

CURRICULUM VITAE – EMANUELE GARONE

I. General Information

1.1 First and Last Name: **Emanuele Garone**

1.2 Sex: **Male**

1.3 Birth date : **16th of April 1980**

1.4 Nationality: **Italian**

1.5 Address:

Emanuele Garone
ULB - CP165/55
Avenue F.D. Roosevelt 50,
1050 Bruxelles
Belgium

1.6 Telephone number and e-mail

Office Phone : +32-(0)2-650.26.86

e-mail: egarone@ulb.ac.be

1.7 Spoken Languages

Italian : Mother Tongue

English : Fluent

French: Intermediate

II. Education

Phd Degree in System Engineering

Issued in January 2009 by the University of Calabria, Rende (CS), Italy

Title Received: “Dottore Di Ricerca in Ingegneria Informatica e dei Sistemi” (PhD)

Thesis Title: “*Model Predictive Control for Linear Parameter Varying Systems*”

Advisor. Prof. A. Casavola

Laurea Degree in Computer Engineering (5 years degree)

Issued in October 2005 by the University of Calabria, Rende (CS), Italy

110/110 and *summa cum laude* (average grade 29.9/30; 18 out of 29 exams "*cum laude*").

Title Received: “Dottore in Ingegneria Informatica”

III. Scientific Career

3.1 Positions

Function/Title: **Chargé de Cours** (Tenured Associate Professor)

Period: **2013 November– now**

Type of the contract: Tenured Professorship

Activity: Teaching and Research

Employer : Université Libre de Bruxelles

% of occupation: 100%

Financing Organism : Université Libre de Bruxelles

Function/Title: **Chargé de Cours** (Assistant Professor)

Period: **2010 November– 2013 November**

Type of the contract: Tenure track professorship
Activity: Teaching and Research
Employer : Université Libre de Bruxelles
% of occupation: 100%
Financing Organism : Université Libre de Bruxelles

Function/Title: **Research Assistant** (and appointed professor)
Period: **2008 November– 2010 October**
Type of the contract: 2 years contract
Activity: Research
Employer : University of Calabria, Rende (CS)
% of occupation: 100%
Financing Organism : University of Calabria, Rende (CS)

Function/Title: **Phd Student**
Period: **2005 November– 2009 January**
Type of the contract: Phd Scholarship
Activity: Research and PhD Thesis
Employer : University of Calabria, Rende (CS)
% of occupation: 100%
Financing Organism : University of Calabria, Rende (CS)

3.2 Visiting Positions Abroad

2007 May – 2008 February – Visiting PhD Student at the Laboratory of Information Decision and Control at Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

2010 January – 2010 February – Visiting Researcher at the Electrical Computer Engineering Department of the Carnegie Mellon Institute (CMU), Pittsburgh, PA, USA.

2015 January – 2015 February – Visiting Professor at Curtin University, Perth, WA, Australia.

2015 January – Visiting Professor at Melbourne University, Melbourne, Australia.

IV. Teaching Activities:

4.1 Teaching Activity

2010 – Now - At Université Libre de Bruxelles.

- Control System Design (MATH-H-407) (*since 2010/2011*)
ECTS: 5
Hours of lectures: 24 h,
Hours of Laboratory/Exercises: 36h (6 groups, total: 204 h)
- Control for Robotics (MATH-H-509) (*since 2010/11*)
ECTS: 3
Hours of lectures: 12 h

Hours of Laboratory: 24h

- Optimization-Based Control (ELEC-H-509) (*since 2012/13*)

ECTS: 4

Hours of lectures: 24 h

Hours of Laboratory: 24h

2009 - 2010 - Appointed Professor at University of Calabria, Italy for the course “Laboratorio di Automatica” (Control Science Laboratory), Bachelor Degree in Computer Engineering. **ECTS: 9. Hours of lectures: 30 h, Hours of Laboratory: 60h**

2008-2009 – Teaching Assistant at University of Calabria, Italy for the course “Modellistica ed Identificazione”, Bachelor Degree in Computer Engineering and Master Degree in Automation Engineering, **Hours of in-class exercises: 9 h**

2007 – 2008 – Teaching Assistant at University of Calabria, Italy for the course “Controllo Digitale” (Digital Control), Bachelor Degree in Electrical Engineering. **Hours of in-class exercises: 13 h**

2007-2008 – Teaching Assistant at University of Calabria, Italy for the course “Modellistica ed Identificazione”, Bachelor Degree in Computer Engineering and Master Degree in Automation Engineering, **Hours of in-class exercises : 9 h**

2006-2007 – Teaching Assistant at University of Calabria, Italy for the course “Complementi di Controlli Automatici”, Master Degree in Mechanical Engineering, **Hours of in-class exercises : 12 h, Hours of Laboratory: 6 h**

2006-2007 – Teaching Assistant at University of Calabria, Italy for the course “Modellistica ed Identificazione”, Bachelor Degree in Computer Engineering and Master Degree in Automation Engineering, **Hours of in-class exercises : 9 h**

4.2 . Master and PhD Thesis supervision

Co- Advisor for the PhD Thesis: “Mobile robots: localization and mapping algorithms”, Luigi D’Alfonso, Università della Calabria, 2013.

Advisor for the Master Thesis: “Control of a Tethered Unmanned Aerial Vehicle”, Sophie Eeckhout, ULB, 2014.

