

CURRICULUM VITAE

Mirko Leomanni

Personal information

Education

- November 2011 - February 2015: PhD in Information Engineering and Science, Department of Information Engineering and Mathematics, University of Siena, Italy. Thesis: “Attitude and orbit control techniques for spacecraft with electric propulsion”;
- July 2013 - December 2013: Visiting researcher at the University of Southampton, United Kingdom;
- August 2005 - September 2008: Master’s degree in Information Engineering (Robotics and Automation), University of Siena, Italy. Thesis: “Simulazione, stima e controllo di dinamiche orbitali e di assetto per sistemi multisatellitari”;
- August 2002 - January 2006: Bachelor’s degree in Information Engineering, University of Siena, Italy. Thesis: “Progetto e realizzazione di un simulatore orbitale per missioni satellitari”.

Experience

2021-2024: RTD-A Researcher - Department of Engineering, University of Perugia, Italy

- Research project on learning-based and model-based perception and control techniques for micro aerial vehicle systems;
- Scientific coordinator of the Intelligent Systems, Automation and Robotics Laboratory (<https://isar.unipg.it>).

2020-2021: Research Fellow - Department of Information Engineering and Mathematics, University of Siena, Italy

- Research project on low-thrust trajectory optimization and on model predictive control for space applications;
- Scientific coordinator of the Aerospace Control Research Group (<http://control.dii.unisi.it/Aerospace>).

2019-2020: Research Fellow - Department of Physical Sciences, Earth and Environment, University of Siena, Italy

- Research project on automation of laser spectroscopy measurement systems for thermal vacuum chambers.

2015-2019: Research Fellow - Department of Information Engineering and Mathematics, University of Siena, Italy

- Research projects on technological and methodological aspects of spacecraft guidance, navigation and control;
- Design and validation of a linear robot for electric propulsion diagnostics, in collaboration with Aerospazio Tecnologie s.r.l.

2008-2010: Guidance, Navigation and Control Engineer - Aerospazio Tecnologie s.r.l., Italy.

- Development of simulation tools including state-of-the-art spacecraft dynamic models and control algorithms for autonomous station-keeping and formation flying.

Qualifications

- National Scientific Habilitation (ASN) as Associate Professor, SC 09/G1 (automatica), received from Italian Ministry of University and Research (MUR) on 27/06/2024;
- National Scientific Habilitation (ASN) as Associate Professor, SC 09/A1 (aeronautical, aerospace and naval engineering), received from Italian Ministry of University and Research (MUR) on 17/12/2023;
- Habilitation to the profession of Information Engineer, received from the University of Florence, Italy, on 31/03/2009;
- Expert technician in industrial automation and robotic systems, European qualification level 85/368/CEE IV.c, received from Regione Toscana, Italy, on 03/07/2008.
- Language proficiency:
 - Italian: Native speaker;
 - English: Advanced (C1 level);
 - Spanish: Beginner (A1 level).

Academic and Research Activity

- Teaching:
 - Lecturer of the course “Gestione e controllo delle reti elettriche di distribuzione modulo B (management and control of electrical distribution networks)”, Department of Engineering, University of Perugia, Italy, for the academic years 2021/2022, 2022/2023 and 2023/2024;
 - Lectures for the course “Ingegneria dei sistemi di controllo (control systems engineering)” held by Prof. Paolo Valigi, Department of Engineering, University of Perugia, Italy, during the academic year 2021/2022.
- Main research topics:
 - Control systems: Linear and nonlinear state estimation and control theory, optimal and robust control;
 - Aerospace systems: Spacecraft navigation and control, Unmanned Aerial Vehicles modeling and control;
 - Optimization: Convex programming and nonlinear programming methods.
- Projects:
 - Technical manager and coordinator of the project “Tematiche relative alla localizzazione e la navigazione di piattaforme robotiche aeree (droni) con dimensioni ridotte (classe micro e nano) in ambienti strutturati e non”, funded by Technology Innovation Institute, United Arab Emirates, 2021-2023. Partnership: Hipert s.r.l., University of Perugia;
 - Technical manager and coordinator of the project “Integrazione di funzionalità autonome in un veicolo elettrico ed interoperabilità con l’infrastruttura Smart Road”, awarded to the University of Perugia by Agenzia nazionale per le nuove tecnologie, l’energia e lo sviluppo economico sostenibile (ENEA), Italy, 2019-2021;
 - Manager of the work package “Simulazione dell’assetto di riferimento per la piattaforma satellitare SSCAM” within the project “SSCAM - Studio di sistemi di controllo di assetto per minisatelliti”, funded by Regione Toscana, Italy, 2016-2018. Partnership: Aerospazio Tecnologie s.r.l., CRM Compositi, D-Orbit, CNR-IFAC, CNR-NANO, University of Siena;
 - Manager of the work package “Modellistica del sistema di automazione del banco prove ed EMC” within the project “DIAST - Sviluppo di un sistema diagnostico integrato per applicazioni spaziali e terrestri”, funded by Regione Toscana, Italy, 2013-2014. Partnership: SITAEL, Aerospazio Tecnologie s.r.l., Italy, VVN, Italy, CRM Compositi, CNR-IFAC, University of Siena;

