Arun Lakshmanan

lakshma2@illinois.edu
github.com/arlk
arunl.com

RESEARCH INTERESTS

Using tools from statistical learning theory to address problems arising from model uncertainty in robotics and control theory with its relevance to motion planning; safe simultaneous learning and control for robots; collision detection methods for motion planning; safe model predictive control under uncertainty; fast planning with reduced-order models.

EDUCATION

Ph.D. Mechanical Science and Engineering   **Jan 2017 - present**
Advanced Controls Research Laboratory
Advisor: Naira Hovakimyan
University of Illinois at Urbana-Champaign, Urbana, IL.

M.S. Aerospace Engineering   **Aug 2014 - Dec 2016**
University of Illinois at Urbana-Champaign, Urbana, IL.

B.Tech. Mechanical Engineering   **July 2010 - May 2014**
VIT University, Vellore, India.

EMPLOYMENT

Facebook Reality Labs, Redmond, WA.   **May 2018 - Aug 2018**
Advisors: Douglas Lanman, Nick Colonnese
Research Intern

Paracosm/Occipital, Gainesville, FL.   **May 2017 - Jul 2017**
Mentors: Jack Morrison, Quinn Martin
Robotics Perception Intern

Qualcomm Research, Philadelphia, PA.   **May 2016 - Aug 2016**
Advisor: Matthew Turpin
Research Intern

TECHNICAL SUMMARY

Proficiency of programming languages (from most to least comfortable): Julia, C++, C, Python, Simulink. Extensive experience with robotics development on quadrotors and ground robots - typically this would involve a C++/C firmware stack, ROS/LCM communication middleware, and a Julia/Python/Simulink layer that handles the high-level decision making. The following are some of the open-source packages published on Github:

- SafeFeedbackMotionPlanning.jl: A Julia package for designing nonlinear controllers that ensure guaranteed performance in trajectory tracking problems.

- CurveProximityQueries.jl, ConvexBodyProximityQueries.jl: Packages that implements methods to compute proximity queries between convex bodies and/or parametric curves in 2/3D.

- cf-firmware: A firmware fork of the original Crazyflie repository that additionally implements geometric control, path following for trajectories, and handles control for attached manipulators.

PUBLICATIONS   Aditya Gahlawat⋆, **Arun Lakshmanan**⋆, Lin Song, Andrew Patterson, Zhuohuan Wu, and Naira Hovakimyan.
$\mathcal{RL}_1 - \mathcal{GP}$: Safe simulataneous learning and control. *(submitted to the Conference on Robot Learning (CoRL) 2020).*

Arun Lakshmanan⋆, Aditya Gahlawat⋆, and Naira Hovakimyan.
Safe feedback motion planning: A contraction theory and $\mathcal{L}_1$-adaptive control based approach. In *IEEE Conference on Decision and Control 2020*, Dec 2020.
https://arxiv.org/pdf/2004.01142.pdf

Andrew Patterson, **Arun Lakshmanan**, and Naira Hovakimyan.
Intent-aware probabilistic trajectory estimation for collision prediction with uncertainty quantification. In *IEEE Conference on Decision and Control 2019*, Dec 2019.
https://ieeexplore.ieee.org/document/9029215

Arun Lakshmanan, Andrew Patterson, Venanzio Cichella, and Naira Hovakimyan.
Proximity queries for absolutely continuous curves. In *Proceedings of Robotics: Science and Systems*, June 2019.
http://www.roboticsproceedings.org/rss15/p42.pdf

Robert M Jones, Donglie Sun, Gabriel B Haberfeld, **Arun Lakshmanan**, Thiago Marinho, and Naira Hovakimyan.
Design and control of a small aerial manipulator for indoor environments. In *AIAA Information Systems-AIAA Infotech@ Aerospace*, Jan 2017.
https://arc.aiaa.org/doi/10.2514/6.2017-1374

Arun Lakshmanan.
Piecewise Bézier curve trajectory generation and control for quadrotors. *Master's Thesis, University of Illinois at Urbana-Champaign*, Dec 2016.
https://www.ideals.illinois.edu/handle/2142/95352

Thiago Marinho, Christopher Widdowson, Amy Oetting, **Arun Lakshmanan**, Hang Cui, Naira Hovakimyan, Ranxiao Frances Wang, Alex Kirlik, Amy Laviers, and Dušan Stipanović.
Carebots: Prolonged elderly independence using small mobile robots. In *Mechanical Engineering, ASME*, Sep 2016.
https://asmedigitalcollection.asme.org/memagazineselect/article-pdf/138/09/S8/6359956/me-2016-sep5.pdf

Thiago Marinho, **Arun Lakshmanan**, Venanzio Cichella, Christopher Widdowson, Hang Cui, Robert M Jones, Bentic Sebastian, and Camille Goudeseune.
VR study of human-multicopter interaction in a residential setting. In *2016 IEEE Virtual Reality (VR)*, Mar 2016.
https://ieeexplore.ieee.org/document/7504790

⋆equal contribution