Advisor for the Master Thesis: “Construction, Modeling, Validation and Control of a test-bench for the study of bi-stable beams”, Loic Vanherck, ULB, 2014.

Advisor for the Master Thesis: “Distributed Control of Multi-Robot Systems: Human-in-the-loop and Constraints Management”, Celine Dupouhon, ULB, 2014.

Co-Advisor for the Master Thesis: “Constrained Control of Multi-Robot Systems”, Letizia Di Giulio, University of Roma 3 (Visiting Master Thesis), 2014.

Advisor for the Master Thesis: “Control of the Center of Gravity for a Humanoid Robot”, Julien Mutangawa, ULB, 2013.

Co-advisor for the Master Thesis: “Optimal mission planning for a class of carrier-carried marsupial robots”, Massimo Ballerini, University of Bologna (Visiting Master Thesis), 2012.

Co-advisor for the Master Thesis: “Controllo e Pianificazione ottima delle traiettorie di veicoli autonomi” (“Optimal Control and Path-planning for the trajectories of Autonomous Vehicles”), Luca Maisto, University of Bologna (Visiting Master Thesis), 2012.

Co-advisor for the Master Thesis: “Studio comparativo di algoritmi distribuiti nel Controllo Predittivo Vincolato” (“Development and Comparisons of distributed predictive control algorithms”), Francesco Tedesco, Università della Calabria, Italy, 2008.

V. Award, Publications and Scientific Activities

5.1 International Awards

August 2014 – Honourable Mention at the **IFAC Congress Young Author Prize** of the XIXth IFAC World Congress (**IFAC 2014**) in Cape Town, South Africa, 2014 for the paper “**Taut Cable Control of a Tethered UAV**”

December 2007 - Best Student Paper Award Finalist for the IEEE Conference on Decision and Control (**IEEE CDC 2008**) in New Orleans for the paper “LQG Control for distributed systems over TCP-like Erasure Channels”.

5.2 List of Publications

5.2.1 Book Chapters:

[BC1] – G. Franzé, A. Casavola, D. Famularo, E. Garone. “An off-line MPC strategy for non-linear systems based on SOS programming” in *Nonlinear Model Predictive Control Towards New Challenging Applications*. Series: Lecture Notes in Control and Information Sciences, Vol. 384, Springer – L. Magni, D. Raimondo, F. Allgower (Eds.) – ISBN: 978-3-642-01093-4, **2009**, pp. 491-500.

[BC2] – E. Garone, B. Sinopoli, A. Casavola. “LQG Optimal Control Over Lossy TCP-Like networks with probabilistic packet acknowledgment” in *Modelling, Estimation and Control of Networked Complex System*. Series: Understanding Complex Systems, Springer– A. Chiuso, L. Fortuna, M. Frasca, A. Rizzo, L. Schenato, S. Zampieri (Eds.) – ISBN: 978-3-642-03198-4, **2009**, pp.181-205

[BC3] – A. Casavola, E. Garone, F. Tedesco. “The Distributed Command Governor (DCG) approach in a nutshell” in *Distributed MPC Made Easy*– J.M. Maestre, R.R. Negenborn (Eds.) – Series: Intelligent Systems, Control and Automation: Science and Engineering, Vol. 69, **2014**.

[BC4] – A. Casavola, E. Garone, F. Tedesco. “Distributed Supervisory Strategies for Multi-agent Networked Systems” in *Complex Systems: Synergies of Control, Communication and Computing*– J. Dimirovsky (Ed.) – Springer, In press, **2014**.

5.2.2 Journal Papers:

[J1] – Giuseppe Franzé, Emanuele Garone, Domenico Famularo and Alessandro Casavola, Dilated model predictive control strategy for linear parameter-varying systems with a time-varying terminal set. *IET Control Theory and Applications*, **2009**, Volume 3, Issue 1, pp. 110-120.

