Abraham Puthuvana Vinod

Hybrid Systems & Control Lab
Room 316, ECE Building
211 Terrace Street NE
University of New Mexico
Albuquerque, NM 87131-0001

Phone : (505) 289-6384
Email : aby.vinod@gmail.com
Homepage : http://unm.edu/~abyvinod
Others : Scholar | GitHub | BitBucket | LinkedIn

Education

Doctoral student in Electrical Engineering 2014 – 2018 (expected)
The University of New Mexico (UNM), USA **GPA:** 4.26/4.0
Advisor: Prof. Meeko M. K. Oishi
PhD Thesis: Safe autonomy using stochastic reachability

Bachelor & Master of Technology 2009 – 2014
Indian Institute of Technology Madras (IIT-M), India **GPA:** 8.59/10
Major: Electrical Engineering Minor: Biomedical Engineering
Master Thesis: Deterministic Attitude Estimation

Research interests

Control of stochastic systems under constrains (reachability, motion planning, model predictive control), optimization (convex, stochastic, combinatorial), human-in-the-loop systems, reinforcement learning

Awards

Best student paper award, ACM Hybrid Systems: Computation and Control, 2017.

Prof. Achim Bopp prize for the best student hardware project at IIT-M, 2014.

Central Board of Secondary Education scholarship for undergraduate studies at IIT-M.

IIT Joint Entrance Examination Rank of 709/ $\sim 400,000$ and All India Engineering Entrance Examination All-India Rank 609/ $\sim 1,000,000$.

Publications (Google scholar)

Journal Articles

A. P. Vinod and M. M. K. Oishi, " Scalable Underapproximation for Stochastic Reach-Avoid Problem for High-Dimensional LTI Systems using Fourier Transforms," in IEEE Control Systems Letters (L-CSS), vol. 1, no. 2, pp. 316 – 321, Oct. 2017.
Presented at CDC 2017, Melbourne, Australia. (pp. 4297 — 4302)

A. P. Vinod, A. D. Mahindrakar, S. Bandyopadhyay, and V. Muralidharan, "A Deterministic Attitude Estimation Using a Single Vector Information and Rate Gyros," in IEEE/ASME Transactions on Mechatronics, vol. 20, no. 5, pp. 2630 – 2636, Oct. 2015.

Proceedings

* denotes equal contribution among the authors.

A. P. Vinod and M. M. K. Oishi, "Scalable Underapproximative Verification of Stochastic LTI Systems using Convexity and Compactness," in Proceedings of ACM Hybrid Systems: Computation and Control (HSCC), Porto, Portugal, 2018. (accepted)

A. P. Vinod, B. HomChaudhuri, C. Hintz, A. Parikh, S. P. Buerger, M. M. K. Oishi, G. Brunson, S. Ahmad, R. Fierro, "Multiple Pursuer-Based Threat Intercept via Forward Stochastic Reachability," in Proceedings of American Control Conference (ACC), Milwaukee, WI, USA, 2018. (accepted)

J. Gleason*, A. P. Vinod*, and M. M. K. Oishi, "Underapproximation of Reach-Avoid Sets for Discrete-Time Stochastic Systems via Lagrangian Methods," in Proceedings of IEEE Conference on Decision and Control (CDC), Melbourne, Australia, pp. 4283 – 4290, 2017.

B. HomChaudhuri*, A. P. Vinod*, and M. M. K. Oishi, "Computation of forward stochastic reach sets: Application to stochastic, dynamic obstacle avoidance," in Proceedings of American Control Conference (ACC), Seattle, WA, USA, pp. 4404 – 4411, 2017.

H.T. (Lewis) Chiang, B. HomChaudhuri, A. P. Vinod, M. M. K. Oishi, L. Tapia, "Dynamic Risk Tolerance: Motion Planning by Balancing Short-Term and Long-Term Stochastic Dynamic Predictions," in Proceedings of IEEE International Conference on Robotics and Automation (ICRA), Singapore, Singapore, pp. 3762 – 3769, 2017.

