

CURRICULUM VITAE OF ANTONIO RUSSO

CURRENT POSITION

Assistant Professor in Automation (Settore Scientifico Disciplinare (SSD) ING-INF/04–AUTOMATICA), full-time since January 1st 2023 at Università degli Studi della Campania “Luigi Vanvitelli”, Dipartimento di Ingegneria, via Roma 29, Aversa (CE), Italy, phone: +39 3341840814, email: antonio.russo1@unicampania.it.

ACADEMIC AND RESEARCH EMPLOYMENT

Past Positions

Università degli Studi della Campania Jan. 2023 - present
Dipartimento di Ingegneria (Assistant Professor)
TOPIC: Automatic Power Management techniques for More Electric Aircraft

Università degli Studi della Campania Jan. 2021 - Dic. 2022
Dipartimento di Ingegneria (Postdoctoral Researcher)
TOPIC: Hybrid nonlinear systems stability analysis

Università degli Studi della Campania Nov. 2017 - Oct. 2020
Dipartimento di Ingegneria (PhD Student)
TOPIC: Sliding Mode Control, Switched Systems, More Electric Aircraft

Education

PhD, Industrial and Information Engineering 13th Jan. 2021
Università degli Studi della Campania
THESIS: Advances in Sliding Mode Control and Switched Systems Theory for More Electric Aircraft
ADVISOR: Prof. Alberto Cavallo

Master of Science, Computer Science Engineering (110/110 cum laude) 17th Jul. 2017
Università degli Studi della Campania
THESIS: Nonlinear Filtering Techniques for Spacecraft Position and Attitude Estimation
ADVISOR: Prof. Alberto Cavallo

Bachelor of Science, Electronic and Computer Science Engineering (110/110) 25th Nov. 2015
Seconda Università degli Studi di Napoli
THESIS: Simulation of Mobile Robot Navigation Algorithms using MATLAB Robotics System Toolbox
ADVISOR: Prof. Ciro Natale

Visiting Appointments

University of Illinois at Urbana-Champaign Jan. 2019 - Jun. 2019
Coordinated Science Laboratory (PhD Student)
TOPIC: Integral-input-to-state stability of switched nonlinear systems under slow switching
ADVISOR: Prof. Daniel Liberzon

ACTIVITIES

Research activity and major scientific achievements

He has authored or co-authored 8 papers published on international journals, 1 book chapter, and 12 papers published on the proceedings of international conferences. His research is mainly in the area of sliding mode control, stability of switched, impulsive and hybrid systems with application to innovative power management techniques for more electric aircraft. Furthermore, recent research on visual servoing algorithms is ongoing.

Switched, Impulsive and Hybrid systems stability

2019-onwards

CONTRIBUTION: He has contributed to the definition of sufficient conditions on dwell-time of the switching signal that guarantee integral Input-to-State stability (iISS) of nonlinear switching systems with jumps. This result involves the definition of weaker variants of the iISS property. Furthermore, he has proved that, similarly to the case of continuous time systems, the equivalence between 0-input Global Asymptotic Stability (0-GAS) plus Uniformly Bounded Energy Bounded (UBEBS) and iISS also holds for hybrid nonlinear systems. Finally, he has identified sufficient conditions on the impulse sequence that guarantee 0-GAS, UBEBS, Asymptotic Gain, ISS and iISS property for impulsive nonlinear systems.

Sliding Mode Control

2020-onwards

CONTRIBUTION: He has contributed to the design of a novel nonlinear control scheme comprising of a Higher-Order Sliding Mode (HOSM) controller equipped with a novel mechanism to encounter the saturation limits named Bounded-Integral-Control (BIC) to solve the problem of robust control in finite time of uncertain continuous-time nonlinear systems affine in the control variable with saturation constraints.

Power Management for More Electric Aircraft

2018-onwards

CONTRIBUTION: He has contributed to the design of nonlinear control algorithms applied to the control of DC/DC power converters aimed at managing electrical power onboard the so-called More Electric Aircraft. Specifically, such DC/DC converters are connected to auxiliary energy storage systems such as batteries and supercapacitors to implement advanced power management techniques. Examples of such power management strategies are: avoiding the aircraft main generator overload by exploiting auxiliary batteries or reducing the mechanical stress on the aircraft generator through adoption of supercapacitors.

Visual Servoing

2021-onwards

CONTRIBUTION: He contributed to the visual servoing research by introducing a novel sampled-data model of the feature dynamics, which, in contrast with the usual forward Euler approximation, retains the rigid motion constraint. Using such model, conditions on the stability of the equilibrium points of the visual servoing system were carried out. Moreover, as further contribution, he has designed a novel feature generation method based on the homography provided by a template matching algorithm based on the Zero mean Normalized Cross Correlation (ZNCC) and the design of a visual tracking scheme by resorting to the Extended Kalman Filter (EKF) and Lyapunov direct method, which explicitly takes into account the camera velocity limits, while ensuring stability.