- [J2] – Alessandro Casavola, Domenico Famularo, Giuseppe Franzé, Emanuele Garone, Set-points reconfiguration in networked multi-area electrical power systems. *International Journal of Adaptive and Signal Processing*, **2009**, Volume 23, pp. 808-813.
- [J3] – Emanuele Garone, Bruno Sinopoli, Alessandro Casavola, LQG Control Over Lossy TCP-like Networks with probabilistic Packet acknowledgment. *International Journal of Systems, Control and Communications*. Special issue on Information Processing and Decision Making in Distributed Control Systems, **2010**, Volume 2, pp. 55-81.
- [J4] – Alessandro Casavola, Emanuele Garone. Fault tolerant adaptive control allocation schemes for overactuated systems, *International Journal of Robust and Nonlinear Control*, Volume 20, Issue 17, **2010**, pp. 1958-1980.
- [J5] – Emanuele Garone, Roberto Naldi, Emilio Frazzoli. Switching Control Laws in the Presence of Measurement Noise, *Systems & Control Letters*, Volume 59, Issue 6, **2010**, pp. 353-364,
- [J6] – Emanuele Garone, Francesco Tedesco, Alessandro Casavola. Sensorless Supervision of Linear Dynamical Systems: The Feed-Forward Command Governor Approach, *Automatica*, **2011** Volume 47, Issue 7, July 2011, pp. 1294-1303.
- [J7] – Emanuele Garone, Roberto Naldi, Alessandro Casavola. A Traveling Salesman Problem for a Class of Carrier-Vehicle System, *AIAA Journal of Guidance, Control, and Dynamics*, Volume 34, Issue 4, July–August **2011**, pp. 1272-1276.
- [J8] – Emanuele Garone, Bruno Sinopoli, Andrea Goldsmith, Alessandro Casavola. LQG Control For MIMO Systems Over Multiple Erasure Channels with Perfect Acknowledgement , *IEEE Transaction on Automatic Control* , Volume 57, Issue 2, **2012**, pp. 450-456.
- [J9] – Yilin Mo, Emanuele Garone, Alessandro Casavola, Bruno Sinopoli. Stochastic Sensor Scheduling for Energy Constrained Estimation in Multi-Hop Wireless Sensor Networks, *IEEE Transaction on Automatic Control* , Volume 56 Issue 10, **2011**, pp. 2489-2495.
- [J10] – Emanuele Garone, Alessandro Casavola. Receding Horizon Control Strategies for Constrained LPV Systems based on a class of Nonlinearly Parameterized Lyapunov Functions, *IEEE Transaction on Automatic Control*, Volume 57, Issue 9, **2012**, pp 2354-2360.
- [J11] – Alessandro Casavola, Domenico Famularo, Giuseppe Franzè, Emanuele Garone. A fast ellipsoidal MPC scheme for discrete-time polytopic linear parameter varying systems, *Automatica*, Volume 48, Issue 10, **2012**, pp. 2620–2626.
- [J12] – Alessandro Casavola, Emanuele Garone, Francesco Tedesco. Improved Feed-Forward Command Governor Strategies for Constrained Discrete-time Linear Systems, *IEEE Transaction on Automatic Control*, Vol. 59, no.1, pp. 216-223, **2014**.
- [J13] –Emanuele Garone, Jean-François Determe, Roberto Naldi. Mission Planning for a carrier-vehicle configuration: a Generalized TSP. *AIAA Journal of Guidance, Control, and Dynamics*, Vol.37, pp. 766-774, **2014**
- [J14] –. Francesco Lamonaca, Andrea Gasparri, Emanuele Garone, Domenico Grimaldi. Clock Synchronization in Wireless Sensor Network with Selective Convergence Rate for Event Driven Measurement Applications. *IEEE Transactions on Instrumentation & Measurement*, In press, **2014**.
- [J15] – Yilin Mo, Bruno Sinopoli, Emanuele Garone. On Infinite-Horizon Sensor Scheduling. *Systems & Control Letters*, Vol 67, pp. 65-70, **2014**.
- [J16] –Alessandro Casavola, Emanuele Garone, Francesco Tedesco, A Distributed Multi-Agent Command Governor Strategy for the Coordination of Networked Interconnected Systems. *IEEE Transaction on Automatic Control*, Accepted **2014**.

[J17] - Ambrosino, R., & Garone, E. Piecewise Quadratic Lyapunov Functions over Conical Partitions for Robust Stability Analysis. *International journal of robust and nonlinear control*. Accepted 2014.

5.2.3 Conferences with proceedings:

[C1] – Alessandro Casavola, Domenico Famularo, Giuseppe Franzé, Emanuele Garone, An improved predictive control strategy for polytopic LPV linear systems 45th IEEE Conference on Decision and Control, December 13-15, San Diego, CA, USA, 2006.

[C2] – Alessandro Casavola, Domenico Famularo, Giuseppe Franzé, Emanuele Garone, A dilated MPC control strategy for LPV linear systems European Control Conference, July 2-5, Kos, Greece, 2007.

[C3] – Emanuele Garone, Alessandro Casavola, Giuseppe Franzé, Domenico Famularo, New stabilizability conditions for discrete-time Linear Parameter Varying systems, 46th IEEE Conference on Decision and Control, December 10-11, New Orleans, LO, USA, 2007.

[C4] – Giuseppe Franzé, Alessandro Casavola, Domenico Famularo, Emanuele Garone, An off-line MPC strategy for nonlinear systems based on SOS programming, IFAC World Conference, Seoul, Korea, 2008.

[C5] – Giuseppe Franzé, Alessandro Casavola, Domenico Famularo, Emanuele Garone, An off-line MPC strategy for nonlinear systems based on SOS programming, International Workshop on Assessment and Future Directions on NMPC, September 5-9, Pavia, Italy, 2008.

[C6] – Alessandro Casavola, Emanuele Garone, Adaptive actuators allocation strategies in overactuated networked control systems, 2nd International Workshop on Networked Control Systems: Tolerant to Faults, November 23-24, Rende, Italy, 2006.

[C7] – Alessandro Casavola, Emanuele Garone, Adaptive actuators allocation for fault tolerant overactuated autonomous vehicles, NATO Research and Technology Organisation (RTO) Applied Vehicle Technology (AVT) Panel Workshop UAV Design Processes / Design Criteria for Structures, May 14-18, Florence, Italy, 2007.

[C8] – Alessandro Casavola, Emanuele Garone, Adaptive Fault Tolerant Control Allocation Strategies for Autonomous Overactuated Vehicles, NGCUV 2008: IFACWorkshop on Navigation, Guidance and Control of Underwater Vehicles, April 8-10, Killaloe, Ireland, 2008.