- Principal investigator of the project “EP-LEO - Electric propulsion for low Earth orbit multi-satellite systems”, funded by Amministrazione Provinciale di Siena, Italy, with the contribution of Fondazione Monte dei Paschi di Siena, Italy, 2009-2010. Partnership: Aerospazio Tecnologie s.r.l., University of Siena;
- Manager the of the work package “Analisi di missioni di osservazione terrestre in orbita bassa con propulsione MiniHall” within the project “Sistema propulsivo elettrico per piccole piattaforme satellitari avanzate”, awarded to Aerospazio Tecnologie s.r.l. by Ministero dello Sviluppo Economico - FIT program, Italy, 2008.
- Editorial activity:
 - Associate Editor for the IEEE Robotics and Automation Letters;
 - Member of the Editorial Board of the 28th International Conference on System Theory, Control and Computing (ICSTCC), 2024;
 - Member of the Editorial Board of the 29th International Conference on System Theory, Control and Computing (ICSTCC), 2025.
- Paper review activity (selected journals):
 - Journal of Guidance, Control, and Dynamics (recipient of the *Excellent Reviewer Award* for the period of Oct. 1, 2021 - Sept. 30, 2022);
 - International Journal of Robust and Nonlinear Control;
 - Aerospace Science and Technology;
 - Acta Astronautica;
 - IEEE Transactions on Aerospace and Electronic Systems;
 - IEEE Transactions on Control Systems Technology;
 - IEEE Control Systems Letters;
 - IEEE Robotics and Automation Letters.
- Bibliometric indicators as of 13/11/2024:

Citations:	358 (Scopus)	547 (Scholar)
h-index:	10 (Scopus)	13 (Scholar)

Publications

Selected Journal Papers (in the works in which M. Leomanni is the first author, he is the main contributor in conceiving and designing the analysis, collecting the data, developing data or analysis tools, performing the analysis and writing the paper):

- [S1] A. Garulli, A. Giannitrapani, M. Leomanni, F. Scortecci, “Autonomous Low Earth Orbit Station-Keeping with Electric Propulsion”, *Journal of Guidance, Control and Dynamics*, Vol. 34, No. 6, 2011.

