Laurent BURLION

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RESEARCH INTERESTS:

My research addresses real-world challenges in aerospace through collaboration with both control theorists to develop innovative solutions and engineers to implement them in industrial aerospace applications. Recent work explores safe control strategies, including the development of reference governors for nonlinear systems with uncertain dynamics. A funded CubeSat mission will demonstrate the application of these techniques to the fuel sloshing mitigation problem.

EMPLOYMENT:

Rutgers University, New Jersey, USA

Assistant Professor: **1/2019-present**

- PI or co-PI of several research projects funded by the NSF, ONR, AFRL\SDL or DOE\ARPA-E,
- PI of the first Rutgers CubeSat mission (UNP cycle 1, NS-11 and NS-12),
- Advanced Control Laboratory director. Development of new control methods and demonstrations on satellite or drone test benches,
- Co-PI of the Rutgers Net-Zero Wind Energy Test (WET) Center.

ONERA, the French Aerospace Lab, Toulouse, FR **4/2010-12/2018**

Research Scientist:

- Awarded a French DoD fellowship to visit Pr. Ilya Kolmanovsky (**University of Michigan's Aerospace Department**). Developed advanced reference governors techniques for uncertain controlled systems during this research visit (September 2017 - August 2018),
- Led the $3M VISIOLAND project (VISIOn based control solutions for automatic Landing of aircraft or UAVs),
- Worked on many applications to aerospace systems (satellite, space launchers, civil and combat aircraft, UAVs) with many industrial and academic partners such as AIRBUS, DASSAULT Aviation, ESA, CNES, ASTRIUM, LAAS-CNRS, L2S-CNRS,
- Developed a back-up/low-weight/low-cost solution to perform bio-inspired lunar landing,
- Developed advanced Backstepping-based control laws for control of nonlinear uncertain flexible systems,
- Developed a novel control method based on a subtle Output to Input Saturation Transform (OIST) to take into account state constraints in combination with anti-windup loops,
- Proposed a novel anti-collision algorithm embedded on a fleet of three UAVs,

- ➢ Developed novel robust anti-windup solutions in the presence of a time-varying parameter with application to visual servoing.

DGA-LRBA, French DoD, Vernon, FR **9/2003-3/2010**

Expert Engineer in Rocket Guidance, Navigation and Control:

- ➢ Worked on advanced nonlinear control solutions with industry partners such as Airbus Defense and Space, MBDA and SAGEM,
- ➢ Was responsible for the road map "Guidance, Control and Optimization",
- ➢ Prepared in parallel a Ph.D. at L2S-CNRS.

EDUCATION:

INP Toulouse, Habilitation (French accreditation to supervise research) **12/2019**

Habilitation Thesis: « *Nonlinear Control and Observation of Aerospace Systems* »,

Committee: T. Ahmed-Ali, J-M. Biannic, S. Caux, F. Cazaurang, B. Clement, I. Fantoni and A. Marcos.

University of Paris Saclay, L2S-CNRS, Ph.D., Physics **9/2003-2/2007**

Thesis: « *Contribution to design and analysis of nonlinear sampled-data control systems* »,

Committee: A. Astolfi, C. Moog, C. Prieur, J. Daafouz, T. Ahmed-Ali, F. Lamnabhi-Lagarrigue.

Ecole Centrale Nantes, M.S., Control Engineering **6/2003**

ENSTA Bretagne, Engineering Degree **9/2003**

PRIZES AND AWARDS:

2021 Rutgers Provost Award for "Excellence in Teaching Innovations"

PUBLICATIONS:

JOURNAL PAPERS (* INDICATES MY STUDENTS / VISITING STUDENTS)

[J40] R. Schieni*, M. Malisoff and L. Burlion, "*Theory for Speeding Up Reference Governors using Interval Contractors,"* submitted to Automatica, in revision.

[J39] A.K. Shakya*, M. Fogel*, G. Pillai, L. Burlion, and S. Chakrabarty, "*Spill-Free Liquid Container Handling using Deep Reinforcement Learning Agents in Feedback Control,*" submitted to Neural Computing and Applications.

[J38] G. Magnani*, J-M. Biannic, M. Cassaro, E. Evain, and L. Burlion, *"Slosh attenuation via Reference Governor-based adaptive control for space operations under actuators constraints,"* submitted to IFAC Journal of Systems and Control, in revision.

[J37] M. Fogel*, and L. Burlion, "*A Nanosatellite Mission to Explore the Propellant Sloshing Problem,*" AIAA Journal of Spacecraft and Rockets, to appear.

[J36] G. Magnani*, M. Cassaro, J-M. Biannic, E. Evain, and L. Burlion, "*Quadrotor Fault-Tolerant Control Using Model Reference Adaptive Control and Adaptive Reference Governor,*" IEEE Transactions on Aerospace and Electronic Systems, to appear.

[J35] R. Schieni*, M. Modasiya*, M. Malisoff and L. Burlion, "*Quadrotor Flight Envelope Protection with Trajectory and Yaw Tracking*", AIAA Journal of Guidance, Control, and Dynamics, to appear.

[J34] X, Du*, J. Liang, J. López Muro*, G. Qian, L. Burlion and O. Bilgen, "*Development of a control co-design optimization framework with aeroelastic-control coupling for floating offshore wind turbines*", Applied Energy, vol. 372, 2024.

[J33] L. Wang, R. Bergua, A. Robertson, J. Jonkman, T. Ngo, T. Das, D. Sarker, F. Fabregas Flavia, R. Harries, M. Fowler, E. Lenfest, J. López Muro*, L. Burlion, and O. Bilgen, "*Experimental validation of models of a hull-based tuned mass damper system for a semisubmersible floating offshore wind turbine platform,*" Journal of Physics: Conference Series, vol.2626-012067, 2023.

[J32] F. Mazenc, M. Malisoff and L. Burlion, "*Almost fixed time observers for parameters and for state variables of nonlinear systems,*" IEEE Control Systems Letters, vol.7, pp.667-672, 2023.