Bibliometric profiles

- Scopus: <https://www.scopus.com/authid/detail.uri?authorId=57210922248>
- Google Scholar: <https://scholar.google.com/citations?user=W8nj-3QAAAAJ&hl=it>
- Web of Science: <https://www.webofscience.com/wos/author/record/AAH-2925-2021>

Editorial Activities

Guest Editor

Feb. 2022

Energies

SPECIAL ISSUE: Advanced Control Strategies for Electric Power Management” for the journal Energies

Associate Editor
Conference Editorial Board of European Control Association (EUCA)
CONFERENCE: European Control Conference (ECC)

Feb. 2022 - present

Participation to Committees

Technical Committee
2022 5th International Conference on Mechatronics, Robotics and Automation

Nov. 2022

Teaching

<i>Course</i>	<i>Role</i>	<i>Academic Year</i>
Identificazione e Controllo dei Processi	Lecturer	2022/2023
Robust Control	Lecturer	2022/2023
Identificazione e Controllo dei Processi	Lecturer	2021/2022
Robust Control	Lecturer	2021/2022

Participation to Research Projects

Clean Aviation, Hybrid ElectriC regional Aircraft distribution TEchnologies (Jan. 2023 - Dic. 2025)
DESCRIPTION: this project will address the associated challenges of system weight and power density, high voltage challenges with lightning, arcing and electromagnetic interference as well as optimized thermal management, in addition to digitizing the design process with digital twins. This will lead to transformative technology bricks, which are holistically optimized at system integration architecture level.

CleanSky2 JTI-CS2-2019-CfP10-SYS-02-59 HYPNOTIC (May 2020 - Mar. 2023)
DESCRIPTION: design of a set of bidirectional converters, acting together as only one equipment able to reconfigure itself as a consequence of load/source variations and as a reaction to a fault or to other undesirable events. Coordinated by Skylife Engineering (ESP) and with participants IRT Antoine de Saint Exupery (FRA), Università degli Studi della Campania “Luigi Vanvitelli” (ITA) and Aeromechs SRL (ITA).
Topic Manager: Airbus (FRA).

CleanSky2 JTI-CS2-2017-CFP06-REG-01-10 ENIGMA (Apr. 2018 - Mar. 2021)
DESCRIPTION: design of a Centralized Smart Supervisory controller to obtain the formulation for the Enhanced Electrical Energy Management control logics. Coordinated by United Technologies Research Centre Ireland (IRL) and with participants University of Nottingham (UK), Università degli Studi della Campania “Luigi Vanvitelli” (ITA) and Aeromechs SRL (ITA). Topic Manager: Leonardo (ITA).

CleanSky2 JTI-CS2-2016-CFP04-REG-01-08 ESTEEM (Jul. 2017 - Dec. 2021)
DESCRIPTION: design of an innovative Energy Storage and Regenerative System with embedded supercapacitors Energy Storage Device for smart energy management of a regenerative Electro-Mechanical Actuator emulator. Coordinated by University of Nottingham (UK) and with participants Università degli Studi della Campania “Luigi Vanvitelli” (ITA) and Aeromechs SRL (ITA). Topic Manager: Leonardo (ITA).

PUBLICATIONS

International Journals

- [J.1] M. Costanzo, G. De Maria, C. Natale, and A. Russo. “Modeling and Control of Sampled-Data Image-Based Visual Servoing With Three-Dimensional Features”. In: *IEEE Transactions on Control Systems Technology* (2023), pp. 1–16.
- [J.2] A. Russo and A. Cavallo. “Stability and Control for Buck-Boost Converter for Aeronautic Power Management”. In: *Energies* 16.2 (2023).
- [J.3] A. Russo, G. P. Incremona, R. Seeber, and A. Ferrara. “Adaptive Bounded Integral Control With Enhanced Anti-Windup Design”. In: *IEEE Control Systems Letters* 7 (2023), pp. 1861–1866.
- [J.4] M. Costanzo, G. De Maria, C. Natale, and A. Russo. “Stability and Convergence Analysis of 3D Feature-Based Visual Servoing”. In: *IEEE Robotics and Automation Letters* 7.4 (2022), pp. 12022–12029.
- [J.5] S. Liu, A. Russo, D. Liberzon, and A. Cavallo. “Integral-Input-to-State Stability of Switched Non-linear Systems Under Slow Switching”. In: *IEEE Transactions on Automatic Control* 67.11 (2022), pp. 5841–5855.
- [J.6] A. Russo, G. P. Incremona, and A. Cavallo. “Higher-Order Sliding Mode design with Bounded Integral Control generation”. In: *Automatica* 143 (2022), p. 110430.
- [J.7] S. Sumsurooah, Y. He, M. Torchio, K. Kouramas, B. Guida, F. Cuomo, J. Atkin, S. Bozhko, A. Renzetti, A. Russo, S. Rivero, and A. Cavallo. “ENIGMA—A Centralised Supervisory Controller for Enhanced Onboard Electrical Energy Management with Model in the Loop Demonstration”. In: *Energies* 14.17 (2021).
- [J.8] G. Canciello, A. Cavallo, A. Lo Schiavo, and A. Russo. “Multi-objective adaptive sliding manifold control for More Electric Aircraft”. In: *ISA Transactions* (2020).
- [J.9] A. Cavallo, G. Canciello, and A. Russo. “Integrated supervised adaptive control for the More Electric Aircraft”. In: *Automatica* 117 (2020).
- [J.10] A. Cavallo, A. Russo, and G. Canciello. “Hierarchical control for generator and battery in the More Electric Aircraft”. In: *Science China Information Sciences* 62.9 (2019).