[C9] – Alessandro Casavola, Emanuele Garone, Enhancing the Actuator Fault Tolerance in Autonomous Overactuated Vehicles via Adaptive Control Allocation, 5th International Symposium on Mechatronics and Its Applications (ISMA08), May 27-29, Amman, Jordan, 2008.

[C10] – Alessandro Casavola, Emanuele Garone, Adaptive fault tolerant actuator allocation for overactuated plants, 26th American Control Conference, July 11-13, New York, NY, 2007. Best Session Presentation

[C11] – Emanuele Garone, Bruno Sinopoli, Andrea Goldsmith, Alessandro Casavola, LQG Control For Distributed Systems Over TCP-like Erasure Channels, 46th IEEE Conference on Decision and Control, December 10-11, New Orleans, LO, USA, 2007 IEEE CDC **Best Student Paper Award Finalist**

[C12] – Emanuele Garone, Bruno Sinopoli, Alessandro Casavola, Communication Protocols for Optimal Control Over Lossy Networks 45th annual Allerton Conference on Communication, Control and Computing, September 26-28, Monticello, IL, USA, 2007

[C13] – Emanuele Garone, Bruno Sinopoli, Alessandro Casavola, LQG Control Over Multi-channel TCP-like Erasure Networks With Probabilistic Packet Acknowledgements 47th IEEE Conference on Decision and Control, December 10-11, Cancun, Mexico, 2008.

- [C14] – Emanuele Garone, Roberto Naldi, Alessandro Casavola, Emilio Frazzoli Cooperative path planning for a class of carrier-vehicle systems, 47th IEEE Conference on Decision and Control, December 10-11, Cancun, Mexico, 2008.
- [C15] – Alessandro Casavola, Domenico Famularo, Giuseppe Franzé, Emanuele Garone, An Off-line MPC Scheme for discrete-time Linear Parameter Varying systems, European Control Conference 2009 (ECC09), 23-26 August, Budapest, Hungary, 2009.
- [C16] – Emanuele Garone, Roberto Naldi, Emilio Frazzoli, Discontinuous Control Systems for Systems Subject to Measurement Noise, European Control Conference 2009 (ECC09), 23-26 August, Budapest, Hungary, 2009.
- [C17] – Emanuele Garone, Francesco Tedesco, Alessandro Casavola, Distributed Coordination-By-Constraint Strategies for Networked Control Systems, 1st IFAC Workshop on Estimation and Control of Networked Systems, Venice, Italy, 2009
- [C18] Emanuele Garone, Francesco Tedesco, Alessandro Casavola, Steady-State Command Governor Strategies for Constrained Linear Systems, 8th IFAC Symposium on Nonlinear Control Systems (Nolcos), Bologna, Italy, pp. 1023-1028, 2010.
- [C19] Emanuele Garone, Francesco Tedesco, Alessandro Casavola, Distributed Coordination Strategies for Interconnected Multi-Agent Systems, 8th IFAC Symposium on Nonlinear Control Systems (Nolcos), Bologna, Italy, pp. 403-408, 2010.
- [C20] Emanuele Garone, Roberto Naldi, Emilio Frazzoli, Alessandro Casavola. Cooperative Path Planning for a Class of Carrier-Vehicle Systems, 8th IFAC Symposium on Nonlinear Control Systems (Nolcos), Bologna, Italy, pp. 969-974, 2010.
- [C21] Emanuele Garone, Roberto Naldi, Emilio Frazzoli, Alessandro Casavola. Cooperative Mission Planning for a Class of Carrier-Vehicle Systems. 49th IEEE Conference on Decision and Control (CDC), pp. 1354-1395, 15-17 December, Atlanta, GA, USA, 2010.
- [C22] Yilin Mo, Emanuele Garone, Bruno Sinopoli, Alessandro Casavola. Sensor Scheduling for Energy Efficient Estimation in Multi-Hop Wireless Sensor Networks. 49th IEEE Conference on Decision and Control (CDC), pp. 1354-1395, 15-17 December, Atlanta, GA, USA, 2010.
- [C23] Yilin Mo, Emanuele Garone, Bruno Sinopoli, Alessandro Casavola. False Data Injection Attacks for State Estimation in Cyber-Physical Systems. 49th IEEE Conference on Decision and Control (CDC), pp. 1354-1395, 15-17 December, Atlanta, GA, USA, 2010.
- [C24] Luca Parolini, Emanuele Garone, Bruno Sinopoli, Bruce H. Krogh, A Hierarchical Approach to Energy Management in Data Centers. 49th IEEE Conference on Decision and Control (CDC), pp. 1354-1395, 15-17 December, Atlanta, GA, USA, 2010.
- [C25] Alessandro Casavola, Giuseppe Franzé, Emanuele Garone, Francesco Tedesco, Distributed Coordination-by-Constraint Strategies in Networked Multi-Area Power Systems. IEEE ISIE 2011, Gdansk (Poland), 2011
- [C26] Alessandro Casavola, Emanuele Garone, Francesco Tedesco, Distributed Reference Management Strategies for a Networked Water Distribution System. IFAC World Congress, 2011.
- [C27] Alessandro Casavola, Emanuele Garone, Francesco Tedesco, Distributed Supervisory Strategies for Multi-agent Networked Systems, "COSY 2011", Ohrid, (Macedonia), 16-20 Settembre, 2011
- [C28] Alessandro Casavola, Emanuele Garone, Francesco Tedesco, A Liveliness Analysis of a Distributed Constrained Coordination Strategy for Multi-Agent Linear Systems, 50th IEEE

Conference on Decision and Control and European Control Conference (CDC-ECC), 12-15 Dec., Orlando, Florida, USA, 2011.

