Thales Costa Silva

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Associate Researcher at GRASP Lab - University of Pennsylvania

Department of Mechanical Engineering and Applied Mechanics   University of Pennsylvania
School of Engineering and Applied Science   Philadelphia, PA - U.S.

SUMMARY

Control Systems Engineer with 6 years of experience in the formal design, development, and experimental validation of control systems for climate change applications. Strong background in system modeling, simulation, and data analysis using formal methods, MATLAB/Simulink, Python, and physics engines. Proficient in programming and experience with a variety of communication protocols. Experience in project management and leading cross-functional teams. Proven track record of delivering projects on time and of scientific communication. Interested in exploring new technologies and methods to deploy multi-robot systems in complex environments.

Keywords:

Distributed Dynamical Systems	Automation & Robotics	Nonlinear Systems
Control Theory	Networking Systems	Data Analysis

EXPERIENCE

Research Associate   *Aug. 2021-Present*
General Robotics, Automation, Sensing, & Perception (GRASP) Lab at UPenn

- Designed and implemented optimization-based control strategies for multi-robot systems subject to stochastic communication.

- Designed new stochastic mathematical representations to perform task allocation for teams of robots and to control their mean and variance across tasks in challenging environments.

- Experimentally validated algorithms for marine applications using surface vehicles for modeling complex phenomena in a water tank.

- Developed algorithms that combine Model Predictive Control, Machine Learning, and Adaptive Control techniques to control Unmanned Aerial Vehicles.

- Experience with control systems design, mathematical modeling, and robotic control algorithms.

Research Scholar   *Aug. 2017-May. 2021*
Control, Automation, and Robotics Lab at Universidade Federal de Minas Gerais

- Developed formal methods to control multi-robot systems subject to dynamical constraints on their communication channels and actuation.

- Developed new sufficient conditions as optimization problems to access the stability properties and to design stable controllers for systems with multiple robots.

- Formulated formal methods to evaluate the stability of nonlinear interconnected Euler-Lagrange systems.

- Validated control algorithms with virtual simulations of aerial vehicles and robotic manipulators.

- Simulated algorithms in Python and performed computational tests using physics engines Gazebo and CoppeliaSim with ROS.

- Experience with control systems design, mathematical modeling, and robotic path planning algorithms.

Research Scholar   *Jan. 2014-Dec. 2016*
Universidade Federal do Tocantins

- Designed, implemented, and experimentally evaluated band-pass filters in the microwave frequency (3.5GHz - 5GHz) in parallel-coupled transmission lines.

- Developed and implemented auxiliary methods in C++ to design power transformers, considering running losses.

Skills

Programming: Python, MATLAB, C++, C, Julia, Git, Linux, Latex.
Office productivity suite: Microsoft Word, Excel, Powerpoint, InkScape, Adobe Illustrator.
Robotics: ROS, GAZEBO, CoppeliaSim, OptiTrack, Control Systems.
Hardware Implementation: Raspberry Pi, Arduino, MSP-430, PIC32.
Languages: Portuguese: First Language; English: Advanced (*Score TOEFL iBT 102/120*); German: A1.

Education

Ph.D. in Electrical Engineering *May 2021*
Universidade Federal de Minas Gerais (GPA 4.0)
Thesis: *Analysis and Design of Distributed Protocols for Multi-Agent Systems Subject to Input Saturation and Time-Varying Delays*

M.Sc. in Electrical Engineering *Apr. 2019*
Universidade Federal de Minas Gerais (GPA 4.0)
Dissertation: *Consensus in Multi-Agent Systems with Input Saturation and Time-Varying Delays*

B.Sc. in Electrical Engineering *Jan. 2017*
Universidade Federal do Tocantins - High Honors (GPA 4.0)

Mentoring

Postdoctoral mentorship at University of Pennsylvania

Urara Kono (Ph.D. Student, 2022 — Current)
Victoria Edwards (Ph.D. Student, 2022 — Current)
Li Shen (Masters Student, 2021 — 2022)

Publications in Progress

Silva, T. C. & M. Ani Hsieh. (2022). Consensus Analysis in the Presence of Disturbances, Intermittent Interactions, and Input Saturation. Manuscript Submitted to Journal of The Franklin Institute.

Victoria Edwards, **Silva, T. C.** & M. Ani Hsieh. (2023). Adaptive Macroscopic Ensemble Modeling and Control for Robot Teams in Unknown Environments. Manuscript Submitted to ICRA 2023.

Victoria Edwards, **Silva, T. C.**, Bharg Mehta, Jasleen Dhanoa, & M. Ani Hsieh. (2023). On Collaborative Robot Teams for Environmental Monitoring: A Macroscopic Ensemble Approach. Manuscript Submitted to IROS 2023.

