering. She is research associate at the Istituto di Elettronica e di Ingegneria dell'Informazione e delle Telecomunicazioni (IEIIT) of the Italian National Research Council (CNR), in the Systems Modeling and Control group (http://www.sct.ieiit.cnr.it) since 2012. She is a member of The Institute of Electrical and Electronics Engineers, Member (IEEE), Control Systems Society since 2014. She is a member of the IEEE Technical Committee in Aerospace Control since 2016. She has the national qualification as Full Professor (Professore di Prima Fascia) since 2022.

Author of more than 100 papers published in international journals and conferences of the following sectors: aerospace engineering, control, automation and robotics. She is involved in research activities in the following fields: design of guidance, control and navigation systems for aircraft and spacecraft, control of wind turbine and wind farm, flight mechanics of fixed and rotary wing aircraft, testing of unmanned aerial systems, planning and mission control for autonomous systems. As part of her research activities, she collaborates with academic institutions, research centers, networks and companies, both in Italy and abroad. Elisa Capello was an International FAI Judge for Helicopter Championship from 2009 to 2015.

Scopus h-index is 15 with 618 citations, Google Scholar h-index 17 with 927 citations (October 2023).

MAIN INSTITUTIONAL RESPONSIBILITIES

Since 2016 Member of the council of Degree in Mechanical, Aerospace and Industrial Production Engineering, POLITO, Italy

Since 2016 Member of PIC4SeR - PoliTO Interdepartmental Centre for Service Robotics, Italy

Since 2017 Member of the council of the Ph.D Course in Aerospace Engineering, POLITO, Italy

MAIN TEACHING ACTIVITY

- Dynamics and Control of spacecraft (course leader, 2019; Master degree level)

- Flight Modeling and Simulation (since 2016; course leader 2021; Master degree level)

- Advanced flight dynamics: modelling and simulation (since 2019; course leader 2021, PhD course)

- Space telecommunications, GNC and avionics (since 2017; course leader 2018, Postgraduate Master level)

-Introduction to Flight Mechanics (since 2016; Bachelor degree level)

-Helicopter Flight Mechanics (since 2016; Master degree level)

MAIN PROJECTS

She is the scientific local coordinator of the following projects:

-PRIN 2017, Young line: Cooperation and REliable Autonomous TEchnologies to Foster Operations Relying on Unmanned Aircraft Systems (CREATEFORUAS),

-Clean Sky Green Regional Aircraft (Airgreen 2), Horizon 2020, Low Noise Configuration (LNC) domain, “Control System Design for Gust Load Alleviation”.

-"Guidance, Navigation and Control algorithms for In-Orbit servicing (TUG)", commercial contract, Thales Alenia Space

-“Assessment and preliminary prototyping of a drag free control system for the L3 gravity wave observatory” (unit coordinator, European Space Agency Project contract, in collaboration with Thales Alenia Space)

- “Drone Navigation Algorithms for advanced Integrated pest management (IPM)”, commercial contract, EURAC Research Center, Center of Sensing Solutions

- “Design of control systems and of modeling systems for LISA and NGGM space missions” commercial contract, Thales Alenia Space

PARTECIPATION TO EDITORIAL BOARD / TECHNICAL COMMITTEE

Journals: Associate Editor of IEEE Transaction on Control System Technology, since Nov2022; Managing Editor (Books), Engineering, Industry, Transportation, De Gruyter Open, 2012-2014; Editorial Assistant, Automatica, 2014-2017.

Conferences: Special Sessions and Tutorial/Workshop Chair for the International Conference on Unmanned Aircraft Systems, 2018-2021. Tutorial/Workshop Chair for 30th Mediterranean Conference on Control and Automation, MED 2022. Associate Editor and member of the International Program Committee for the International Conference on Unmanned Aircraft Systems, since 2015. Associate Editor for the IEEE CCTA since 2020. Associate Editor for EUCA-CEB (European Control Conference), since 2020.

Technical Committee: Member of IEEE Technical Committee in Aerospace Control since 2016.