[C29] Alessandro Casavola, Emanuele Garone, Francesco Tedesco, Distributed Coordination-by-Constraint Strategies for Multi-agent Networked Systems, 50th IEEE Conference on Decision and Control and European Control Conference (CDC-ECC), 12-15 Dec., Orlando, Florida, USA, 2011.

[C30] Alessandro Casavola, Emanuele Garone, Francesco Tedesco, Improved Feed-Forward Command Governor Strategies for Discrete-time Time-Invariant Linear Systems, 50th IEEE Conference on Decision and Control and European Control Conference (CDC-ECC), 12-15 Dec., Orlando, Florida, USA, 2011.

[C31] Andrea Tilli, Emanuele Garone, Matteo Cacciari, Andrea Bartolini, Thermal models characterization for reliable temperature capping and performance optimization in Multiprocessor Systems on Chip, American Control Conference (ACC), 27-29 June 2012, Montreal, Canada, 2012.

[C32] Francesco Tedesco, Alessandro Casavola, Emanuele Garone, Distributed Command Governor Strategies for Constrained Coordination of Multi-Agent Networked Systems, American Control Conference (ACC), 27-29 June 2012, Montreal, Canada, 2012.

[C33] Ylin Mo, Emanuele Garone, Alessandro Casavola, Bruno Sinopoli. Stochastic sensor scheduling in Wireless Sensor Networks with general graph topology , American Control Conference (ACC), 27-29 June 2012, Montreal, Canada, 2012.

[C34] Francesco Tedesco, Alessandro Casavola, Emanuele Garone, A distributed parallel command governor strategy for the coordination of multi-agent networked systems, Nonlinear Model Predictive Control 2012 (NMPC'12), August 23 - 27, Noordwijkerhout, the Netherlands, 2012.

[C35] Roberto Naldi, Andrea Gasparri, Emanuele Garone, Cooperative Pose Stabilization of an Aerial Vehicle through Physical Interaction with a Team of Ground Robots, IEEE Multi-conference on Systems and Control, 3-5 October, Dubrovnik, Croatia, 2012

[C36] Francesco La Monaca, Emanuele Garone, Domenico Grimaldi, Alfonso Nastro, Localized fine accuracy synchronization in Wireless Sensor Network based on consensus approach, IEEE Instrumentation and Measurement Technology Conference (I2MTC), 13-16 May, Graz, Austria, 2012

[C37] Roberto Ambrosino, Emanuele Garone. Robust Stability of Linear Uncertain Systems through Piecewise Quadratic Lyapunov Functions Defined Over Conical Partitions, IEEE 51st Annual Conference on Decision and Control (CDC), Maui, Hawaii, pp. 2872-2877, 2012.

[C38] Roberto Ambrosino, Emanuele Garone, Marco Ariola, Francesco Amato, Piecewise Quadratic Functions for Finite-Time Stability Analysis, IEEE 51st Annual Conference on Decision and Control (CDC), Maui, Hawaii, USA, pp. 6535-6540, 2012.

[C39] Emanuele Garone, Jean-François Determe, Roberto Naldi, A Travelling Salesman Problem for a Class of Heterogeneous Multi-Vehicle Systems, IEEE 51st Annual Conference on Decision and Control (CDC), Maui, Hawaii, USA, pp. 1166-1171, 2012.

[C40] Francesco Tedesco, Alessandro Casavola, Emanuele Garone, A Parallel Distributed Coordination-By-Constraint Strategy for Multi-Agent Networked Systems, IEEE 51st Annual Conference on Decision and Control (CDC), Maui, Hawaii, USA, pp. 284-289, 2012.

[C41] Yilin Mo, Bruno Sinopoli, Ling Shi, Emanuele Garone, Infinite-Horizon Sensor Scheduling for Estimation Over Lossy Networks, IEEE 51st Annual Conference on Decision and Control (CDC), Maui, Hawaii, USA, pp. 3317-3322, 2012.

[C42] Francesco Lamonaca, Andrea Gasparri, Emanuele Garone, Wireless Sensor Networks Clock Synchronization with Selective Convergence Rate. The 2013 IFAC Intelligent Autonomous Vehicles Symposium Gold Coast, 26-28 June 2013.

[C43] Emanuele Garone, Andrea Gasparri, Francesco Lamonaca, Clock Synchronization for Wireless Sensor Network with Communication Delay, American Control Conference, Washington, DC, USA, June 17-19 2013.

[C44] Yilin Mo, Emanuele Garone, Bruno Sinopoli, LQG Control with Markovian Packet Loss, European Control Conference, Zurich, Switzerland, July 17-19, 2013.

[C45] Luigi D'Alfonso, Emanuele Garone, Pietro Muraca, Paolo Pugliese. On the use of inclinometers in the PnP problem, European Control Conference, Zurich, Switzerland, July 17-19, 2013.

[C46] Luigi D'Alfonso, Emanuele Garone, Pietro Muraca, Paolo Pugliese, P3P and P2P Problems with Known Camera and Object Vertical Directions, European Control Conference, Plataanias-Chania, Crete, Greece, June 25-28, 2013.

