Marco Tulio Angulo

Address
16 Queensberry St. Apt. 15, Boston, MA. 02215.
☎ 617 784 4691 : bit.ly/1RowaxT
✉ m.anguloballesteros@neu.edu

RESEARCH

My aim is to understand, diagnose and control complex systems by blending control theory, system identification, dynamical systems theory and networks science.

RESEARCH INTERESTS

Diagnosis and control of complex systems • Fundamental limitations in network reconstruction • Interplay between network structure and functionality in complex systems • Optimization of uncertain systems • Performance tradeoffs in the differentiation of noisy signals • Observability and observer design for uncertain systems • Robust control with emphasis on discontinuous algorithms.

PUBLICATION SUMMARY

9 Journal / 12 Conference papers.
106 Citations (h-index 7).

SCIENTIFIC VISITS

2013	*Christos Cassandras*. Center for Information & Systems Engineering Boston University (1 week)
2011 and 2009	*Claude Moog*. Institut de Recherche en Communications et Cybernétique de Nantes, France (1 month per visit)

SKILLS

OPERATING SYSTEMS
Mac OS • Linux

PROGRAMMING
MATLAB • Simulink • LaTeX• C • Mathematica

HARDWARE DESCRIPTION
VHDL

LANGUAGES
Spanish (Native)
English (Proficient)

EDUCATION

HARVARD | Channing Division of Network Medicine
Brigham and Women's Hospital, Harvard Medical School, Boston, MA
2015 – 2016 | Sponsored Staff Collaborator
Project title: *Interplay between structure and dynamics in complex networks*.
Supervision by Prof. Yang-Yu Liu

CCNR | Center for Complex Network Research
Northeastern University, Boston, MA
2015 – 2016 | Postdoctoral Research Associate
2014 – 2015 | Visiting Research Scholar
Project title: *Sensitivity of Complex Networks*.
Supervision by Prof. Albert-László Barabási

UNAM | Universidad Nacional Autónoma de México
Ciudad Universitaria, DF, México
2009 – 2012 | Dr. Eng. (Automatic Control)
Thesis title: *Robustness and fragility in the control and observation of systems with noise and perturbation*.
Supervision by Prof. Leonid Fridman and Prof. Jaime Moreno
2007 – 2009 | M. Eng. (Electrical Engineering, Automatic Control)
Thesis title: *Output-feedback exact finite-time stabilization of disturbed LTI systems*.
Supervision by Prof. Leonid Fridman

UAQ | Universidad Autónoma de Queétaro
Querétaro, México
2002 – 2007 | Bachelors' Degree (Automation, Mechatronic Systems)
Thesis title: *Disturbance Rejection using Iterated Integrals*.
Supervision by Prof. Victor Manuel Hernández

PROFESIONAL EXPERIENCE

FULL TIME PROFESSOR
2012 – 2013 | Faculty of Engineering, UAQ
Course lecturer for *Selected Topics in Nonlinear Control Theory* (graduate level) and *Laboratory of Numerical Methods* (undergraduate level).

DISTINCTIONS

2014	Member of the Mexican **National System of Researchers** (SNI), Level 1
2015	**Scholarship** from the Mexican National Council of Science and Technology
2012	Dr. Eng degree with **summa cum laude**
2010	**Alfonso Caso Medal** to the academic merit, given to the most distinguished graduate of the Master program
2009	Master degree with **summa cum laude**
2007	**Diploma to the Academic Excellence**, given to the most distinguished graduate of the Bachelor program
2007	**Best** Bachelor Thesis
2007	Bachelor degree with **summa cum laude**
2005	**First Prize in the Mechatronic Contest**, first International Engineering Congress

LIST OF PUBLICATIONS

Journals: [1 NatPhys, 2 IJSS, 4 Automatica, 1 JFI, 1 IET]
International Congresses: [5 CDC, 1 IFAC, 2 VSS, 1 CCE, 1 ACC, 1 ADHS, 1 SysTol]
Citations: 106, h-**index**: 7. (Source: Google Scholar [1])

JOURNALS

[1] Marco Tulio Angulo. "Nonlinear extremum seeking inspired on second order sliding modes". In: *Automatica* 57 (2015), pp. 51–55. issn: 0005-1098. doi: http://dx.doi.org/10.1016/j.automatica.2015.04.001. url: http://www.sciencedirect.com/science/article/pii/S0005109815001521.