[J31] L. Burlion, R. Schieni* and I. Kolmanovsky, "*A Reference Governor for linear systems with polynomial constraints,*" Automatica, vol.142, 2022.

[J30] L. Burlion, V. Gibert*, M. Malisoff and F. Mazenc, *"Controls for a nonlinear system arising in vision-based landing of airliners,"* International Journal of Robust and Nonlinear Control, vol 31(4), pp.1227-1244, 2021.

[J29] I. Rubio Scola, G. Guijarro Reyes, L. Garcia Carrillo, J. Hespanha and L. Burlion, "*A Robust Control Strategy with Perturbation Estimation for the Parrot Mambo Platform,*" IEEE Trans. on Control Systems Technology, vol. 29(4), pp.1389-1404, 2021.

[J28] T. Cunis*, J-P. Condomines, and L. Burlion, "*Stability and control synthesis for deep-stall recovery using sum-of-square,*" AIAA Journal of Guidance, Control and Dynamics, vol. 43(8), pp.1498-1511, 2020.

[J27] T. Cunis*, J-P. Condomines, and L. Burlion, "*Local stability analysis for large polynomial spline systems,*" Automatica, vol.113, 2020.

[J26] T. Cunis*, J-P. Condomines, L. Burlion and A. La Cour-Harbo, "*Dynamic stability analysis of aircraft flight in deep stall,*" AIAA Journal of Aircraft, vol. 57(1), pp. 143-155, 2020.

[J25] L. Burlion, M. Malisoff, F. Mazenc, "*Stabilization and Robustness Analysis of Saturating Integrators arising in Vision Based Landing of Aircraft with Sampling*", Systems & Control Letters, vol 135, 2020.

[J24] M.M. Nicotra, D. Liao-McPherson, L. Burlion and I.V. Kolmanovsky, *"Spacecraft Attitude Control with Nonconvex Constraints: An Explicit Reference Governor Approach,"* IEEE Trans. on Automatic Control, vol 65(8), pp. 3677-3684, 2020.

[J23] T. Ahmed-Ali, E. Fridman, F. Giri, M. Kahelras, F. Lamnabhi-Lagarrigue and L. Burlion, "*Observer design for a class of parabolic systems with large delays and*

sampled measurements," IEEE Trans. on Automatic Control, vol.65(5), pp.2200-2206, 2020.

[J22] L. Burlion, L. Zaccarian, H. de Plinval and S. Tarbouriech, "*Discontinuous model recovery anti-windup for image based visual servoing,*" Automatica, vol.104, pp.41-47, 2019.

[J21] F. Mazenc, L. Burlion and M. Malisoff, "*Backstepping design for output feedback stabilization for a class of uncertain systems,*" Systems & Control Letters, vol.123, pp.134-143, 2019.

[J20] F. Mazenc, L. Burlion and M. Malisoff, "*Stabilization and robustness analysis for a chain of saturating integrators with imprecise measurements,*" IEEE Control Systems Letters, vol.3(2), 2019.

[J19] T. Cunis*, L. Burlion and J-P. Condomines, "*On Piece-wise Polynomial Modeling for Control and Analysis of Aircraft Dynamics beyond Stall,*" AIAA Journal of Guidance, Control and Dynamics, vol.42(4), pp. 949-957, 2019.

[J18] L. Burlion, J-M. Biannic and T. Ahmed-Ali, "*Attitude tracking of a flexible spacecraft under angular velocity constraints,*" International Journal of Control, vol.92(7), pp. 1524-1540, 2019.

[J17] V. Gibert*, F. Plestan, L. Burlion, J.Boada and A. Chriette, "*New scheme for visual estimation of deviations based on sliding mode and high gain approaches: application to the landing of a civil aircraft,*" Control Engineering Practice, vol.75, pp.17-25, 2018.

[J16] F. Mazenc, M. Malisoff, L. Burlion and J. Weston, "*Bounded Backstepping Control and Robustness Analysis for Time-Varying Systems under Converging-Input-Converging-State Conditions,*" European Journal of Control, vol.42, pp.15-24, 2018.

[J15] T. Ahmed-Ali, F. Giri, M. Krstic, L. Burlion and F. Lamnabhi-Lagarrigue, "*Adaptive Observers design in presence of heat PDE sensor,*" Automatica, vol.82, pp. 93-100, 2017.

[J14] E. Chambon*, L. Burlion and P. Apkarian, "*Time-response shaping using Output to Input Saturation Transformation*", International Journal of Control, vol. 91(3), pp.534-553, 2018.

[J13] P. Bidaud, L. Burlion, H. de Plinval, T. Loquen, J. Marzat and C. Pralet, "*Dealing with complexity through advanced control techniques*", in a special issue celebrating the 70th birthday of ONERA, Vol.12(13), AL12-13 (the electronic Journal of Onera, on-line accessible), 2016.

[J12] E. Chambon*, L. Burlion and P. Apkarian, "*Détermination de matrice semblable Metzler par optimisation non lisse,*" JESA, European Journal of Automation, vol.50, pp.75-94, 2017.

[J11] E. Duraffourg*, L. Burlion and T. Ahmed-Ali, "*Finite-time observer based Backstepping control of a flexible launch vehicle,*" Journal of Vibration and Control, (published online 09-2016), vol. 24(2), pp. 1535-1550, 2018.

[J10] T. Ahmed-Ali, F. Giri, M. Krstic, L. Burlion and F. Lamnabhi-Lagarrigue, "*Adaptive Boundary Observer for Parabolic PDEs subject to Domain and Boundary Parameter Uncertainties,*" Automatica, vol.72, pp 115-122, 2016.

[J9] T. Ahmed-Ali, E. Fridman, F. Giri, L. Burlion and F. Lamnabhi-Lagarrigue, "*Using exponential time-varying gains for sampled-data stabilization and estimation,*" Automatica, vol.67, pp 244-251, 2016.

[J8] E. Chambon*, L. Burlion and P. Apkarian, "*A Nonsmooth Optimization-based Approach to Interval Observers Design,*" in IET Control Theory & Applications, vol. 10, no. 11, pp. 1258-1268, 2016.