[C47] Luigi D'Alfonso, Emanuele Garone, Pietro Muraca, Paolo Pugliese, On the use of IMUs in the PnP Problem, 2014 IEEE International Conference on Robotics and Automation, 2014.

[C48] Ilya V. Kolmanovsky, Emanuele Garone, Stefano Di Cairano, Reference and Command Governors: A Tutorial on Their Theory and Automotive Applications. **Tutorial Paper**, American Control Conference, Portland, 2014.

[C49] Marco Nicotra, Emanuele Garone, Roberto Naldi, Lorenzo Marconi. Nested Saturation Control of an UAV carrying a suspended load. American Control Conference, Portland, 2014.

[C50] Alessandro Casavola, Emanuele Garone, Francesco Tedesco. Scalability and Performance Improvement of Distributed Sequential Command Governor Strategies via Graph Colorability Theory. IFAC WC, Cape Town, South Africa, 2014.

[C51] Marco M. Nicotra, Roberto Naldi, Emanuele Garone, Taut Cable Control of a Tethered UAV. IFAC WC, Cape Town, South Africa, 2014. **Honourable mention at the IFAC Young Author Prize**

[C52] Sophie Eeckhout, Marco M. Nicotra, Roberto Naldi, Emanuele Garone, Nonlinear Control of an Actuated Tethered Airfoil, 22nd IEEE Mediterranean Control Conference, Palermo, Italy, 2014.

[C53] Celine Depouhon, Matteo Masciotta, Emanuele Garone, Andrea Gasparri, Swarm aggregation with a multi-robot system composed of three robotic units: a closed form analysis, 22nd IEEE Mediterranean Control Conference, Palermo, Italy, 2014.

5.2.4 Conferences without proceedings :

[C54] – Emanuele Garone, LQG optimal control over erasure channel: protocols and solutions. LIDS Student Conference, MIT, Cambridge, Massachusetts (USA), January 31 - February 2, 2007.

[C55] – Alessandro Casavola, Giuseppe Franzé, Emanuele Garone. Coordination Strategies for Networked Control Systems: A Power System Application. Convegno SIDRA, Vicenza, Italy, September 2008.

[C56] – Emanuele Garone, Bruno Sinopoli, Alessandro Casavola. LQG Control over lossy networks with probabilistic packet acknowledgements. Convegno SIDRA, Vicenza, Italy, September 2008.

[C57] – Alessandro Casavola, Emanuele Garone, Francesco Tedesco. A Distributed Command Governor Approach for Constrained Networked Control Systems. Convegno SIDRA, Siracusa, Italy, September 2009.

[C58] – Alessandro Casavola, Emanuele Garone, Francesco Tedesco. A distributed coordination-by-constraints approach for setpoint management of interconnected multi-agent system. 6th Spain, Italy and Netherlands meeting on Game Theory (SING 6), Palermo, July 2010.

[C59] Francesco Tedesco, Alessandro Casavola, Emanuele Garone, Distributed Coordination-by-Constraint, Strategies for Multi-Agent Networked Systems, Automatica.it (Italian Control Researcher Conference), 3-5 September Benevento, Italy, 2012.

[C60] Jean-François Determe, Emanuele Garone, Roberto Naldi, Cooperative planning of a class of heterogeneous multi-vehicle systems, 31st Benelux Meeting on Systems and Control, 27-29 March, Heijen, The Netherlands 2012.

[C61] Luigi D'Alfonso, Emanuele Garone, Pnp Problem with IMU, 32nd Benelux Meeting on Systems and Control, Belgium 2013.

[C62] Marco M. Nicotra, Roberto Naldi, Emanuele Garone, Constrained Control of Tethered Unmanned Aerial Vehicles, 33rd Benelux Meeting on Systems and Control, The Netherlands 2014.

5.3 Invited Talks

[T1] - December 12nd, 2006, Adaptive fault tolerant actuator allocation for overactuated plants, Dept of EECS, Cory Hall, University of California at Berkeley (U.C. Berkeley), Berkeley, CA, USA.

[T2] - December 10th, 2007, LQG Optimal Control For Distributed Systems Over TCP-like Erasure Channels, LIDS, Stata Center Building 32, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA.

[T3] - December the 11st, 2009, Steady State Command Governor (SS-CG) and Distributed SS-CG, Casy – Alma Mater Studiorum - University of Bologna, Bologna, Italy.

[T4] - February the 25th, 2010, Feed-forward Reference Management and Distributed Supervision for Interconnected Linear Systems, ECE Department- Carnegie Mellon University (CMU), Pittsburgh, PA, USA.

[T5] - May the 10th, 2012, Distributed Supervision Strategies for Constrained Multi-agent Systems, IRIDIA, Université Libre de Bruxelles, 87 av. Adolph Buyl, Brussels, Belgium.

[T6] - September the 12th, 2014, Distributed Supervision Strategies for Constrained Multi-agent Systems, Technical University Darmstadt, Department of Computer Science Darmstadt, Germany.

