

Prabhjeet Singh Arora

Control Systems | Optimization | Path Planning | Unmanned Vehicle Systems | Robotics
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Education

Master of Science — Mechanical Engineering — University of Texas at Arlington, TX Aug'16 - Dec'18
• Thesis: Reachable Set Computation and Analysis for Perturbed Linear Systems (GPA - 3.78/4)

Bachelor of Technology — Mechanical Engineering — Indian School of Mines, India Aug'11 - May'15
• Final year project: Bachelor's Final year project - Study of Regenerative braking system

Key Skills

Language - C++, Python

Softwares - ROS, Visual Studio code, MATLAB, Simulink, Solidworks, AutoCAD, Abaqus, Excel, LaTeX, MS Office

Skills - Linear and Nonlinear Control, Optimal Control, Optimal Estimation, Optimization, Reachable Sets, Functional Analysis, Path Planning, Motion Planning

Experience

Research Assistant — LEARN Laboratory (UTA), Arlington, TX Jan 2019 - Present
• Developed potential field based path planner for 7 degree of freedom Baxter robot arm and executed real time planning
• Decentralized the planning method for last 3 degree of freedom
• Reduced the computation time required for motion planning

Research Assistant — Aerospace Laboratory (UTA), Arlington, TX Jul 2017 - Dec 2018
• Theorized the conditions for discretizing nonlinear system using Euler 1-step discretization
• Created procedure to handle discretized nonlinear systems with discrete input and produced numerical methods
• Developed algorithms to compute reachable sets and invariant sets of discrete nonlinear systems
• Further improved the algorithms to compute overapproximated reachable sets of complex nonlinear systems
• Reduced space usage by 50% and reduced computation time significantly

Graduate Teaching Assistant — University of Texas at Arlington, Arlington, TX Jan 2018 - Jun 2018
• Tutored students undertaking the course - Classical Methods of Control Systems Analysis and Synthesis
• Proctored exams, as well as, graded exam and homework

Hydraulics Engineering Intern — EATON Corporation, Pune, India May 2014 - Jul 2014
• Worked on dynamic system modelling and implemented hydraulic power and controls systems in stacker-reclaimer project to design optimized systems

Publication

Reachable Set Computation and Analysis for Perturbed Linear Systems : <http://hdl.handle.net/10106/27661>
• Computed reachable set and invariant set of Liénard systems of Lipschitz kind with bounded control input (Matlab)
– Provided information of all the states the system can achieve
• Computed overapproximated reachable set of errors in multi rotor system (Matlab)
– Provided the “region of collision” due to nonlinear disturbance of first-order aerodynamic effect

Projects

Projects on Optimal Estimation of Dynamic Systems

- Tracked a maneuvering target with sensor data (Matlab)
 - Implemented Extended Kalman Filter, Unscented Filter and Particle Filter in Matlab
 - Estimated position of a maneuvering target with error within Three-Sigma Limits
 - Estimation time and data required were compared
- Estimated unknown parameter of Van der Pol system (Matlab)
 - Implemented MMAE approach, IMM estimator in Matlab
 - Estimated unknown parameter with error within Three-Sigma Limits
- Achieved sensor data fusion (Matlab)
 - Implemented Covariance Intersection in Matlab
 - Performed sensor data fusion for given data from multiple sensor models with different error covariances
 - Produced optimal error covariance

Project on Classical Control Theory

- Designed a feedback controller to eliminate flight disturbance during auto pilot of helicopter using classical methods of control systems, reducing steady state error to 4%