[J7] T. Folin, T. Ahmed-Ali, F. Giri, L. Burlion and F. Lamnabhi-Lagarrigue, "*Sampled-Data Adaptive Observer for a Class of State-Affine Output-Injection Nonlinear Systems,*" in IEEE Trans. on Automatic Control, vol. 61(2), pp.462-467, 2016

[J6] T Ahmed-Ali, F. Giri, M. Krstic, F. Lamnabhi-Lagarrigue and L. Burlion, "*Adaptive observer for a class of parabolic PDEs,*" in IEEE Trans. on Automatic Control, vol.61(10), pp.3083-3090, 2016.

[J5] G. Sabiron*, T. Raharijaona, L. Burlion, E. Kervendal, E. Bornschlegl and F. Ruffier, "*Sub-optimal Lunar Landing GNC using Non-Gimbaled Optic Flow Sensors,*" in IEEE Trans. on Aerospace and Electronic Systems, vol. 51 (4), pp.2525-2545, 2015.

[J4] J.M. Biannic, L. Burlion and H. de Plinval, "*Robust control design over large flight envelopes: a promising approach for aerial robotics,*" in a special issue of the Aerospace Lab Journal on Aerial Robotics, Vol.8(1), AL8-01 (the electronic Journal of Onera, on-line accessible), 2014.

[J3] R. Postoyan, T. Ahmed-Ali, L. Burlion, F. Lamnabhi-Lagarrigue, "*On the Lyapunov-based adaptive control redesign for a class of nonlinear sampled-data systems,*" Automatica, vol.44(8), pp 2099-2107, 2008.

[J2] L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*On the stability of a class of nonlinear hybrid systems,*" Nonlinear Analysis: Theory, Methods and Applications, vol.65(12), 2236-2247, 2006.

[J1] L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*On the stabilization of sampled-data nonlinear systems by using backstepping on the higher order approximate models,*" International Journal of Control, vol.79(9), 1087-1095, 2006.

BOOK CHAPTERS

[B5] L. Burlion, R. Caverly and J-M. Biannic, "Satellite Control", in Elsevier "*Encyclopedia of Systems and Control Engineering,*" accepted. doi:10.106/B978-0-443-14081-5.00010-6

[B4] E. Chambon*, P. Apkarian and L. Burlion, *"Flexible launch vehicle control using robust observer-based controller obtained through structured H∞ synthesis",* in "Advances in Aerospace Guidance Navigation and Control: selected papers of the 3rd CEAS Specialist Conference on Guidance, Navigation and Control," Springer, pp.23-38, 2015.

[B3] H. de Plinval and L. Burlion, "*Nonlinear visual servoing control for VTOL UAVs with field of view constraint*", in "Advances in Aerospace Guidance Navigation and Control: selected papers of the 3rd CEAS Specialist Conference on Guidance, Navigation and Control," Springer, pp.531-548, 2015.

[B2] V. Gibert*, L. Burlion, A. Chriette, J. Boada and F. Plestan, "*A new observer for range identification in perspective vision systems*", in "Advances in Aerospace Guidance Navigation and Control: selected papers of the 3rd CEAS Specialist Conference on Guidance, Navigation and Control," Springer, pp.401-414, 2015.

[B1] G. Sabiron*, P. Chavent, L. Burlion, E. Kervendal, P. Fabiani, T. Raharijaona and F. Ruffier, "*Toward an autonomous lunar landing based on low-speed optic flow sensors*", in "Advances in Aerospace Guidance Navigation and Control: selected papers of the 2nd CEAS Specialist Conference on Guidance, Navigation and Control," Springer, pp.681-699, 2013.

CONFERENCE PUBLICATIONS

[C75] M. Fogel*, and L. Burlion, "*Engaging Students in Control Engineering through Sloshing Experiments,*" in Proc. of the 2024 IFAC Workshop on Aerospace Control Education (WACE), pp. 83-88, 2024.

[C74] C. Stoica, S. Bertrand, and L. Burlion, "*Feedback on Drone Arenas-based Remote international Teaching – DAReTeach,*" in Proc. of the 2024 IFAC Workshop on Aerospace Control Education (WACE), 2024, pp. 135-140, 2024.

[C73] M. Fogel*, S. Terracina*, and L. Burlion, "*The Rutgers SPICESat Mission: An Educational Case Study,*" in Proc. of the 2024 IEEE Aerospace Conference, pp. 1-11, Big Sky, MT, USA, 2024.

[C72] J. López Muro*, J-P. Condomines, O. Bilgen and L. Burlion, "*Control Oriented Modeling of a Floating Offshore Wind Turbine,*" in Proc. of the 2023 CCTA Conference, pp. 208-213, 2023.

[C71] R. Schieni*, C. Zhao, M. Malisoff and L. Burlion, "Reference Governor Design in the Presence of Uncertain Polynomial Constraints," in Proc. of the 2023 American Control Conference, pp.1428-1433, 2023.

[C70] G. Magnani, A. de Souza, M. Cassaro, J-M. Biannic, H. Evain and L. Burlion, "Command governor-based adaptive control for constrained linear systems in presence of unmodelled dynamics", in Proc. of the 2023 American Control Conference, pp.2387-2392, 2023.

[C69] M. Maadani*, J. López Muro*, Z. Soriano* and L. Burlion, "Control Allocation of Over-Actuated Tilt-Rotor Quadcopters with Aerodynamic Interactions", in Proc. of the AIAA Scitech Forum, 2023.

[C68] R. Schieni*, J. Barreira*, C. Zhao*, M. Malisoff and L. Burlion, "Quadrotor Flight Envelope Protection while Following High-Speed Trajectories: a Reference Governor Approach", in Proc. of the AIAA Scitech Forum, 2023.

[C66] M. Fogel*, M. Jadeja*, and L. Burlion, "*SPICEsat: A Nanosatellite Mission to Explore the Propellant Sloshing Problem*", in Proc. of the AIAA Scitech Forum, 2023.