[T7] – November the 6th, 2014, Distributed Supervision Strategies for Constrained Multi-agent Systems, Institute for Systems Theory and Automatic Control University of Stuttgart, Germany

[T8] – December the 4th, 2014, It's not MPC ! Explicit Reference Governor for Constrained Systems, LIDS, Stata Center Building 32, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

[T9] – December the 5th, 2014, It's not MPC ! Explicit Reference Governor for Constrained Systems, Northeastern University, Boston, MA, USA

[T10] – December the 9th, 2014, It's not MPC ! Explicit Reference Governor for Constrained Systems, ECE Department- Carnegie Mellon University (CMU), Pittsburgh, PA, USA.

[T11] – January the 30th, 2015, It's not MPC ! Explicit Reference Governor for Constrained Systems, EE Department- University of Melbourne, Melbourne, Australia.

5.4 Other Scientific Activities:

Stable research collaborations with:

- University of Calabria, Rende (CS), Italy
- Alma Mater Studiorum – University of Bologna, Bologna (BO), Italy
- Curtin University – Perth, Australia
- University of Roma 3 - Rome, Italy
- University of Michigan, USA

- University Parthenope – Naples, Italy
- Carnegie Mellon University, Pittsburgh, PA, USA
- Massachusetts Institute of Technology, Cambridge, MA, USA
- University of Melbourne – Melbourne, Australia

VI. Research Supervision Activities

October 2009 - “Young Researcher Grant” for the research project “*Path Planning per Veicoli Eterogenei Cooperanti*” (Path Planning for Heterogeneous Cooperating Vehicles). The project resulted to be the first financed project in the “Industrial and Computer Engineering” area.

July 2011- December 2011 – Supervision of a Visiting Phd Student. (Matteo Cacciari) from University of Bologna on the subject “*Model Predictive Control for the thermal control of a multi-core processor*”

July 2011 – Supervision of a Bourse D’Initiation a la Recherche (Jean-François Determe) on the subject “*Path Planning for a class of heterogeneous network of vehicles*”

January 2012 – Supervision of a 6 Month Post-Doc Grant (Francesco La Monaca) financed by the Italian Electric Measures Association (GMEE) on the subject “*Synchronization of Wireless Sensor Network based on consensus*”

March 2012- March 2013 – Supervision of a Visiting Phd Student. (Luigi D’Alfonso) from University of Calabria on the subject “*Pose Estimation for Heterogeneous Vehicles: Fusing IMU and Camera information*”

October 2012 - co-Supervision of a 4 years Phd Student (Hao Jingjing), Université Libre de Bruxelles “*Sensor fault detection and localisation in wireless sensor networks: application to structural health monitoring*”

January 2013 - Supervision of a 4 years Phd Student (Marco Nicotra), Université Libre de Bruxelles on the project CAT-AVIATOR. FRIA grant.

October 2014 - Supervision of a Phd Student (Tam Nguyen), Université Libre de Bruxelles.

VII. Grants and Organization Activities

7.1 Grants

2009 - “Young Researcher Grant” for the research project “Path Planning for Heterogeneous Cooperating Vehicles”. First winner classified in the “Industrial and Computer Engineering” area.

Ref: http://www.unical.it/portale/portalemedia/2009-10/DR_VINCITORI_GiovaniRicercatori_20091.doc –

Role: Principal Investigator

2011 – (FER – ULB) – “For the construction of a testbench for the study of the control of a bi-stable buckled beam” – Role: Principal Investigator

2013 – FRIA Grant “CAT-AVIATOR” on the control of tethered aerial vehicles – **Role:** Supervisor

2014 – (FER – ULB) – “For the construction of an UAV laboratory and of a prototype of tethered UAV” – Role: Principal Investigator

2014 – BATWAL (Excellence program of the Waloon Region) – for the construction and control of a new generation of batteries - Role: Participant

7.2 Organization Activities

7.2.1 Conferences Organization

December 2014 – Organizer of the one day Workshop “Reference and Command Governors: A Tutorial on Their Theory and Automotive Applications” at the IEEE Control and Decision Conference, Los Angeles, USA, 2014.

July 2014 – Organizer of the Tutorial Session “Reference and Command Governors: A Tutorial on Their Theory and Automotive Applications” at the American Control Conference Portland, USA, 2014.

March 2013 - Organizing Committee of the “33rd Benelux Meeting on Systems and Control”, 26th -28th of March 2013.

November 23,24, 2006 - Organizing Committee of the 2nd International Workshop on Networked Control Systems: Tolerant to Faults – University of Calabria, Rende Italy.

7.2.2 Technical Committees

2011-Now - Member of the **IEEE CSS Technical Committee** on Systems with Uncertainty (TC-SU),

2012-Now – Active Member of the **IFAC Technical Committee TC 2.5** on Robust Control and Education liaison with

VIII. Brief presentation of current active research topics and future plans

My research activity and interest are focusing mostly on the following fields :

- 1) Supervision and Control of Constrained Systems
- 2) Remote Control and Estimation through unreliable networks
- 3) Networks of heterogeneous vehicles

The above topics will be briefly detailed.

