

Curriculum Vitae

Alessandro D’Innocenzo, PhD

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Research Interests

Theory: Hybrid Systems, Timed Automata, Approximate abstractions of dynamical systems, Observability, Diagnosability, Model Checking, Decentralized routing control.

Applications: Air Traffic Management Systems, Wireless Sensor Networks, Wireless Industrial Control.

Education

- **April 2nd, 2007:**
Accomplishment of the International Curriculum Option of Doctoral Studies in Hybrid Control for Complex, Distributed and Heterogeneous Embedded Systems
(<http://www.piaggio.cci.unipi.it/ICO/ICO.htm>).
- **January 29th, 2007:**
PhD Degree in Electrical Engineering and Computer Science, Department of Electrical Engineering and Computer Science, University of L’Aquila, Italy.
Title: Observability and Temporal Properties of Hybrid Systems: Analysis and Verification.
Advisor: Prof. M.D. Di Benedetto.
PhD Commission: Prof. M.D. Di Benedetto, Prof. M.G. Di Benedetto, Prof. N. Benvenuto, Prof. G.J. Pappas.
- **From November 2003 to January 2007:**
PhD student at the Department of Electrical Engineering and Computer Science, University of L’Aquila, Italy.
- **July 21st, 2000:**
Laurea Degree in Electronic Engineering, Department of Electrical Engineering, University of L’Aquila, Italy. Full mark 110/110 *cum laude*.
- **June 1994:**
High School Diploma, Liceo Scientifico F. Masci, Chieti, Italy. Full mark 60/60.

Working Positions

Since March 2008

Post-Doc: *Department of Electrical and Systems Engineering, University of Pennsylvania.*
Prof. G.J. Pappas.

Since January 2007

Post-Doc: *Centre of Excellence DEWS, University of L'Aquila.*
Prof. M.D. Di Benedetto.

July 2005 – December 2006

Consultant: *Centre of Excellence DEWS, University of L'Aquila (www.diel.univaq.it/dews).*
HYCON Project, *Hybrid Control: Taming Heterogeneity and Complexity of Networked Embedded Systems*, IST, Network of Excellence, contract n.511368.

January 2003 – December 2004

Consultant: *Centre of Excellence DEWS, University of L'Aquila.*
Distributed Control and Stochastic Analysis of Hybrid Systems Supporting Safety Critical Real-Time Systems Design Project IST-2001-32460 HYBRIDGE.
(<http://www.nlr.nl/public/hosted-sites/hybridge>).

May – June 2004

Consultant: *Department of mathematics "Federigo Enriques", University of Milano.*
Topological interpretations of the transformations of a rectangle: cylinder, torus, Moebius strip, projective plan. (<http://matemilano.mat.unimi.it>).

March 2002 – December 2003

Consultant: *Digital Video S.r.l., Roma (www.toonz.com).*
Computer Graphics Programming.

October 2000 – December 2004

Employee: *Marconi, Chieti (www.marconi.com).*
Communication Systems (GSM and UMTS): Software Engineer.

September 2000

Post-thesis stage: *Telecom Italia Lab, Torino.*
Voice over IP – Circuit network gateway.

September 1999 – July 2000

Experimental Thesis: *Telecom Italia Lab, Torino (www.telecomitalialab.com/ITA/index.htm).*
Voice over IP – Circuit network gateway.

Awards

- 2005: "Fondazione Filaurò" Scholarship, University of L'Aquila, Italy.
- 1994 - 1999: Student scholarships, University of L'Aquila, Italy.

Projects

Present:

- **iFly**, *Safety, complexity and responsibility based design and validation of highly automated air traffic management*, Project STREP FP6-2005-AERO-4 (<http://ifly.nlr.nl/>).
- **PRIN05**, *Forecast and control systems for landslides: local sensor distributed networks integration, monitoring techniques and hydro-geological models*.
- **HYCON**, *Hybrid Control: Taming Heterogeneity and Complexity of Networked Embedded Systems*, IST, Network of Excellence, contract n.511368 (<http://www.ist-hycon.org/>).

Former:

- **HYBRIDGE**, *Distributed control and stochastic analysis of hybrid system supporting safety critical real-time systems design*, Project IST-2001-32460 (<http://www.nlr.nl/public/hosted-sites/hybridge>).
- **“Toonz”** software (computer graphic algorithms), Digital Video (www.toonz.com).
- **UMTS** network system (protocol simulators) (www.marconi.com).
- **GSM-R** terminal (firmware programming) (www.marconi.com).

Foreign Languages

English and German.

Visiting Positions

November 26th – December 14th 2007

November 9th – December 12th 2006

January 22nd – February 11th 2006

Visitor at the Department of Electrical and Systems Engineering of the University of Pennsylvania (Philadelphia), in the research team of Prof. George J. Pappas.