Reviewer for the following journals: Acta Astronautica, Advances in Space Science, Automatica, Journal of Intelligent & Robotic Systems, IET Control Theory & Applications, Proceedings of the Institution of Mechanical Engineers, Journal of Aerospace Engineering, Journal of Guidance, Control and Dynamics, IEEE Transactions on Aerospace and Electronic Systems, IEEE Transactions on Automation, Journal of Electrical Power, Journal of Adaptive Signal, Journal of Aerospace Information, Journal of Franklin Institute, Journal of Systems and Control Engineering, Aerospace, Sensors, Chinese Journal of Aeronautics, Nonlinear Dynamics.

RESEARCH INTERESTS

Elisa Capello’s research mainly focuses on the following topics:

1. Modeling of dynamic, linear and non-linear systems. Modeling of dynamic systems includes models of unmanned aircraft and transport flexible aircraft.

2. Development of control laws for unmanned aircraft, transport aircraft and orbital maneuvers. Different control laws are designed and implemented starting from classical controllers, adaptive (L1 type) control laws, randomized type for uncertain systems and non-linear variable structure (sliding mode controller).

3. Development of orbital simulators with six degrees of freedom for rendezvous and docking maneuvers of two satellites.

Regarding the study and development of methods for the identification of nonlinear models, the research has been carried out at Naval Postgraduate School (NPS) - Monterey. For the development and implementation of control laws, the research was performed in collaboration with the University of Illinois - Urbana Champaign and at the Institute of Electronics and Information and Telecommunications Engineering

(IEIIT) of the CNR, Turin. She started a collaboration with Osaka University, School of Engineering, and with Graduate School of Information Science and Technology, since 2015.

Elisa Capello studied methodologies for modeling and identifying the dynamic characteristics of the considered aircraft. Non-linear mathematical models were implemented for three types of aircraft: (i) multi-rotor unmanned aircrafts, (ii) non-pilot fixed-wing aircraft and (iii) transport aircraft.

SELECTED PUBBLICATIONS

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https://doi.org/10.3390/app13106026 "Leader-Follower Formation of Second-Order Agents via Delayed Relative Displacement Feedback", Fausto Francesco Lizzio, Elisa Capello, Yasumasa Fujisaki. IEEE CONTROL SYSTEMS LETTERS, ISSN: 2475-1456, doi: 10.1109/LCSYS.2023.3285901, 2023.

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"Assessment of Quadrotor PID Control Algorithms using six-Degrees of Freedom CFD simulations", Ruiz, Manuel Carreno, Bloise, Nicoletta, Capello, Elisa, D'Ambrosio, Domenic, Guglieri, Giorgio, 2022 IEEE 61st Conference on Decision and Control (CDC), p. 3098-3103, IEEE, ISBN: 978-1-6654-6761-2, doi: 10.1109/CDC51059.2022.9992477, 2023.

"Nonlinear UGV Identification Methods via the Gaussian Process Regression Model for Control System Design", Enza Incoronata Trombetta, Davide Carminati, Elisa Capello, APPLIED SCIENCES, vol. 12, ISSN: 2076-3417, doi: 10.3390/app122211769, 2022.

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"Flexible Spacecraft Model and Robust Control Techniques for Attitude Maneuvers", Morga, Pierangela, Mancini, Mauro, Capello, Elisa, American Control Conference (ACC), p. 1120-1126, Atlanta (USA), doi: 10.23919/ACC53348.2022.9867280, 2022.

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"Implementation and Performance Evaluation of a Consensus Protocol for Multi-UAV Formation with Communication Delay", Lizzio Fausto Francesco, Capello Elisa, Guglieri Giorgio, 2022 International Conference on Unmanned Aircraft Systems (ICUAS). p. 1592-1600, IEEE, Dubrovnik, Croatia, June 21-24, doi: 10.1109/ICUAS54217.2022.9836201, 2022.

"Experimental evaluation of Wall Effect for small UAVs in Climate-Controlled Environments", David Du Mutel de Pierrepont Franzetti I., Capello E., Vilardi A., Parin R., 2022 IEEE 9th International Workshop on Metrology for AeroSpace, MetroAeroSpace 2022 - Proceedings, 2022, pp. 119–123, 2022.

