

Caio César Graciani Rodrigues, D.Sc.

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Current Position Postdoctoral Fellow at the National Laboratory for Scientific Computing (LNCC), Petrópolis, RJ, Brazil, since May 2017. This project comprises the study of H_2 control for Markov jump linear system with multiplicative noises and partial information.

Education **Math Major** 2007 – 2010
Fluminense Federal University (UFF) – Volta Redonda, RJ, Brazil

Master thesis 2011 – 2013

Post-Grad in Computational Modeling in Science and Technology – Fluminense Federal University (UFF) – Volta Redonda, RJ, Brazil

Title: Efeitos de idade na propagação da tuberculose.

Supervisors: Prof. Thadeu Josino Penna and Prof. Aquino Lauri de Espíndola.

In this work we have presented an agent-based computational model to study the spreading of the tuberculosis (TB) disease on age-structured populations. The model proposed is a merge of two previous models: an agent-based computational model for the spreading of tuberculosis and a bit-string model for biological aging. The main results can be summarized as follows:

- The combination of TB with the population aging reproduces the coexistence of health states, as seen in real populations.
- The universal exponential behavior of mortalities curves is still preserved.
- The population distribution as function of age shows the prevalence of TB mostly in elders, for high efficacy treatments.

Doctor thesis 2013 – 2017

National Laboratory for Scientific Computing (LNCC), Petrópolis, RJ, Brazil

Title: Control and Filtering for Continuous-time Markov Jump Linear Systems with Partial Mode Information.

Supervisors: Prof. Marcos Garcia Todorov and Prof. Marcelo Dutra Fragoso.

The thesis featured contributions to the H_∞ control and filtering for continuous-time Markov jump linear system with partial mode information. In order to overcome the challenge regarding the lack of information of the current state of the Markov chain, we have used a *detector-based formulation*. In what concern the challenges and its developments, we highlight:

- Our strategy have allowed us to recover some recent results of partial information scenarios in which we have an explicit solution, such as the cases of complete information, mode-independent and cluster observations.
- Our results comprise a new *bounded real lemma* followed by the design of controllers and filters driven only by the informations given by the detector.
- Both, the H_∞ analysis and the design methods presented are established through the solutions of linear matrix inequalities.
- Numerical simulations are also presented encompassing the H_∞ performance for particular structures of the detector process. From an application point of view, we have shown some examples related to the linearized dynamics for an unmanned aerial vehicle.

- Skills** **Languages:** Portuguese – Mother tongue; English – reading and writing (advanced), oral (intermediate); French – Elementary
Programming Languages: Matlab, C, C++.
 In addition, typesetting system: LaTeX.
- Conference Presentations** M. G. Todorov, M. D. Fragoso and O. L. V. Costa. A new approach for the H_∞ control of Markov Jump linear systems with partial information . Oral presentation at the 54th IEEE Conference on Decision & Control in Osaka, Japan, 2015.
- C. C. Graciani Rodrigues, M. G. Todorov, and M. D. Fragoso. A bounded real lemma for continuous-time linear systems with partial information on the Markovian jumping parameters. Oral presentation at the 54th IEEE Conference on Decision & Control in Osaka, Japan, 2015.
- C. C. Graciani Rodrigues, M. G. Todorov, and M. D. Fragoso. H_∞ control for continuous-time Markov jump linear systems with partial mode information. Oral presentation at the *Congresso Brasileiro de Automática*, in Vitória, ES, Brazil, October 2016.
- C. C. Graciani Rodrigues, M. G. Todorov, and M. D. Fragoso. H_∞ filtering for Markovian jump linear systems with mode partial information. Oral presentation at the 55th IEEE Conference on Decision & Control, in Las Vegas, USA, December 2016.
- Review Articles** F. V. Vergés and M. D. Fragoso. Optimal linear mean square filter for the operation mode of continuous-time Markovian jump linear systems. In 56th IEEE Conference on Decision & Control, pages 5876–5881, Melbourne, Australia, 2017.
- F. D. Rossa and F. Dercole. A simple tree-based algorithm for deciding the stability of discrete-time switched linear systems. In 56th IEEE Conference on Decision & Control, pages 5298–5303, Melbourne, Australia, 2017.
- Publications** C. C. Graciani Rodrigues, A. L. Espíndola, and T. J. Penna. An agent-based computational model for tuberculosis spreading on age-structured populations. *Physica A*, 428:5259, 2015.
- C. C. Graciani Rodrigues, M. G. Todorov, and M. D. Fragoso. A bounded real lemma for continuous-time linear systems with partial information on the Markovian jumping parameters. In 54th IEEE Conference on Decision & Control, pages 4226–4231, Osaka, Japan, 2015.
- C. C. Graciani Rodrigues, M. G. Todorov, and M. D. Fragoso. H_∞ control for continuous-time Markov jump linear systems with partial mode information. In *Congresso Brasileiro de Automática*, pages 1572–1577, Vitória, ES, Brazil, October 2016.
- C. C. Graciani Rodrigues, M. G. Todorov, and M. D. Fragoso. H_∞ filtering for Markovian jump linear systems with mode partial information. In 55th IEEE Conference on Decision & Control, pages 640–645, Las Vegas, USA, December 2016.
- C. C. Graciani Rodrigues, M. G. Todorov, and M. D. Fragoso. H_∞ control of continuous-time Markov jump linear systems with detector-based information. *International Journal of Control*, 90(10):2178–2196, 2017.