November 28th – December 9th 2005

Visitor at the EECS Department (<http://www.eecs.berkeley.edu/>) of the University of California Berkeley, in the research team of Prof. Shankar Sastry. (<http://robotics.eecs.berkeley.edu/~sastry/>).

January – June 2005

Visiting Scholar at the Department of Electrical and Systems Engineering (<http://www.seas.upenn.edu/ese/index.html>) of the University of Pennsylvania (Philadelphia), in the research team of Prof. George J. Pappas (<http://www.seas.upenn.edu/~pappasg>).

November 2003

Visitor of Dr. H. Blom at the National Aerospace Laboratory (NLR), Amsterdam, The Netherlands (<http://www.nlr.nl/>).

Editorial Activities

Since 2005, reviewer for international journals as International Journal of Robust and Nonlinear Control, International Journal of Control, Automatica, IEEE Transactions on Automatic Control, and for international conferences as IEEE Conference on Decision and Control, American Control Conference, IFAC Conferences, IEEE International Conference on Communications.

Attended Graduate Courses

- **CIRA Summer Graduate School on Non-Linear Control and Adaptive Control, 11-16 July 2005**, Bertinoro, Italy.
- **Spring Semester Graduate Courses, January - April 2005**, Department of Electrical and Systems Engineering, University of Pennsylvania, Philadelphia:
 - **Theory of Computation** (Prof. R. Alur).
 - **Advanced Geometric Methods in Computer Science** (Prof. J. Gallier).
 - **Topics in Logic: Finite Model Theory & Descriptive Complexity** (Prof. S. Weinstein).
 - **Stochastic processes** (Prof. R. Pemantle).
- **Summer Pedagogical School on Hybrid Systems, 22-24 September 2004**, University of Patras, Greece.
- **Air Traffic Control familiarization course, March 2004**, Eurocontrol Experimental Centre (http://www.eurocontrol.int/corporate/public/subsite_homepage/index.html), Paris.

Teaching Activities

Teaching assistant in the following classes given at the Department of Electrical Engineering and Computer Science, University of L'Aquila, Italy:

- **Analisi e controllo di sistemi ibridi** (Analysis and control of hybrid systems), Prof. M.D. Di Benedetto. Years 2006 – 2007.
- **Controlli Automatici I** (Control theory of linear systems I), Prof. S. Di Gennaro. Years 2006 – 2007.
- **Controlli Automatici II** (Control theory of linear systems II), Prof. Di Benedetto. Years 2006 – 2007.

He has been co-tutor in the following Bachelor Theses:

- L. Catenaro. **Sistemi ibridi ed applicazione ad uno scenario di Air Traffic Management**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila, April 2007.
- A. Mastroberardino. **Analisi delle interfacce tra nodi Mica2 e attuatori di controllo per mini cars**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila, April 2007.
- K. Palluzzi. **Analisi di un microcontrollore per mini cars**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila, April 2007.
- M. Di Giorgio. **Realizzazione di una Classe in C++ per la Costruzione Automatica di un Osservatore per Sistemi ad Eventi Discreti**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila, December 2006.
- E. Iacobucci. **Diagnosi e osservazione di automi temporizzati**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila, July 2006.

- G. Fiore. **Controllo di luminosità con disturbo per reti di sensori wireless**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila, April 2006.
- M. Pastore. **Analisi e controllo di un pendolo inverso su rete wireless**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila, April 2006.
- V. Ercoli. **Controllo di luminosità per reti di sensori wireless**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila, February 2006.
- M. Passerini. **Diagnosi di guasti in reti Wireless di sensori**. Bachelor Thesis (in Italian), Department of Electrical Engineering and Computer Science, University of L'Aquila. December 2005.

Participation to International Conferences

46th IEEE Conference on Decision and Control 2007. (speaker)
New Orleans, LA, USA. 12-14 December 2007.

Hybrid Systems: Computation and Control. (speaker)
Pisa, Italy. April 3-5, 2007.

45th IEEE Conference on Decision and Control 2006.
San Diego, CA, USA. 13-15 December 2006.

CTS-HYCON Workshop on Nonlinear and Hybrid Control. (speaker)
Université Paris Sorbonne (Paris IV), Paris, France. July 10-12, 2006.

2nd IFAC Conference on Analysis and Design of Hybrid Systems. (speaker)
Alghero, Sardinia, Italy. June 7-9, 2006.

Hybrid Systems: Computation and Control. (speaker)
Santa Barbara, California. March 29-31, 2006.

44th IEEE Conference on Decision and Control and European Control Conference ECC 2005. (speaker)
Seville, Spain. 12-15 December 2005.

Participation to National Conferences

Convegno CIRA 2005. Tropea, 8-10 Settembre 2005.