"Nonlinear Observer and MPC-based algorithms for rendezvous maneuver with tumbling target", Faliero,Fabio, Morga,Pierangela, Capello,Elisa, Proceedings of the 73rd International Astronautical Congress., IAF, Paris, France, 18-22 September, 2022.

"Unscented Kalman filter and control on TSE(3) with application to spacecraft dynamics", G. Mangiacapra, M. Wittal, **E. Capello**, M. Nazari, NONLINEAR DYNAMICS, https://doi.org/10.1007/s11071-022-07293-x, 2022.

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"Design and validation of an MPC controller for CMG-based testbed." , M. Facchino, A. Totsuka, **E. Capello**, S. Satoh, G. Guglieri, K. Yamada, OPTIMIZATION AND ENGINEERING, ISSN: 1389-4420, doi: 10.1007/s11081-021-09633-z, 2021.

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"Fault tolerant control based on continuous twisting algorithms of a 3-DoF helicopter prototype", U. Perez-Ventura, L. Fridman, **E. Capello**, E. Punta, CONTROL ENGINEERING PRACTICE, pagine 1-14, ISSN: 0967-0661, 2020.

"Precise Attitude Control Techniques: Performance Analysis from Classical to Variable Structure Control", **E. Capello**, M. Dentis, Advances in Spacecraft Attitude Control, ISBN: 978-1-78984-803-8, 2020.

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“Robust Model Predictive Control for Automated Rendezvous Maneuvers in Near-Earth and Moon Proximity”, M. Mammarella, **E. Capello**, G. Guglieri, 2018 AIAA Space, Orlando, USA, September 17-19, 2018.

“Minimax Optimization of Fatigue Loads in a Wind Farm and Its Realization via Sliding Mode Controller of Wind Turbines”, **E. Capello**, T. Wada, E. Punta, Y. Fujisaki, 2nd IEEE Conference on Control Technology and Applications, Copenhagen, Denmark, August 21-24, 2018.

“Artificial Potential Field and Sliding Mode Strategies for Rendezvous Maneuver and Obstacle Avoidance”, N. Bloise, **E. Capello**, E. Punta, 2018 SICE International Symposium on Control Systems, Tokyo, Japan, March 9-11, 2018.

“Wind Turbine Sliding Mode Control and Wind Farm Energy Optimization with Fatigue Constraints”, **E. Capello**, T. Wada, E. Punta, Y. Fujisaki, SICE International Symposium on Control Systems 2018, Tokyo, Japan, March 9-11, 2018.

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"Design and validation of an L1 adaptive controller for Mini-UAV autopilot", E. Capello, G. Guglieri, F. Quagliotti, D. Sartori, JOURNAL OF INTELLIGENT AND ROBOTIC SYSTEMS: THEORY AND APPLICATIONS, Springer, vol. 69 (1-4), pp. 109-118, 2013, 10.1007/s10846-012-9717-2.

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"Preliminary Assessment of Flying and Handling Qualities for mini-UAVs", **E. Capello**, G. Guglieri, P. Marguerettaz, F. Quagliotti, JOURNAL OF INTELLIGENT & ROBOTIC SYSTEMS, Springer, vol. 65 n. 1-4, pp. 43-61. - ISSN 0921-0296, 2012, https://doi.org/10.1007/s10846-011-9565-5.

"Robust assessment for the design of multi-loop proportional integrative derivative autopilot", **E. Capello**, D. Sartori, G. Guglieri, F. Quagliotti, IET CONTROL THEORY & APPLICATIONS, The Institution of Engineering and Technology, vol. 6 n. 11, pp. 1-10. - ISSN 1751-8644, 2012, 10.1049/iet-cta.2011.0275.

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"A simulation-based approach for control design of uncertain UAVs", **E. Capello**, R. Tempo, 51st Annual Conference on Decision and Control (CDC), Maui, USA, December 10-13, 2012, pp. 3086-3091, 10.1109/CDC.2012.6426895.