[C65] G. Magnani, J-M. Biannic, M. Cassaro, H. Evain and L. Burlion, "*Reference Governor Based Solution for Satellite Attitude Control with Sloshing and Actuation Constraints*", in Proc. of the 9th European Conference for Aeronautics and Space Sciences, (EUCASS 2022), Lille, France, 2022.

[C64] C. Zhao* and L. Burlion, "*Geometric Model Free Control Tracking Control on SE(3)*", in Proc. of the 22nd IFAC Symposium on Automatic Control in Aerospace (ACA 2022), pp. 387-393, 2022.

[C63] M. Simsek, R. Schieni*, L. Burlion and O. Bilgen, "A Hybrid Position Feedback Controlled Bistable Metamaterial Concept", 10th European Nonlinear Dynamics Conference (ENOC 2022), Lyon, France, 2022-07-17, 2022.

[C62] C. Zhao*, M. Fogel* and L. Burlion, "Control of propellant slosh dynamics in observation spacecraft using Model Free Control and pressure sensors", in Proc. of IEEE CCTA conference, Trieste, pp. 191-196, 2022.

[C61] R. Schieni* and L. Burlion, "A Reference Governor for Control of Bistable Structures with Polynomial Constraints", in Proc. of the IEEE CCTA conference, Trieste, pp. 191-196, 2022.

[C60] J. López Muro*, X. Du*, J-P. Condomines, O. Bilgen and L. Burlion, "Wind Turbine Tower Thickness and Blade Pitch Control Co-Design Optimization", in Proc. of the AIAA Scitech Forum, 2022.

[C59] M. Higgins* and L. Burlion, "Implementation of a Learning-Based Explicit Reference Governor for Constrained Control of a UAV", in Proc. of the AIAA Scitech Forum, 2022.

[C58] R. Schieni*, M. Simsek, T. Cunis, O. Bilgen and L. Burlion, "Control of Bistable Structures Using a Modified Hybrid Position Feedback Controller", in Proc. of the AIAA Scitech Forum, 2022.

[C57] B. Lai*, T. Cunis and L. Burlion, "*Nonlinear Trajectory Based Region of Attraction Estimation for Aircraft Dynamics Analysis*", in Proc. of the AIAA Scitech Forum, 2021.

[C56] X. Du*, L. Burlion and O. Bilgen, "*Control co–design for rotor blades of floating offshore wind turbines*", in *Proc. of the ASME 2020 International Mechanical Engineering Congress and Exposition (IMECE), Volume 7A: Dynamics, Vibration, and Control*. Virtual, 2020.

[C55] T. Cunis*, D. Liao-MacPherson, I. Kolmanovsky and L. Burlion, " *Model-Predictive Spiral and Spin Upset Recovery Control for the Generic Transport Model Simulation*", in Proc. of the IEEE CCTA conference, pp. 1-7, 2020.

[C54] L. Burlion and I. Kolmanovsky, "Aircraft *Vision based Landing of an Aircraft using Robust Extended Command Governors*", in Proc. of the 2020 IFAC World Congress, Pages 14716-14723, 2020.

[C53] T. Cunis*, D. Liao-MacPherson, J-P Condomines, L Burlion, I. Kolmanovsky, "*Economic Model Predictive Control Strategies for Aircraft Deep-stall Recovery with Stability Guarantees*", in Proc. of the 58th IEEE Conference on Decision and Control, (CDC 2019), pp. 157-162, 2019.

[C52] L. Burlion, M. Malisoff and M. Mazenc, "*Stabilization and robustness analysis for a chain of saturating integrators arising in the visual landing of aircraft*", in Proc. of the 58th IEEE Conference on Decision and Control, (CDC 2019).

[C51] J.-M. Biannic, A. Bourdelle*, H. Evain, S. Moreno and L. Burlion, "*On robust LPV-based observation of fuel slosh dynamics for attitude control design*", in Proc. of the 3rd IFAC

Workshop on Linear Parameter Varying Systems, (LPVS 2019), vol.52(28), pp. 170-175, 2019.

[C50] A. Bourdelle*, J-M. Biannic, H. Evain, C. Pittet, S. Moreno and L. Burlion, *"Modeling and control of propellant slosh dynamics in observation spacecraft"*, in Proc. of the 8th European Conference for Aeronautics and Space Sciences, (EUCASS 2019), Madrid, Spain, (**Best Student Paper Award in Flight Dynamics, GNC and Avionics**), 2019.

[C49] A. Bourdelle*, J-M. Biannic, S. Moreno, C. Pittet and L. Burlion, *"Propellant sloshing torque H∞-based observer design for enhanced attitude control"*, in Proc. of the 21st IFAC Symposium on Automatic Control in Aerospace, (ACA 2019), vol.52(12), pp. 286-291, 2019.

[C48] A. Bourdelle*, L. Burlion, J-M. Biannic, S. Moreno and C. Pittet, *"Towards new control design oriented models for fuel sloshing in observation spacecraft"*, in Proc. of the 2019 AIAA SciTech Forum, San Diego, CA, 2019.

[C47] L. Burlion, M. Nicotra and I. Kolmanovsky, "*A fast reference governor for the constrained control of linear discrete-time systems with parametric uncertainties*", in Proc. of the 57th IEEE Conference on Decision and Control, (CDC 2018), pp. 6289-6294, 2018.

[C46] F. Mazenc, L. Burlion and V. Gibert*, "*Stabilization of a nonlinear system that arises in the context of vision based landing of an airliner*", in Proc. of the 57th IEEE Conference on Decision and Control, (CDC 2018), pp. 5313-5318, 2018.

[C45] T. Ahmed-Ali, E. Fridman, F. Giri, M. Kahelras, F. Lamnabhi-Lagarrigue and L. Burlion, "*Observer design for a class of parabolic systems with arbitrarily delayed measurements*", in Proc. of the 57th IEEE Conference on Decision and Control, (CDC 2018), pp. 2199-2204, 2018.

[C44] J-M. Biannic, L. Burlion and S. Tarbouriech, *"Finite time LPV analysis of vision based landing system with Anti-Windup augmentation"*, in Proc. of the 2nd IFAC Workshop on Linear Parameter Varying Systems, (LPVS'18), vol. 51(26), pp.37-42, 2018.