- [S2] M. Leomanni, E. Rogers, S.B. Gabriel, “Explicit Model Predictive Control Approach for Low-Thrust Spacecraft Proximity Operations” *Journal of Guidance, Control and Dynamics*, Vol. 37, No. 6, 2014.
- [S3] A. Garulli, A. Giannitrapani, M. Leomanni, “Minimum Switching Control for Systems of Coupled Double Integrators”, *Automatica*, Vol. 60, 2015.
- [S4] M. Leomanni, G. Bianchini, A. Garulli, A. Giannitrapani, “A Class of Globally Stabilizing Feedback Controllers for the Orbital Rendezvous Problem”, *International Journal of Robust and Nonlinear Control*, Vol. 27, No. 18, 2017.
- [S5] M. Leomanni, A. Garulli, A. Giannitrapani, F. Scortecci, “Propulsion Options for Very Low Earth Orbit Microsatellites”, *Acta Astronautica*, Vol. 133, 2017.
- [S6] M. Leomanni, G. Bianchini, A. Garulli, A. Giannitrapani, R. Quartullo, “Orbit Control Techniques for Space Debris Removal Missions using Electric Propulsion”, *Journal of Guidance, Control and Dynamics*, Vol. 43, No. 7, 2020.
- [S7] M. Leomanni, G. Bianchini, A. Garulli, R. Quartullo “Sum-of-Norms Periodic Model Predictive Control for Space Rendezvous”, *IEEE Transactions on Control Systems Technology*, Vol. 30, No. 3, 2021.
- [S8] M. Leomanni, G. Costante, F. Ferrante, “Time-Optimal Control of a Multidimensional Integrator Chain with Applications”, *IEEE Control Systems Letters*, Vol. 6, 2022.
- [S9] M. Leomanni, R. Quartullo, G. Bianchini, A. Garulli, A. Giannitrapani, “Variable-Horizon Guidance for Autonomous Rendezvous and Docking to a Tumbling Target”, *Journal of Guidance, Control and Dynamics*, Vol. 45, No. 5, 2022.
- [S10] M. Leomanni, G. Mollica, A. Dionigi, P. Valigi, G. Costante, “A Convex Programming Approach to Multipoint Optimal Motion Planning for Unicycle Robots”, *IEEE Control Systems Letters*, Vol. 7, No. 3, 2023.
- [S11] A. Dionigi, S. Felicioni, M. Leomanni, G. Costante, “D-VAT: End-to-End Visual Active Tracking for Micro Aerial Vehicles”, *IEEE Robotics and Automation Letters*, Vol. 9, No. 6, 2024.
- [S12] M. Leomanni, F. Ferrante, A. Dionigi, G. Costante, P. Valigi, M.L. Fravolini, “Quadrotor Control System Design for Robust Monocular Visual Tracking”, *IEEE Transactions on Control Systems Technology*, Vol. 32, No. 6, 2024.

Other Journal Papers:

- [J1] M. Leomanni, A. Garulli, A. Giannitrapani, F. Scortecci, “All-Electric Spacecraft Precision Pointing using Model Predictive Control”, *Journal of Guidance, Control and Dynamics*, Vol. 38, No. 1, 2015.

- [J2] M. Leomanni, A. Garulli, A. Giannitrapani, F. Farina, F. Scortecci, “Minimum Switching Thruster Control for Spacecraft Precision Pointing”, *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 53, No. 2, 2017.
- [J3] M. Leomanni, G. Bianchini, A. Garulli, A. Giannitrapani, “State Feedback Control in Equinoctial Variables for Orbit Phasing Applications”, *Journal of Guidance, Control and Dynamics*, Vol. 41, No. 8, 2018.
- [J4] M. Leomanni, G. Bianchini, A. Garulli, A. Giannitrapani, R. Quartullo, “Sum-of-Norms Model Predictive Control for Spacecraft Maneuvering”, *IEEE Control Systems Letters*, Vol. 3, No. 3, 2019.
- [J5] M. Leomanni, A. Garulli, A. Giannitrapani, F. Scortecci, “An Adaptive Groundtrack Maintenance Scheme for Spacecraft with Electric Propulsion”, *Acta Astronautica*, Vol. 167, 2020.
- [J6] M. Leomanni, A. Garulli, A. Giannitrapani, R. Quartullo, “Satellite Relative Motion Modeling and Estimation via Nodal Elements”, *Journal of Guidance, Control and Dynamics*, Vol. 43, No. 10, 2020.
- [J7] M. Leomanni, G. Bianchini, A. Garulli, R. Quartullo, F. Scortecci, “Optimal Low-Thrust Orbit Transfers Made Easy: A Direct Approach”, *Journal of Spacecraft and Rockets*, Vol. 58, No. 6, 2021.
- [J8] G. Bianchini, A. Garulli, A. Giannitrapani, M. Leomanni, R. Quartullo, “Learning-Based Parameter Optimization for a Class of Orbital Tracking Control Laws”, *The Journal of the Astronautical Sciences*, Vol. 71, No. 1, 2024.