Convegno CIRA 2004. Villasimius, 16-18 Settembre 2004.

Seminars

January 31st 2008

Finite Abstractions of Hybrid Automata, given at the KTH School of Electrical Engineering, Stockholm, Sweden.

November 19th 2007

Observability and diagnosability of hybrid systems, given at the IASI-CNR Institute (Istituto di Analisi dei Sistemi ed Informatica "A. Ruberti"), Rome.

September 8th 2006

A Theoretical Framework for Control over Wireless Networks, given at the NEWCOM-HYCON Technical Workshop on Embedded Systems and Infrastructureless Networks, Laboratoire des Signaux et Systemes, Centre National de la Recherche Scientifique, Supelec.

June 20th 2006

On the observability problem for hybrid systems, given at the Laboratoire des Signaux et Systemes, Centre National de la Recherche Scientifique, Supelec. Gif-sur-Yvette, France.

May 22nd 2006

A Theoretical Framework for Control over Wireless Networks, given at the NEWCOM-HYCON Technical Workshop on Embedded Systems and Infrastructureless Networks, Florence, Italy

February 16-17 2006

Modeling of adaptive behaviors in control over wireless networks, given at the Hycon WP4d meeting, PARADES, Rome, Italy

February 8th 2006

Observability of Hybrid Automata by Abstraction, given at the Department of Electrical and Systems Engineering of the University of Pennsylvania (Philadelphia)

December 6th 2005

Observability of Hybrid Automata by Abstraction, given at the EECS Department of the University of California Berkeley.

February 21st 2005

Observability of Hybrid Systems and Application to Air Traffic Management, given at the Grasp Lab, Department of Electrical and Systems Engineering, University of Pennsylvania.

Book chapters

- B1.** A. Abate, A. D'Innocenzo, M.D. Di Benedetto, S. Sastry (2008). **Markov Set-Chains as abstractions of Stochastic Hybrid Systems.** To appear in *Hybrid Systems: Computation and Control 2008*, Lecture Notes in Computer Science.
- B2.** A. Abate, A. D'Innocenzo, G. Pola, M.D. Di Benedetto, S. Sastry (2007). **The Concept of Deadlock and Livelock in Hybrid Control Systems.** In *Hybrid Systems: Computation and Control 2007*, Lecture Notes in Computer Science (short paper).
- B3.** M.D. Di Benedetto, S. Di Gennaro, A.D'Innocenzo (2007). **Diagnosability Verification for Hybrid Automata.** In *Hybrid Systems: Computation and Control 2007*, Lecture Notes in Computer Science (short paper).
- B4.** A. D'Innocenzo, M.D. Di Benedetto, S. Di Gennaro (2006). **Finite horizon observability of Hybrid Automata by Abstraction.** *CTS-HYCON Workshop on Nonlinear and Hybrid Control*. July 10-12 2006. Paris La Sorbonne, International Scientific and Technical Encyclopedia (ISTE).
- B5.** A. D'Innocenzo, M.D. Di Benedetto and S. Di Gennaro (2006). **Observability of hybrid automata by abstraction.** In: *Hybrid Systems: Computation and Control* (J. Hespanha and A. Tiwari, Eds.). Vol. 3927 of Lecture Notes in Computer Science. pp. 169-183. Springer Verlag.
- B6.** E. De Santis, M.D. Di Benedetto, S. Di Gennaro, A. D'Innocenzo, G. Pola. (2005) **Critical Observability of a Class of Hybrid Systems and Application to Air Traffic Management**, 2005, *Lecture Notes on Control and Information Sciences*, Springer Verlag.

Conferences

- C1.** A. D'Innocenzo, M.D. Di Benedetto (2008). **Fault diagnosis in a wireless network.** In Proceedings of the *17th IFAC World Congress*. July 6-8, 2008. Seoul, Korea.
- C2.** A. D'Innocenzo, A.A. Julius, G.J. Pappas, M.D. Di Benedetto, S. Di Gennaro (2007). **Verification of temporal properties on hybrid automata by simulation relations.** In Proceedings of the *46th IEEE Conference on Decision and Control*. December 12-14, 2007. New Orleans, Louisiana, USA.
- C3.** A. D'Innocenzo, A.A. Julius, M.D. Di Benedetto, G.J. Pappas (2007). **Approximate timed abstractions of hybrid automata.** In Proceedings of the *46th IEEE Conference on Decision and Control*. December 12-14, 2007. New Orleans, Louisiana, USA.
- C4.** M.D. Di Benedetto, S. Di Gennaro and A. D'Innocenzo (2007). **Diagnosability Verification for Hybrid Automata and Durational Graphs.** In Proceedings of the *46th IEEE Conference on Decision and Control*. December 12-14, 2007. New Orleans, Louisiana, USA. (invited paper)
- C5.** M.D. Di Benedetto, A. D'Innocenzo, C. Rinaldi, F. Santucci, E. Serra. **Modeling and design of control algorithms over wireless networks.** *IEEE Multi-conference on Systems and Control (MSC)*, October 1-3, 2007. Singapore. (invited paper)
- C6.** M.D. Di Benedetto, A. D'Innocenzo, G. Pola, C. Rinaldi, F. Santucci. **A Theoretical Framework for Control over Wireless Networks.** *17th International Symposium on Mathematical Theory of Network and Systems*. July 24-28, 2006. Kyoto, Japan.
- C7.** M.D. Di Benedetto, S. Di Gennaro, A.D'Innocenzo (2006). **Critical States Detection with Bounded Probability of False Alarm and Application to Air Traffic Management.** *2nd IFAC Conference on Analysis and Design of Hybrid Systems*. Alghero, Sardinia, Italy. June 7-9, 2006.