A. P. Vinod, B. HomChaudhuri, and M. M. K. Oishi, "Forward stochastic reachability analysis for uncontrolled linear systems using Fourier Transforms," in Proceedings of ACM Hybrid Systems: Computation and Control (HSCC), Pittsburg, PA, USA, 2017.
Best Student Paper Award | Repeatability Evaluated

J. Gleason, A. P. Vinod, M. M. K. Oishi, and R. S. Erwin, "Viable Set Approximation for Linear-Gaussian Systems with Unknown, Bounded Variance," in Proceedings of IEEE Conference on Decision and Control (CDC), Las Vegas, USA, pp. 7049 – 7055, 2016.

A. P. Vinod, Y. Tang, M. M. K. Oishi, K. Sycara, C. Lebiere, and M. Lewis, "Validation of Cognitive Models for Collaborative Hybrid Systems with Discrete Human Input," in Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, Korea, pp. 3339 – 3346, 2016.

A. P. Vinod, T. H. Summers, and M. M. K. Oishi, "User-interface design for MIMO LTI human-automation systems through sensor placement," in Proceedings of American Control Conference (ACC), Boston, MA, USA, pp. 5276 – 5283, 2016.

Workshops

A. P. Vinod, B. HomChaudhuri, C. Hintz, A. Parikh, S. P. Buerger, J. Salton, D. Novick, M. M. K. Oishi, and R. Fierro, "Aerial Suppression of Airborne Platforms (ASAP): Coordinated Capture of a Threat UAS via Stochastic Reachability," in International Symposium on Aerial Robotics, Philadelphia, PA, USA, July 2017.

Book chapters

A. P. Vinod and A. D. Mahindrakar, "Deterministic Attitude Estimation," Multisensor Attitude Estimation: Fundamental Concepts and Applications, H. Fourati and D. E. C. Belkhiat (Eds.), CRC Press, 2016.

Professional activities

Reviewer

Journal : Automatica
Conferences : IEEE Conference on Decision and Control,
American Control Conference,
ACM Hybrid Systems: Computation and Control,
IEEE International Conference on Robotics and Automation

Volunteer at the 2016 American Control Conference organization

Teaching

ECE 514: Nonlinear Control at UNM (guest lectured for Dr. Christopher Petersen)

ECE 546: Multivariate Control Theory at UNM (guest lectured for Prof. Chaouki Abdallah)

ECE 101: Introduction to Electrical Engineering at UNM (teaching assistant)

Advanced Control Systems Lab at IIT-M

Industry experience

Student Intern — R&D (Connected cars) Summer 2017
Nissan Research Center — Silicon Valley, Sunnyvale, California, US

- Developed location estimation techniques using CAN and GPS data for cars
- Created Python code compilation workflow for secure code deployment

Interim Engineering Intern Summer 2012
Qualcomm Incorporated, Hyderabad, India

- Analyzed performance of the DRAM with the existing mobile platform builds
- Created a framework that sped up the debugging process by 30%

Relevant Courses

UNM: Probability and stochastic processes, Advanced calculus — I & II, Detection and estimation theory, Advanced probability theory, Complex systems theory, Multivariable control theory, Linear systems

IIT-M: Computer Methods in Electrical Engineering, Nonlinear systems, Mechanics of Robotic Manipulators, Fundamentals of Medical Instrumentation

Online: Machine learning, Optimization (convex and discrete), Game theory

Miscellaneous

Developed a PhoneGap application to visualize personal mobility data using MQTT and Amazon AWS.

Developed an Android application to recognize American Sign Language for TATA EngiNX Innovation Challenge.

Developed the control algorithms and managed the team as the team leader for the Indian team to the Robosoccer World Cup, 2013, held in Bristol, UK.

Conducted several hands-on workshop on embedded systems as the core member of the IIT-M Institute Electronics Club.