Supervision and Control of Constrained Systems: Since the beginning of my academic carrier, my main research topic was the control and the supervision of constrained system. During my PhD my main interest concerned the development of Model Predictive Control schemes. In particular during my PhD I focused on the development of MPC schemes for Linear Parameter Varying (LPV) systems subject to saturation constraints. In [J1], [J10], [J11], [C1]-[C3], [C15]. Several MPC algorithms have been proposed with clear improvement of the control performance w.r.t. the state of the art. Further research directions in the field of MPC regarded the use of Sum of Squares based convex optimization for the development of MPC schemes for non linear polynomial systems [BC1], [C4], [C5]. More recently my attention focused on the development of reference management schemes (Reference Governor/Command Governor). My early works on the subject explored the possibility to use of Command Governor schemes for the reference management of power networks [J2], [C19],[C25]. This kind of application triggered the development of decentralized reference governor schemes [BC3], [J16], [C17], [C19], [C25]-[C28], [C32], [C34], [C40], [C50]. In these papers several distributed reference governors schemes have been outlined and their main properties pointed out. Particularly relevant are in my opinion [J16], [C28] where the links between the existence of non-Pareto Nash equilibria and the geometry of the constraints have been carefully analysed. A further recent and relevant contribution can be found in [C50] where graph colorability theory has proved to be a very important tool to improve the performances of distributed schemes. For what regard centralized reference/command governor scheme has been developed several other contribution have been given in recent years. In [J6][J12][C18][C30], reference governors have been developed that perform reference management even in absence of sensors (sensorless supervision). Beside the completion of the aforementioned activities, my current research on the field is focusing on the development of low-computational burden reference governor schemes making use of continuous time optimization ideas and their application to UAV [C49],[C51],[C52]. Such activities are very promising and some of the related early results lead to a Honourable mention at the 2014 IFAC World Congress Young Author Prize. It is worth mentioning that, together with some colleagues, I am currently involved in a series of surveying and dissemination activities concerning reference/command governor schemes. I have recently published the only survey paper on Reference/Command Governor schemes [C48] and presented it as a tutorial at the ACC 2014. During CDC 2015 a workshop on the subject has been organized as well. A journal survey on the subject is currently in preparation.

Remote Control and Estimation through unreliable networks: The term Cyber-Physical Systems (CPS) refers to the embedding of information and telecommunication technologies into physical systems, with the purpose of monitoring and controlling them at a fine temporal and spatial scale. Several industries, such as automotive, process control, energy and built environments will be able to monitor and improve their performance while being safer, more robust and energy efficient. Closing the loop around CPS raises numerous issues. Unlike the classical control paradigm, where components, i.e. sensors, controllers and actuators, are often co-located and therefore connected via dedicated channels (e.g. serial cables), spatially

distributed systems will make use of general purpose networks to communicate and exchange information. As a consequence the communication introduces uncertainty as data may get delayed or lost in the communication. My research activity in this field was mainly devoted to the problem of control through erasure channel (channel in which packets may be lost accordingly to a Bernoulli variable). In particular in [C11] and [J8] we considered the optimal LQG control for Multi-Input-Multi-Output systems in the presence of TCP-like acknowledgment mechanism. In such a case it was possible to prove that the optimal LQG control is linear and that separation principle holds true. In [C12], [B2], [J3] we focused on the same problem in the case of “Quasi-TCP-Like” acknowledgment mechanisms, i.e. in the case the acknowledgment between actuators and controller is stochastic. There we showed that separation principle does not hold anymore and the optimal control is in general not linear. Moreover we showed that, in those cases in which the optimal control is linear, the convergence regions present smooth transitions between the TCP-like case and the UDP-like case. Further research directions I’m working in this field regard optimal sensor selection [J9], [C22],[C33],[C41], synchronization [C36][J14] and security topics (detection of malicious attacks) [C23].

Networks of interacting heterogeneous robots: The complexity of many applications envisioned for future autonomous vehicle networks, ranging from planetary exploration to rescue missions, requires a broad range of capabilities for individual units---ranging from air, ground or sea mobility, to sophisticated multi-modal sensor suites and actuation devices---which cannot be implemented on a single platform class. Rather, it may be necessary to coordinate several specialized units to attain complex objectives in a reliable, timely, and efficient fashion. While considerable progresses have been made on cooperative control of networks of homogeneous vehicles, heterogeneous networks are still relatively poorly understood. The framework envisioned stirs the interdependence of the robot functionalities to enhance the overall capabilities of the integrated system in terms of sensing (extended perception), achievable tasks (extended action) and reciprocal support (refueling, repairing, transportation). In [C14] a preliminary work has been carried out on a very simple network of heterogeneous vehicles, arising from the combination of (i) a slow autonomous surface carrier (typically a ship) with long range operational capabilities and (ii) a faster vehicle (typically a helicopter, an UAV or an offshore vehicle) with a limited operative range. The carrier is able to transport the faster vehicle, as well as to deploy, recover, and service it. In that paper in particular we pointed out the closed form minimum time combined trajectory for the case 1 and 2 points have to be visited. Further developments have been published [C20], [C21],[C39], [J7],[J13] and regard the determination, via convex optimization procedures, of the optimal path to visit a certain number of point. Moreover we dealt with some strategic problems like Travelling Salesman Problem and the determination of the optimal take-off – landing sequence. More recently my research activity is regarding the study of the physical interaction between aerial vehicle and ground robots that are linked through cable and actuated winches. The first work in this direction was [C35] where an aerial vehicle was connected to a team of ground robots for the sake of obtaining full actuation. This latter topic is closely connected with some of my previous work in the field of optimal control allocation [J4], [C6]-[C10]. More recently my research focused on understanding the constrained control of tethered aerial vehicles [C49], [C51], [C52] using nonlinear control theory in conjunction with reference management techniques.