[C43] F. Mazenc, L. Burlion and M. Malisoff, "*Backstepping design for output feedback stabilization for uncertain systems using dynamic extension*", in Proc. of the 2nd IFAC Conference on Modelling, Identification and Control of Nonlinear Systems, (MICNON 2018), pp.260-265, 2018.

[C42] F. Mazenc, L. Burlion and V. Gibert*, "*Stabilization of a system that arises in the context of vision based landing of a civil aircraft*", in Proc. of the annual American Control Conference, (ACC 2018), pp. 2978-2983, 2018.

[C41] T. Cunis*, L. Burlion and J-P.Condomines, "*Piece-wise Identification and Analysis of the Aerodynamic Coefficients, Trim Conditions, and Safe Sets of the Generic Transport Model*", AIAA SciTech 2018 Forum, Kissimmee, FL, January 2018.

[C40] F. Mazenc, M. Malisoff and L. Burlion, "*Bounded backstepping through a dynamic extension with delay*", in Proc. of the 56th IEEE Conference on Decision and Control, (CDC 2017), pp.4351-4356, 2017.

[C39] J-M. Biannic and L. Burlion, "*Performance analysis of saturated parameter-varying systems with application to vision-based landing assessment*", in Proc of the 20th IFAC World Congress, pp.10513-10517, 2017.

[C38] L. Burlion and H. de Plinval, "*Vision based anti-windup design with application to the landing of an airliner*", in Proc of the 20th IFAC World Congress, pp.10482-10487, 2017.

[C37] C. Chauffaut*, L. Burlion, F. Defay and H. de Plinval, "*Collision Avoidance of multiple MAVs using a multiple Outputs to Input Saturation Technique*", in Proc of the International Micro Air Vehicle Conference and Competition, (IMAV 2017), pp.190-195, 2017.

[C36] T. Cunis*, J-P. Condomines and L. Burlion, " Full envelope, *six-degrees-of-freedom trim analysis of unmanned aerial systems based on piecewise polynomial aerodynamic coefficients*", in Proc. of the 2017 Workshop on Research, Education and Development of Unmanned Aerial Systems, (RedUAS 2017), pp. 108-113, 2017.

[C35] L. Burlion and H. de Plinval, "*Toward vision-based landing of a fixed-wing UAV on an unknown runway under some FoV constraints*", in Proc of the 2017 International Conference on Unmanned Aircraft Systems, (ICUAS 2017), Miami, Florida, pp. 1824-1832, 2017.

[C34] C. Chauffaut, F Defaÿ, L Burlion and H de Plinval, "*UAV obstacle avoidance scheme using an Output to Input Saturation Transformation technique*", in Proc of the International Conference on Unmanned Aircraft Systems, (ICUAS 2016), pp. 227-234, 2016.

[C33] V. Gibert*, L. Burlion, A. Chriette, J. Boada and F. Plestan, "*Vision based automatic landing of a civil aircraft by using nonlinear pose estimation*", in Proc of the 6th European Conference for Aeronautics and Space Sciences, (EUCASS 2015), Krakow, Poland, 2015.

[C32] E. Chambon*, L. Burlion and P. Apkarian, "*Output to Input Saturation Transformation: Demonstration and Application to Disturbed Linear Systems*", in Proc of the 54th IEEE Conference on Decision and Control, pp.7566-7571, 2015.

[C31] V. Gibert*, L. Burlion, A. Chriette, J. Boada and F. Plestan, "*New pose estimation scheme in perspective vision system during civil aircraft landings*", in Proc of the 11th IFAC Symposium on Robot Control, SYROCO 2015, vol.48(19), pp.238-243, 2015.

[C30] L. Burlion and H. de Plinval, "*Visual landing insensitive to the depth with variable constraints: a twisting based solution*", in Proc. of the.23rd Mediterranean Conference on Control and Automation, MED 2015, pp.603-610, 2015.

[C29] T. Ahmed-Ali, E. Fridman, F. Giri, L. Burlion and F. Lamnabhi-Lagarrigue, "*A new approach to enlarging sampling intervals for some sampled-data systems and observers*", in Proc of the 12th IFAC workshop on Time Delay Systems, IFAC TDS 2015, vol.48(12), pp.440-445, 2015.

[C28] E. Chambon*, P. Apkarian and L. Burlion, "*Metzler matrix transform determination using a non-smooth optimization technique with application to interval observers*", in Proc. of the SIAM conference on Control and Its Applications, SIAM CT 15, pp. 205-211, 2015.

[C27] V. Gibert*, L. Burlion, A. Chriette, J. Boada and F. Plestan, "*Nonlinear observers in vision system: application to civil aircraft vision-based landing*", in Proc. of the European Control Conference, ECC 2015, pp. 1812-1817, 2015.

[C26] T. Ahmed-Ali, F. Giri, M. Krstic, L. Burlion and F. Lamnabhi-Lagarrigue, "*Adaptive observers for parabolic PDEs with uncertain parameter in the boundary condition*", in Proc. of the European Control Conference, ECC 2015, pp. 1337-1342, 2015.

[C25] E. Chambon*, L. Burlion, and P. Apkarian, "*Robust output interval constraint using O/I saturation transformation with application to uncertain linear launch vehicle*", in Proc. of the European Control Conference, ECC 2015, pp. 1796-1801, 2015.

[C24] G. Sabiron*, L. Burlion, E. Kervendal, E. Bornschlegl, T. Raharijaona and F. Ruffier, "*Autonomous Lunar Landing Based on Bio-inspired Visual Motion sensors tested in flight*", in Proc of 9th International ESA Conference on Guidance, Navigation & Control Systems, ESA GNC 2014.

[C23] G. Sabiron*, L. Burlion, T. Raharijaona and F. Ruffier, "*Optic flow-based nonlinear control and optimal guidance for lunar landing*", in proc of IEEE International Conference on Robotics and Biomimetics, ROBIO 2014, pp. 1241-1247, 2014.