Book chapters

- [B.1] A. Russo, B. Guida, G. Canciello, and A. Cavallo. “13 - Energy system management for aeronautic and aerospace applications: Demonstration and study cases”. In: *Hybrid Technologies for Power Generation*. Ed. by M. Lo Faro, O. Barbera, and G. Giaccoppo. Hybrid Energy Systems. Academic Press, 2022, pp. 373–418.

International conferences proceedings

- [C.3] A. Russo, M. Costanzo, and A. Cavallo. “Combined Supercapacitor and Battery Sliding Mode Control for Aeronautic Application”. In: *2022 5th International Conference on Mechatronics, Robotics and Automation (ICMRA)*. 2022, pp. 64–68.
- [C.1] A. Russo, G. P. Incremona, and A. Cavallo. “A Saturated Higher Order Sliding Mode Control Approach for DC/DC Converters”. In: *2022 IEEE 17th International Conference on Control & Automation (ICCA)*. 2022, pp. 44–49.
- [C.2] A. Russo, G. P. Incremona, A. Cavallo, and P. Colaneri. “State Dependent Switching Control of Affine Linear Systems With Dwell Time: Application to Power Converters”. In: *2022 American Control Conference (ACC)*. 2022, pp. 3807–3813.
- [C.4] A. Russo, G. Canciello, and A. Cavallo. “Generalized Super-Twisting control of a Dual Active Bridge for More Electric Aircraft”. In: *2021 European Control Conference, ECC 2021*. Vol. 2021-June. 2021.

- [C.5] A. Russo, G. Canciello, and A. Cavallo. “MIL-Standards Verification of Battery Control for More Electric Aircraft Application”. In: vol. 1828. 1. IOP Publishing, Feb. 2021, p. 012057.
- [C.6] A. Russo, G. Canciello, and A. Cavallo. “MPC based Sliding Mode Control for More Electric Aircraft application”. In: *2021 International Conference on Industrial Technology, ICIT 2021*. Vol. 2021-March. 2021.
- [C.7] G. Zappulla Sathler, B. Cougo, A. L. Rodriguez Vazquez, A. Russo, and B. Guida. “Optimization of Bidirectional Modular DC/DC Converter for Low and High Power Operation in Aircraft Applications”. In: *2021 International Conference on Industrial Technology, ICIT 2021*. Vol. 2021-March. 2021.
- [C.8] A. Russo and A. Cavallo. “Supercapacitor stability and control for More Electric Aircraft application”. In: *2020 European Control Conference, ECC 2020*. 2020.
- [C.9] A. Russo, S. Liu, D. Liberzon, and A. Cavallo. “Quasi-Integral-Input-to-State Stability for Switched Nonlinear Systems”. In: vol. 53. 2. 21st IFAC World Congress. 2020, pp. 1992–1997.
- [C.10] A. Cavallo, G. Canciello, and A. Russo. “Buck-Boost Converter Control for Constant Power Loads in Aeronautical Applications”. In: *Proceedings of the IEEE Conference on Decision and Control*. Vol. 2018-December. 2019, pp. 6741–6747.
- [C.11] A. Cavallo, A. Russo, and G. Canciello. “Control of supercapacitors for smooth EMA operations in aeronautical applications”. In: *Proceedings of the American Control Conference*. Vol. 2019-July. 2019, pp. 4948–4954.
- [C.12] G. Canciello, A. Russo, B. Guida, and A. Cavallo. “Supervisory Control for Energy Storage System Onboard Aircraft”. In: *Proceedings - 2018 IEEE International Conference on Environment and Electrical Engineering and 2018 IEEE Industrial and Commercial Power Systems Europe, IEEEIC/I and CPS Europe 2018*. 2018.
- [C.13] A. Cavallo, G. Canciello, and A. Russo. “Supervised Energy Management in Advanced Aircraft Applications”. In: *2018 European Control Conference, ECC 2018*. 2018, pp. 2769–2774.

Submitted papers

- [S.1] M. Costanzo, G. De Maria, C. Natale, and A. Russo. *3D Feature-Based Sampled-Data Visual Tracking*. Submitted to 2023 IFAC World Congress conference, Accepted. 2023.
- [S.2] S. Liu and A. Russo. *Further characterizations of integral input-to-state stability for hybrid systems*. Submitted to Automatica. 2023.
- [S.3] A. Russo and S. Liu. *Do 0-GAS-Guaranteeing Impulse Sequences Preserve ISS or iISS properties? Not Always*. Submitted to IEEE Conference on Decision and Control, Accepted. 2023.