Conference Papers:

- [C1] N. Ceccarelli, A. Garulli, A. Giannitrapani, M. Leomanni, F. Scortecci, “Spacecraft Localization via Angle Measurements for Autonomous Navigation in Deep Space Missions”, *17th Symposium on Automatic Control in Aerospace*, 2007.
- [C2] A. Garulli, A. Giannitrapani, M. Leomanni, F. Scortecci, “Autonomous LEO Station-Keeping with a Hybrid Continuous/Impulsive Electric Propulsion System”, *32nd International Electric Propulsion Conference*, 2011.
- [C3] M. Leomanni, A. Garulli, A. Giannitrapani, F. Scortecci, “Precise Attitude Control of All-Electric GEO Spacecraft using Xenon Microthrusters”, *33rd International Electric Propulsion Conference*, 2013.
- [C4] S. Gabriel, E. Rogers, M. Leomanni, “The Applicability of Pulsed Plasma Thrusters to Rendezvous and Docking of Cubesats”, *33rd International Electric Propulsion Conference*, 2013.

- [C5] M. Leomanni, A. Garulli, A. Giannitrapani, F. Scortecci, “An MPC-based Attitude Control System for All-Electric Spacecraft with On/Off Actuators”, *52nd IEEE Conference on Decision and Control*, 2013.
- [C6] A. Garulli, A. Giannitrapani, M. Leomanni, “Minimum Switching Limit Cycle Oscillations for Systems of Coupled Double Integrators”, *53rd IEEE Conference on Decision and Control*, 2014.
- [C7] M. Leomanni, A. Garulli, A. Giannitrapani, P. Pergola, F. Petroni, F. Scortecci, “SSCAM: Micro-satellite Platform for Earth Observation”, *10th IAA Symposium on Small Satellites for Earth Observation*, 2015.
- [C8] M. Leomanni, A. Garulli, A. Giannitrapani, F. Scortecci “Minimum Switching Control for Spacecraft Precision Pointing with On/Off Actuators”, *54th IEEE Conference on Decision and Control*, 2015.
- [C9] M. Leomanni, A. Garulli, A. Giannitrapani, F. Scortecci “Propulsion Options for Station-Keeping of Small LEO Satellites”, *Space Propulsion 2016*, 2016.
- [C10] M. Leomanni, G. Bianchini, A. Garulli, A. Giannitrapani, “Nonlinear Orbit Control with Longitude Tracking”, *55th IEEE Conference on Decision and Control*, 2016.
- [C11] M. Leomanni, G. Bianchini, A. Garulli, A. Giannitrapani, R. Quartullo, “An MPC Strategy for Low-Thrust Space Debris Rendezvous”, *59th IEEE Conference on Decision and Control*, 2020.
- [C12] M. Leomanni, G. Bianchini, A. Garulli, R. Quartullo, “Sum-Of-Norms MPC for Linear Periodic Systems with Application to Spacecraft Rendezvous”, *59th IEEE Conference on Decision and Control*, 2020.
- [C13] M. Leomanni, F. Ferrante, N. Cartocci, G. Costante, M.L. Fravolini, K.M. Dogan, T. Yucelen, “Robust Output Feedback Control of a Quadrotor UAV for Autonomous Vision-Based Target Tracking”, *AIAA SciTech 2023 Forum*, 2023.
- [C14] R. Brilli, M. Legittimo, F. Crocetti, M. Leomanni, M.L. Fravolini, G. Costante, “Monocular Reactive Collision Avoidance for MAV Teleoperation with Deep Reinforcement Learning”, *IEEE International Conference on Robotics and Automation*, 2023.
- [C15] A. Dionigi, M. Leomanni, A. Saviolo, G. Costante, G. Loianno, “Exploring Deep Reinforcement Learning for Robust Target Tracking using Micro Aerial Vehicles”, *21st IEEE International Conference on Advanced Robotics*, 2023.
- [C16] S. Felicioni, E. Burani, M. Leomanni, M.L. Fravolini, P. Valigi, G. Costante, “Integrating Occupancy Grid with Semantic Road Information for Autonomous Navigation in Urban Scenarios: A Benchmark Study”, *20th IEEE International Conference on Automation Science and Engineering*, 2024.

Siena, 13/11/2024