[C22] T. Ahmed-Ali, L. Burlion, F. Lamnabhi-Lagarrigue and C. Hann, "*A sampled-data observer with time-varying gain for a class of nonlinear systems with sampled-measurements*", in Proc of the 53rd Conference on Decision and Control, Los Angeles, pp.316-321, 2014.

[C21] L. Burlion, H. de Plinval and P. Mouyon, "*Backstepping based Visual Servoing for Transport Aircraft Automatic Landing*", in Proc. of IEEE Multi conference on Systems and Control, MSC 2014, pp. 1461-1466, 2014.

[C20] G. Sabiron*, L. Burlion, G. Jonniaux, E. Kervendal, E. Bornschlegl, T. Raharijaona, and F. Ruffier, "*Backup State Observer Based on Optic Flow Applied to Lunar Landing*", in Proc of international conference on Intelligent RObot and Systems, IROS 2014, pp. 2325-2332, 2014.

[C19] L. Burlion, C. Poussot-Vassal, P. Vuillemin, M. Leitner and T. Kier, "*Longitudinal manoeuvre load control of a flexible large-scale aircraft*", in Proc of the 19th IFAC World Congress, pp. 3413-3418, 2014.

[C18] E. Duraffourg*, L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*Finite time adaptive observer of a flexible nonlinear model of a launcher*", in Proc of the 19th IFAC World Congress, pp. 546-551, 2014.

[C17] L. Burlion, E. Duraffourg*, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*Global asymptotic stabilization for some nonlinear models of flexible aerospace vehicles*", in Proc of the 52nd Conference on Decision and Control, Florence, pp.4230-4235, 2013.

[C16] E. Duraffourg*, L. Burlion and T. Ahmed-Ali, "*Longitudinal Modeling and Preliminary Control of a Non-linear Flexible Launch Vehicle*", in Proc. of the 11th IFAC International Workshop on Adaptation and Learning in Control and Signal Processing, Caen, pp.209-214, 2013.

[C15] E. Duraffourg*, L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*Nonlinear full-state control of a flexible hypersonic vehicle*", in Proc. of the IEEE conference on Electronics, Control, Measurement, Signals and their application to Mechatronics, 2013.

[C14] E. Duraffourg*, L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*Nonlinear control of the longitudinal rotational dynamics of a flexible aircraft*", in Proc. of the European Control Conference, pp.335-340, 2013.

[C13] L. Burlion and H. de Plinval, "*Keeping a ground point in the camera field of view of a landing UAV*", in Proc of the IEEE International Conference on Robotics and Automation, pp.5763-5768, 2013.

[C12] G. Sabiron*, P. Chavent, L. Burlion, E. Kervendal, P. Fabiani, T. Raharijaona and F. Ruffier, "*Toward an autonomous lunar landing based on low-speed optic flow sensors*", in Proc of Euro GNC 2013, pp.993-1011, 2013.

[C11] L. Burlion and H. de Plinval, "*Automatic UAV landing with ground target maintained in the field of view*", in Proc of Euro GNC 2013, pp.1546-1562, 2013.

[C10] J-M. Biannic, L. Burlion, S. Tarbouriech and G. Garcia, "*On dynamic inversion with rate limitations*", American Control Conference, pp. 191-196, 2012.

[C9] L. Burlion, "*A new Saturation function to convert an output constraint into an input constraint*", 20th Mediterranean Conference on Control and Automation, (MED 2012), pp.1217-1222, 2012.

[C8] L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*Updating the gain of global finite-time high gain observers*", in Proc. of the 50th IEEE Conference on Decision and Control and European Control Conference, pp. 8145-8150, 2011.

[C7] L. Burlion, T. Ahmed-Ali, R. Postoyan and F. Lamnabhi-Lagarrigue, "*Adaptive control redesign for some nonlinear sampled-data systems*", in proc. of the IFAC Symposium on Nonlinear Control, (NOLCOS'07), pp.754-759, 2007.

[C6] L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*On the adaptive control of nonlinear sample-data systems*", in Proc. of the European Control Conference, (ECC'07), 2007.

[C5] T. Ahmed-Ali, L. Burlion and F. Lamnabhi-Lagarrigue, "*On the stabilization of sampled-data systems by using higher order approximations of the exact discretized systems*", in Proc. of IMACS World Congress, 2005.

[C4] L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*On the design of Lyapunov functions for state-dependent impulsive dynamical systems*", in Proc. of the IFAC World Congress, pp. 379-384, 2005.

[C3] L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*Stabilization of switching systems: a viability approach*", in Proc. of the 16th International Symposium on Mathematical Theory of Networked Systems, (MTNS 2004), 2004.

[C2] L. Burlion, T. Ahmed-Ali and F. Lamnabhi-Lagarrigue, "*On the stability of a class of nonlinear hybrid systems*", in Proc. of the 6th IFAC-Symposium on Nonlinear Control Systems (NOLCOS 2004), 2004.

[C1] L. Burlion, T. Ahmed-Ali and N. Seube, "*Glider's roll control based on Backstepping*", in Proc. of the IFAC Conference on Control Applications in Marine Systems (CAMS 2004), 2004.

PATENT:

[P1] US Patent 20,160,026,189, "*Method and system for automatic autonomous landing of an aircraft*", J. Boada-Bauxell, V. Gibert, L. Burlion, A. Chriette, F. Plestan.

RECENT PRESENTATIONS:

10-2024: ME Seminar speaker, "Learning Aerospace Control Engineering by working on a Cubesat Mission to Mitigate Sloshing," University of Maryland Baltimore County, MA.

08-2024: PI project presentation, "Interval Observers for Enhanced Shipboard Landing and Formation Control for Naval Aircraft," Office of Naval Research, Arlington, VA.

07-2024: IFAC WACE, "Engaging Students in Control Engineering through Sloshing Experiments," Bertinoro, Italy.

05-2024: ECE Seminar speaker, "Drones Flight Envelope Protection Using Reference Governors," NYU.

08-2023: PI project presentation, "Interval Observers for Enhanced Shipboard Landing and Formation Control for Naval Aircraft," Office of Naval Research, Arlington, VA.