Kong Yao Chee, **Silva, T. C.**, M. Ani Hsieh, & George J. Pappas. (2023). Enhancing Sample Efficiency and Uncertainty Compensation in Learning-based Model Predictive Control for Aerial Robots. Manuscript Submitted to IROS 2023.

Peer Reviewed Publications

Silva, T. C., Li Shen, Xi Yu, & M. Ani Hsieh. (2022). Receding Horizon Control on the Broadcast of Information in Stochastic Networks. In Proceedings of the 16th International Symposium on Distributed Autonomous Robotic Systems.

Silva, T. C., Victoria Edwards, & M. Ani Hsieh. (2022). Proportional Control for Stochastic Regulation on Allocation of Multi-Robots. In Proceedings of the 16th International Symposium on Distributed Autonomous Robotic Systems.

Victoria Edwards, **Silva, T. C.**, & M. Ani Hsieh. (2022). Stochastic Nonlinear Ensemble Modeling and Control for Robot Team Environmental Monitoring. In Proceedings of the 16th International Symposium on Distributed Autonomous Robotic Systems.

Silva, T. C., Leite, V. J. S., Souza, F. O., & Pimenta, L. C. A. (2022). Regional Consensus in Discrete-Time Multi-Agent Systems Subject to Saturating Inputs and Time-Varying Delays. International Journal of Control, DOI: 10.1080/00207179.2022.2053207.

Silva, T. C., Souza, F. O., & Pimenta, L. C. A. (2021). Consensus in Multi-Agent Systems Subject to Input Saturation and Time-Varying Delays. International Journal of Systems Science, DOI: 10.1080/00207721.2020.1860267.

Silva, T. C., Souza, F. O., & Pimenta, L. C. A. (2020). Distributed formation-containment control with Euler-Lagrange systems subject to input saturation and communication delays. International Journal of Robust and Nonlinear Control, 30(7), 2999-3022. DOI: 10.1002/rnc.4919.

Silva, T. C., Souza, F. O., & Pimenta, L. C. A. (2018). *Consenso em sistemas multiagentes sujeitos a saturação e atrasos variantes no tempo.* Anais do XXII Congresso Brasileiro de Automação, 1-8. (Published in Portuguese.)

Freitas, S. C. L., **Silva, T. C.**, Silva, G. C., Martins, R., Rezende, R. R., Oliveira, P. S. (2015). *Estratégia para Incremento da Aprendizagem e do Conteúdo Ministrado na Disciplina Conversão de Energia.* Revista SODEBRAS, v. 10, p. 339-344. (Published in Portuguese.)

Presentations and Talks

Silva, T. C., Souza, F. O., & Pimenta, L. C. A. (2018). *Consenso em sistemas multiagentes sujeitos a saturação e atrasos variantes no tempo.* Oral presentation delivered at the Congresso Brasileiro de Automação, 1-8.

Freias, S. C. L., Silva, J. C., **Silva, T. C.** (2015). A New Contribution to the Calculation of Losses in Transformers in Function of Magnetic Flux Density. Oral presentation delivered at the XI Latin American Congress on Electricity Generation and Transmission, 2015, Guaratinguetá. Proceedings and Book of Abstracts of The 11 th Latin-American Congress on Electricity Generation and Transmission - CLAGTEE2015. p. 176-176. ISBN: 978-85-61065-02-7

Silva, T. C., Freitas, S. C. L., Oliveira, P. S., Torres, P. R.(2015) *Aplicativo para dispositivos móveis como ferramenta educacional auxiliar ao projeto de transformadores monofásicos e trifásicos.* Oral presentation delivered at the XI Latin American Congress on Electricity Generation and Transmission, 2015, Guaratinguetá. Proceedings and Book of Abstracts of The 11 th Latin-American Congress on Electricity Generation and Transmission - CLAGTEE2015, p. 176-177. ISBN: 978-85-61065-02-7 (Published in Portuguese.)

Teaching Experience

Universidade Federal de Minas Gerais
Teaching Assistant, Digital Systems Design and Practice   1st and 2nd semester of 2020

Universidade Federal do Tocantins
Teaching Assistant, Principles of Electromagnetism   1st semester of 2016
Teaching Assistant, Differential Calculus   2nd semester of 2015
Teaching Assistant, Linear Algebra   1st semester of 2015

Scholarships

Coordination for the Improvement of Higher Education Personnel (CAPES)   2017-2021
National Fund for the Development of Education (FNDE)   2014-2016
Undergraduate Teaching Assistant Scholarship   2015-2016

References

M. Ani Hsieh, Ph.D.
Associate Professor
Department of Mechanical Engineering and Applied Mechanics
University of Pennsylvania, Philadelphia-US.
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Fernando de Oliveira Souza, Ph.D.
Associate Professor
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Luciano Cunha de Araújo Pimenta, Ph.D.
Associate Professor
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