[2] Marco Tulio Angulo, Yang-Yu Liu, and Jean-Jacques Slotine. "Network motifs emerge from interconnections that favour stability". In: *Nature Physics* (2015). doi: http://dx.doi.org/10.1038/nphys3402. url: http://www.nature.com/nphys/journal/vaop/ncurrent/full/nphys3402.html.

[3] Marco Tulio Angulo and Valentin Carrillo-Serrano. "Estimating rotor parameters in induction motors using high-order sliding mode algorithms". English. In: *IET Control Theory & Applications* (Aug. 2014). issn: 1751-8644. url: http://digital-library.theiet.org/content/journals/10.1049/iet-cta.2014.0110.

[4] Marco Tulio Angulo, Leonid Fridman, and Jaime A. Moreno. "Output-feedback finite-time stabilization of disturbed feedback linearizable nonlinear systems". In: *Automatica* 49.9 (2013), pp. 2767–2773. issn: 0005-1098. doi: http://dx.doi.org/10.1016/j.automatica.2013.05.013. url: http://www.sciencedirect.com/science/article/pii/S0005109813002835.

[5] Marco Tulio Angulo, Jaime A. Moreno, and Leonid Fridman. "On functional observers for linear systems with unknown inputs and HOSM differentiators". In: *Journal of the Franklin Institute* (2013), issn: 0016-0032. doi: http://dx.doi.org/10.1016/j.jfranklin.2013.12.001. url: http://www.sciencedirect.com/science/article/pii/S0016003213004298.

[6] Marco Tulio Angulo, Jaime A. Moreno, and Leonid Fridman. "Robust exact uniformly convergent arbitrary order differentiator". In: *Automatica* 49.8 (2013), pp. 2489–2495. issn: 0005-1098. doi: http://dx.doi.org/10.1016/j.automatica.2013.04.034. url: http://www.sciencedirect.com/science/article/pii/S0005109813002598.

[9] Marco Tulio Angulo, Leonid Fridman, and Arie Levant. "Output-feedback finite-time stabilization of disturbed LTI systems". In: *Automatica* 48.4 (2012), pp. 606–611. issn: 0005-1098. doi: http://dx.doi.org/10.1016/j.automatica.2012.01.003. url: http://www.sciencedirect.com/science/article/pii/S0005109812000179.

[14] Marco Tulio Angulo, Leonid Fridman, and Arie Levant. "Robust exact finite-time output based control using high-order sliding modes". In: *International Journal of Systems Science* 42.11 (2011), pp. 1847–1857. issn: 0020-7721. doi: 10.1080/00207721.2011.564676. eprint: http://www.tandfonline.com/doi/pdf/10.1080/00207721.2011.564676. url: http://www.tandfonline.com/doi/abs/10.1080/00207721.2011.564676.

[17] Vadim Azhmyakov and Marco Tulio Angulo. "Applications of the strong approximability property to a class of affine switched systems and to relaxed differential equations with affine structure". In: *International Journal of Systems Science* 42.11 (2011), pp. 1899–1907. issn: 0020-7721. doi: 10.1080/00207721.2011.570879. eprint: http://www.tandfonline.com/doi/pdf/10.1080/00207721.2011.570879. url: http://www.tandfonline.com/doi/abs/10.1080/00207721.2011.570879.

CONFERENCE PROCEEDINGS

[7] M.T. Angulo and C. Verde. "Second Order Sliding Mode Algorithms for the Reconstruction of Leaks". In: *2nd International Conference on Control and Fault-Tolerant Systems*. Nice, France, 2013.

[8] Kunusch C., J.A. Moreno, and M.T. Angulo. "Identification and observation in the anode line of PEM fuel cell stacks". In: *Decision and Control (CDC), 2013 IEEE 52nd Annual Conference on*. Florencia, Italy, 2013.

[10] M.T. Angulo, J.A. Moreno, and L. Fridman. "Optimal gain for the Super-Twisting differentiator in the presence of measurement noise". In: *American Control Conference (ACC), 2012*. Montreal, Canada, 2012, pp. 6154–6159.