06-2023: Guest Speaker, "Protecting Quadrotor Flight Envelope: A Reference Governor Approach for Uncertain Polynomial Constraints," UC Riverside, CA.

03-2023: Seminar speaker, "Reference Governors for Linear Systems with Uncertain Polynomial Constraints and Disturbances," CentraleSupelec, University of Paris Saclay, France.

03-2023: Seminar speaker, "Reference Governors for Systems with Polynomial Constraints," Tel Aviv University, IL.

03-2023: Guest Speaker "Reference Governors for Linear Systems with Uncertain Polynomial Constraints and Disturbances," Ensta Bretagne, France.

12-2022: Invited Speaker, FEANICSES Workshop, "Quadrotor Flight Envelope Protection while Following High-Speed Trajectories: a Reference Governor Approach," ENAC, the French School of Aviation, Toulouse, France.

01-2022: Panelist representing Rutgers at the Innovation Chat of James Barrood on the "future of drones," Podcast series.

03-2021: Seminar speaker, "Aerospace systems control using reference governors," University of Minnesota, Aerospace and Mechanical Engineering Department seminar series.

10-2020: Seminar speaker, "DAReTeach: *Drone Arenas-based Remote international TEACHing,*" Rutgers Global Collaborative Education Lab (GCEL) Symposium.

05-2019: Seminar speaker, "Advanced nonlinear control methods to push aerospace systems to their limits," invited talk, Louisiana State University Mathematical Department seminar series.

COMMITTEES:

IFAC TC 7.3 (Aerospace): Member since 2014.

IEEE CSS TCAC (Aerospace Control): Member since 2019.

IEEE RAS TC (Aerial Robotics and Unmanned Aerial Vehicles): Member since 2022.

Member of the IPC (international Program Committee) for the IFAC Automatic Control in Aerospace (ACA) 2022.

Member of the IPC for the ICINCO (International Conference on Informatics in Control, Automation and Robotics) 2023 and 2024.

MEMBERSHIPS:

AIAA Senior Member

IEEE Senior Member

Vertical Flight Society Member

EDITORIAL BOARDS:

Associate Editor for Control Engineering Practice, from January 2024.

Guest editor for the special issue **"New Trends in Spacecraft and Launch Vehicles Control"** of Control engineering Practice, July 2023-September 2024.

Member of the IEEE CSS Technology Conferences Editorial Board since 2022.

Guest editor for the special issue "Latest Developments in Offshore Wind Technologies", Energies, May 2023-June 2024.

Associate editor for the conferences "Ubiquitous Robotics" 2020 and 2021.

Frontiers in Control Engineering: review editor since 2023.

RESEARCH GRANTS:

In progress

- **SPICESAT 2** (Sloshing Platform for In-Orbit Controller Experimentation)

Funded by AFRL\SDL (UNP-12)
Period: 01/2025-03/2027

- **Collaborative Research: Designs and Theory for Interval Contractors and Reference Governors with Aerospace Applications**

Funded by NSF
Period: 08/2023-07/2026

- **Interval Observers for Enhanced Shipboard Landing and Formation Control for Naval Aircraft**

Funded by ONR
Period: 01/2022-06/2025

- **Establishment of the Rutgers Climate and Energy Institute (RCEI) with the Launch of the Flagship Net-Zero Wind Energy Test (WET) Center Project**

Funded by Rutgers
Period: 07/2023-06/2026

Completed

- **SPICESAT** (Sloshing Platform for In-Orbit Controller Experimentation)

Funded by AFRL\SDL (UNP-11)
Period: 01/2022-03/2024

- **RU/TAU research collaboration** (Advanced Time Delay Control Methods for Aerospace Autonomous Systems)

Funded by Rutgers and Tel Aviv University
Period: 06/2022-06/2023

- **Batteries Sharing for Autonomous Vehicles** (Team Science Initiative Project)

Funded by Rutgers\SOE
Period: 01/2021-06/2023

- **ATLANTIS** (Computationally Efficient Atmospheric-Data-Driven Control Co-Design Optimization Framework with Mixed-Fidelity Fluid and Structure Analysis)

Funded by Advanced Research Projects Agency-Energy (ARPA-E).
Period: 03/2020-02/2022.

- **DARETeach (**Drone Arenas-based Remote International Teaching)

Funded by the FACE Foundation. Collaboration with CentraleSupélec.
Period: 10/2020-09/2021.

FORMER PROJECTS AND COLLABORATIONS BEFORE 2019:

- **Constrained control solutions for drones' dependency**

Funded by the French DoD\DGA, sabbatical year grant at the University of Michigan. Period covered: 09/2017-08/2018.

- **CONVEX** (Non-linear control for upset recovery of a fixed-wing MAV)

Funded by ONERA. Collaboration with ENAC, the French School of Aviation. Period: 09/2016-08/2019.

- **DROPTER** (Drone reconfiguration in the event of unforeseeable situations)

Funded by ONERA. Period: 09/2017-12/2018.

- **Railway inspection using drones (Pre project)**

Funded by DGAC. Period: 01/2017-07/2017.

- **COSOR** (Orbital robotic systems control)

Funded by CNES and ONERA. Collaboration with CNES. Period: 09/2016-12/2018.

- **VISIOLAND** (VISIOn based LANDing solutions)

Funded by ANR. Collaboration with Airbus (Flight control department) and Irccyn.
Period: 11/2013-11/2017.

- **R&T CNES: "Adaptive control of a flexible satellite"**

Funded by CNES. Collaboration with Greyc CNRS. Period: 01/2014-12/2014.

- **SMAC** (Systems Modeling Analysis & Control)

Funded by ONERA. Period: 01/2012-12/2015.

- **Autonomous Exploration of Highly Confined Environments by Compact Micro Air Vehicles**

Funded by the University of Toulouse, FR, IDEX
Period: 01/2014-12/2014.

- **Design of a bio-inspired autopilot for safe and soft lunar landing**

Funded by the European Space Agency and ASTRIUM
Period: 01/2011-09/2014.

- **Clean Sky ITD SFWA**

Funded by European Commission. Collaboration with AIRBUS (Load control department).
Period: 01/2011-12/2014.

