Edgar Granados Osegueda

EDUCATION

Ph.D., Computer Science Rutgers, USA. Fall 2019 - Now
Efficient methods for Sample Based Kinodynamic Motion Planning Advisor: Kostas E. Bekris

M.S., Computer Science ITAM, México. August 2019
Risk Estimation and Tracking for Tree-based Motion Planners Towards Safety in Dynamic Environments Advisor: Marco Morales.

B.S., Computer Engineering ITAM, México. July 2017.
Design and Implementation of a Mobile Omnidirectional Robot for Collaborative Applications. Advisor: Marco Morales.

B.S., Industrial Engineering ITAM, México. June 2018.
Design of the Modular Architecture of a Robotic System Subject to the F180 Rules. Advisor: Marco Morales.

COMPUTER SKILLS

Languages: C/C++, (LISP), Bash, Python, Matlab, Java, VHDL, Verilog, Prolog, R, PHP
Libraries & Software: Eigen, Boost, CMake, ROS, Gazebo, LaTeX, NX, Rhino, Git, VI, Quartus
Operating Systems: Linux (Fedora, Ubuntu, CentOS), MacOS, Windows
Other: 3D Printing & CAD design

ROBOTICS

Motion Planning and Control: Planning for systems with dynamics (Kinodynamic planning). Algorithms include sampling-based motion planners (RRT/RRT*, SST, DIRT, AORRT) for explicit guarantees, and optimization-based (MPC, MPPI, iLQR) for fast, reliable computation. Research includes combining both approaches: planning via sampling-based, with state estimation and control via factor graphs.

Estimation: Sensor fusion via factor graphs for non-traditional robots (tensegrity). Simultaneous trajectory estimation and control for kinodynamic systems.

Safe Planning and Control: Controller region of attraction computation via Morse Graphs. Safe motion planning and control framework by integrating safety in every layer of the architecture (planning, interfaces, control).

ACADEMIA & RESEARCH

Fall Instructor Computer Science, Rutgers

- CS460/560: Intro. to Computational Robotics Fall 2024
- CS440: Intro. to Artificial Intelligence Summer 2021

Summer Internship: Stow Intern Amazon Robotics

Summer Internship: Motion Planning Intern Outrider Inc.

Teaching/Graduate Assistant Computer Science, Rutgers 2019-2024

- Graduate Assistant: Efficient Sample-Based Kinodynamic Motion Planning.
- Teaching Assistant: Principles of Programming Languages, Systems Programming, Intro. to Artificial Intelligence, Intro to Computational Robotics

Part Time Professor Department of Digital Systems, ITAM

- SDI-11322: Logic Circuits Laboratory Fall 2017 & 2018
- SDI-11561: Elements of Mechatronics Spring 2018 & 2019

OPEN SOURCE PROJECTS

- ML4KP Library for Kinodynamic Motion Planning `github.com/PRX-Kinodynamic/ML4KP`
- Development for AutoNOMOS robot & a Gazebo-Ros system for simulation: `github.com/EagleKnights/AutoNOMOS` & `github.com/EagleKnights/EK_AutoNOMOS`.

SELECTED PAPERS

• Granados, E., et al. State and Trajectory Estimation of Tensegrity Robots via Factor Graphs and Chebyshev Polynomials. Accepted, RoboSoft 2026.

• Granados, E., Tangirala, S., & Bekris, K. E. (2025). Kinodynamic Trajectory Following with STELA: Simultaneous Trajectory Estimation & Local Adaptation. In RSS 2025.

• A. Sivaramakrishnan, S. Tangirala, D. Metha Ramesh, E. Granados, and K. Bekris. "KRAFT: Sampling-Based Kinodynamic Replanning and Feedback Control over Approximate, Identified Models of Vehicular Systems." arXiv preprint arXiv:2409.11522 (2024).

• [Finalist IEEE ICRA Best Paper Award in Automation] E. Vieira, A. Sivaramakrishnan, S. Tangirala, E. Granados, K. Mischaikow, and K. Bekris. "MORALS: Analysis of High-Dimensional Robot Controllers via Topological Tools in a Latent Space." In 2024 IEEE ICRA, pp. 27-33. IEEE, 2024.

• A. Sivaramakrishnan, S. Tangirala, E. Granados, N. Carver, and K. Bekris. "Roadmaps with gaps over controllers: Achieving efficiency in planning under dynamics." arXiv preprint arXiv:2310.03239 (2023).

• E. Vieira, A Sivaramakrishnan, Y. Song, E. Granados, M. Gameiro, K. Mischaikow, Y. Hung, and K. Bekris. "Data-efficient characterization of the global dynamics of robot controllers with confidence guarantees." In 2023 IEEE International Conference on Robotics and Automation (ICRA), pp. 3065-3072. IEEE, 2023.

• L. Schramm, Y. Deng, E. Granados, and A. Boularias. "Usher: Unbiased sampling for hindsight experience replay." In Conference on Robot Learning, pp. 2073-2082. PMLR, 2023.

• T. McMahon, A. Sivaramakrishnan, E. Granados, and K. Bekris. "A survey on the integration of machine learning with sampling-based motion planning." Foundations and Trends in Robotics 9, no. 4 (2022): 266-327.

• T. McMahon, A. Sivaramakrishnan, K. Kedia, E. Granados, and K. Bekris. "Terrain-aware learned controllers for sampling-based kinodynamic planning over physically simulated terrains." In 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 2925-2930. IEEE, 2022.

• E. Vieira, E. Granados, A. Sivaramakrishnan1, M. Gameiro, K. Mischaikow, K. Bekris "Morse Graphs: Topological Tools for Analyzing the Global Dynamics of Robot Controllers" WAFR 2022.

• E. Granados, A. Boularias, K. Bekris and M. Aanjaneya "Model Identification and Control of a Low-cost Mobile Robot with Omnidirectional Wheels using Differentiable Physics" ICRA 2022.

• S. Karten , A. Sivaramakrishnan, E. Granados, T. McMahon, and K. Bekris. "Data-Efficient Learning of High-Quality Controls for Kinodynamic Planning used in Vehicular Navigation." arXiv preprint arXiv:2201.02254 (2022).

• E. Granados, A. Sivaramakrishnan, T. McMahon, Z. Littlefield, K. Bekris "ML4KP: a Light and Flexible Library for Integrating Machine Learning with Sampling-Based Kinodynamic Planners" MLMP@ICRA2021

• A. Sivaramakrishnan, E. Granados, S. Karten, T. McMahon, K. Bekris "Improving Kinodynamic Planners for Vehicular Navigation with Learned Goal-Reaching Controllers" IROS 2021.

• M. Kleinbort, E. Granados, K. Solovey, R. Bonalli, K. E. Bekris and D. Halperin, "Refined Analysis of Asymptotically-Optimal Kinodynamic Planning in the State-Cost Space," 2020 IEEE International Conference on Robotics and Automation (ICRA), Paris, France, 2020, pp. 6344-6350, doi: 10.1109/ICRA40945.2020.9197236.

• R. Rill-García, J. Martinez-Carranza, E. Granados, and M. Morales. "Path planning and following for an autonomous model car using an "eye in the sky"." In ROS, pp. 25-51. Springer, Cham, 2020.

LANGUAGES

Spanish: Mother tongue *English:* Fluent *French:* Basic