- C8.** M.D. Di Benedetto, S. Di Gennaro, A.D'Innocenzo (2005). **Error Detection within a Specific Time Horizon and Application to Air Traffic Management.** In *Proceedings of the Joint 44th IEEE Conference on Decision and Control and European Control Conference (CDC-ECC'05)*, Seville, Spain, Dec. 2005, pp.7472-7477.
- C9.** M.D. Di Benedetto, S. Di Gennaro, A. D'Innocenzo (2005). **Critical Observability and Hybrid Observers for Error Detection in Air Traffic Management.** *Joint 2005 International Symposium on Intelligent Control 3rd Mediterranean Conference on Control and Automation (2005 ISIC-MED)*, Limassol, Cyprus, June 27-29, 2005.

Technical Reports

- R1.** M.D. Di Benedetto, S. Di Gennaro, A.D'Innocenzo (2006). **Critical States Detection with Bounded Probability of False Alarm and Application to Air Traffic Management.** Technical Report R.06-86 of University of L'Aquila.
- R2.** M. D. Di Benedetto, S. Di Gennaro, A. D'Innocenzo (2005). **Critical Observability for a Class of Stochastic Hybrid Systems and Application to Air Traffic Management.** *Public Deliverable D7.5*, Project IST-2001-32460 HYBRIDGE, May 30, 2005.
- R3.** M. D. Di Benedetto, S. Di Gennaro, A. D'Innocenzo (2005). **Error Detection within a Specific Time Horizon.** *Public Deliverable D7.4*, Project IST-2001-32460 HYBRIDGE, January 26, 2005.
- R4.** M. D. Di Benedetto, S. Di Gennaro, A. D'Innocenzo (2004). **Situation Awareness Error Detection.** *Public Deliverable D7.3*, Project IST-2001-32460 HYBRIDGE, August 18, 2004.

Theses

- T1.** A. D'Innocenzo. **Observability and Temporal Properties of Hybrid Systems: Analysis and Verification.** *PhD Thesis, January 29th 2007.* Department of Electrical Engineering and Computer Science, University of L'Aquila.
- T2.** A. D'Innocenzo. **Trasmissione di voce su reti IP e valutazione della qualità del servizio (Voice over IP transmission and quality of service evaluation).** *Master Thesis, July 2000.* Department of Electrical Engineering, University of L'Aquila. In Italian.

Programming Languages

Assembly, C++, IDL, JAVA, HTML, PERL, SDL-UML.

Programming Projects

In inverse chronological order:

1. **Vectorization** algorithm of raster images, in C++ (“Toonz” software, Digital Video).
2. **Sweep Boundary** algorithm of a circle along a quadratic curve, in C++, $N \cdot \log N$ complexity (“Toonz” software, Digital Video).
3. **Triangulation** Algorithm of non-simple polygons with non-simple holes (floating coordinates), in C++, $N \cdot \log N$ complexity (“Toonz” software, Digital Video).
4. **Corner Detection** algorithm on an integer array, in C++ (“Toonz” software, Digital Video).
5. Implementation of a **Drag’n’Drop** module in **OLE** environment on a Windows Platform, in C++ (“Toonz” software, Digital Video).
6. **GSM-R** terminal implementation, in embedded C (Marconi).
7. Set up in UNIX environment of the protocol stacks SIGTRAN (SCCP-M3UA-SCTP-IP-AAL5-ATM) and BROADBAND (SCCP-MTP3b-SSCF-SSCOP-AAL5-ATM), in a **UMTS system** (Marconi).
8. Implementation of the **UTMS** protocol **RANAP** (Core Network Side, SGSN) in C++ (Marconi).
9. Automatic Generator of API in language C for the PDUs of protocols implemented in **ASN.1**, in PERL (Marconi).
10. Implementation of a **Gateway H.323** for **Voice over IP**, in C++ (Telecom Italia Lab, Master Thesis).