- **NICE** (Nonlinear Innovative Control designs and Evaluations)

Funded by European Defence Agency (EDA) Collaboration with Dassault Aviation (Flight control department), LAAS-CNRS and University of Tor Vergata. Period: 04/2010-09/2012.

PATENT:

[P1] US Patent 20,160,026,189, "*Method and system for automatic autonomous landing of an aircraft*", J. Boada-Bauxell, V. Gibert, L. Burlion, A. Chriette, F. Plestan.

TEACHING:

- Special topic: Drones II: control and coordination (Spring 2021, Spring 2022, Spring 2023, Summer 2023 and 2024), Rutgers-MAE 606.
- Advanced Control I (Fall 2020, Fall 2022, Fall 2023, Fall 2024), Rutgers-MAE 504.
- Aircraft flight Dynamics (Spring 2019, Spring 2020, Spring 2024), Rutgers-MAE 471.
- Vehicles Dynamics (Fall 2019, Fall 2021), Rutgers-MAE 451.
- Introduction to linear control systems (Fall 2014, Fall 2015, Fall 2016)

  Tutoring, Isae Supaero, 2nd year (equiv. MSc 1st year).

- Linear filtering and signal processing (Fall 2014, Fall 2015, Fall 2016)

Tutoring, Isae Supaero, 2nd year (equiv. MSc 1st year).

- Introduction to flight dynamics (Spring 2014, Spring 2015)

  Tutoring, Isae Supaero, 2nd year (equiv. MSc 1st year).

- Kalman filtering (Fall 2013, Fall 2014, Fall 2015, Fall 2016)

  Tutoring, Enseeiht, 3rd year (equiv. MSc 2nd year).

- Mathematical analysis (Spring 2012, Fall 2012)

  Tutoring University Paul Sabatier, Toulouse, L1 (equiv. Undergraduate 1st year).

STUDENT SUPERVISION:

Doctoral Theses, main or co-advisor:

[1] G. Sabiron, "Design of a GNC Solution based on Bio-Inspired Optic Flow Sensors adapted to low speed measurement for an Autonomous Soft Lunar Landing", Ph.D., 2014.

External funding: ESA, Airbus Defence and Space.

[2] E. Duraffourg, "Nonlinear control with flexible modes, aerospace applications", PhD, 2014.

[3] V. Gibert, "Observability analysis and robust nonlinear observers design for vision-based landing of a transport aircraft on an unknown runway", Ph.D., 2016.

External funding: Airbus.

[4] E. Chambon, "Frequency and time-domain constrained control of linear systems. Application to a flexible launch vehicle", Ph.D., 2016.

[5] T. Cunis, "Modeling, Analysis, and Control for Upset Recovery - from System Theory to Unmanned Aircraft Flight", Ph.D., 2019.

[6] A. Bourdelle, "Attitude control of a satellite in presence of sloshing", Ph.D. 2021.

External funding: French Space Agency “CNES”.

[7] R. Schieni, “Reference Governors for Systems with Polynomial Constraints: Theory and Extensions”, Ph.D., Rutgers University, 2022.

External funding: Middlesex Community College.

[8] C. Zhao, Ph.D. candidate, in progress

[9] J. Lopez Muro, Ph.D. candidate, in progress.

External funding: DoE\ARPA-E.

[10] M. Fogel, Ph.D. candidate, in progress

[11] A. Melal, Ph.D. candidate, in progress

Postdoctoral researcher, main or co-advisor:

[1] C. Chauffaut, 2015.

[2] R. Hamrah, 01/2021-06/2021.

[3] X. Du, 2020-2021.

[4] M. Maadani, 10/2021-06/2023.

Master Theses, supervisor:

[MS1] N. Jacob, M.S, "Nonlinear model predictive control of a missile", 2007.

[MS2] M. Archen, M.S, "Control of large scale uncertain nonlinear flexible systems", 2011.

[MS3] D. Hernandez, M.S, "Transportation of cable suspended load using two rotary wing UAVs", 2012.

[MS4] E. Chambon, M.S, "Nonlinear energy-based control method for fixed wing UAV automatic landing", 2013.

[MS5] B. Espivent, M.S, "Vision based automatic landing of a fixed wing UAV", 2014.

[MS6] M. Fogel, M.S, "Applying Machine Learning to the Satellite Sloshing Problem", Rutgers University, January 2022.

[MS7] M. Jadeja, M.S, "Integrating Controls and CFD for the satellite sloshing problem", Rutgers University, January 2024.

[MS8] A. Modasiya, M.S, "Towards Robust-Safe Control of Multi-Rotor UAVs", Rutgers University, May 2024.

External funding: ONR.

[MS9] N. Kartashov, M.S, in progress

[MS10] M. Alexeev, M.S, in progress

[MS11] T. Leiser, M.S, in progress

[MS12] S. Srikanth, M.S, in progress

Graduate projects, supervisor:

[1] S. Duverger and.C. Issanchou "Modeling and nonlinear control of an automated wind kite", 2014.

[2] A. El-Mourabit and B. Pontin, *"Virtual constraints for kite-based systems control*", 2014.

[3] D. Sutton, M. Eng, "Small Quadcopters & Advanced Control: dynamic thrust stand", 2021.

[4] J. Barreira, M. Eng, "Simultaneous and autonomous control of multiple quadcopters from Matlab", 2021.

[5] J. Brennan, M. Eng, "Drone Conversion: Fixed Wing Drone to Tiltrotor Drone", 2022.

[6] K. Leiton, M. Eng, "Tricopter/Fixed Wing Hybrid Aircraft Drone Capable of Vertical Takeoff and Landing", 2022.

[7] R. Chen, M. Eng, "Flight Testing and Aerodynamic Optimization of a Fixed Wing Tilt-Rotor Tricopter Capable of VTOL", 2023.

[8] M. Abdalla, M. Eng, "Effects of Fluids on Spacecraft", May 2024.

[9] A. Scalia, M. Eng, in progress

[10] C. Diaz, M. Eng, in progress

[11] M. Correia, M. Eng, in progress