[11] M.T. Angulo, J.A. Moreno, and L. Fridman. "Some remarks about the tradeoffs between exactness and robustness in control". In: *Variable Structure Systems (VSS), 2012 12th International Workshop on*. Mombay, India, 2012, pp. 82–87. doi: 10.1109/VSS.2012.6163482.

[12] M.T. Angulo, J.A. Moreno, and L. Fridman. "The differentiation error of noisy signals using the Generalized Super-Twisting differentiator". In: *Decision and Control (CDC), 2012 IEEE 51st Annual Conference on*. Hawaii, USA, 2012, pp. 7383–7388. doi: 10.1109/CDC.2012.6426662.

[1] http://scholar.google.com/citations?user=8kG5294AAAAJ

[13] L. Fraguela, M.T. Angulo, J.A. Moreno, and L. Fridman. "Design of a prescribed convergence time uniform Robust Exact Observer in the presence of measurement noise". In: *Decision and Control (CDC), 2012 IEEE 51st Annual Conference on*. Hawaii, USA, 2012, pp. 6615–6620. doi: 10.1109/CDC.2012.6426147.

[15] Marco Tulio Angulo, Jaime A Moreno, and Leonid Fridman. "On Functional Observers for Linear Systems with Unknown Inputs and HOSM Differentiators". In: *IFAC World Congress*. Vol. 18. 1. Milan, Italy, 2011, pp. 1922–1927. doi: 10.3182/20110828-6-IT-1002.02162. url: http://www.ifac-papersonline.net/Detailed/48109.html.

[16] M.T. Angulo, J.A. Moreno, and L. Fridman. "An exact and uniformly convergent arbitrary order differentiator". In: *Decision and Control and European Control Conference (CDC-ECC), 2011 50th IEEE Conference on*. Orlando, USA, 2011, pp. 7629–7634. doi: 10.1109/CDC.2011.6160926.

[18] M.T. Angulo, L. Fridman, C.H. Moog, and J. Moreno. "Output feedback design for exact state stability of flat nonlinear systems". In: *Variable Structure Systems (VSS), 2010 11th International Workshop on*. México City, México, 2010, pp. 32–38. doi: 10.1109/VSS.2010.5544668.

[19] M.T. Angulo, J. Moreno, and R. Lazáro. "Robust dissipative observer design for nonlinear systems". In: *Electrical Engineering Computing Science and Automatic Control (CCE), 2010 7th International Conference on*. México, 2010, pp. 111–115. doi: 10.1109/ICEEE.2010.5608674.

[20] Marco Tulio Angulo and Arie Levant. "On robust output based finite-time control of LTI systems using HOSMs". In: *Analysis and Design of Hybrid Systems*. Vol. 3. 1. Zaragaza, Spain, 2009, pp. 222–227. url: http://www.ifac-papersonline.net/Detailed/41973.html.

[21] M.T. Angulo and L. Fridman. "Output-based Finite Time Control of LTI systems with matched perturbations using HOSM". In: *Decision and Control, 2009 held jointly with the 2009 28th Chinese Control Conference. CDC/CCC 2009. Proceedings of the 48th IEEE Conference on*. Shangai, China, 2009, pp. 6095–6100. doi: 10.1109/CDC.2009.5400624.

IN PREPARATION AND PREPRINTS

- Marco Tulio Angulo, Jaime A. Moreno, Gabor Lippner, Albert László Barabási and Yang-Yu Liu, *"Fundamental limits of network reconstruction"*. Submitted to PNAS, arXiv preprint: http://arxiv.org/abs/1508.03559. October 2015 .
- Marco Tulio Angulo, Gabor Lippner, Yang-Yu Liu and Albert László Barabási, *"Sensitivity of complex networks"*. To be submitted to Physical Review Letters, December 2015 .
- Marco Tulio Angulo and Jean-Jacques Slotine, *"Qualitative stability of nonlinear networked systems"*. In preparation.
- M. T. Angulo, *"Dissipative design of Nonlinear Adaptive Observers"*.

INVITED TALKS

2015 | Networks Control Group, MIT (Prof. Domitilla DelVecchio)
2014 | Channing Division of Network Science, BWM, Harvard Medical School (Prof. Yang-Yu Liu)