

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

Experience

- Research Assistant — LEARN Laboratory (UTA), Arlington, TX** **Jan 2019 - Present**
• Developed potential field based path planner for 7 dof Baxter robot arm and executed real time planning
• Decentralized the planning method for last 3 dof and reduced the computation time required for 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 nonlinear systems
• Further improved the algorithms to compute overapproximated reachable sets of complex nonlinear systems and reduced space usage by 50% and 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

Projects

Projects on Optimal Estimation of Dynamic Systems

- Implemented Extended Kalman Filter, Unscented Filter and Particle Filter using Matlab and estimated the position of a maneuvering target, with error within Three-Sigma Limits. The methods were then compared, based on time and data required for estimation
- Estimated unknown parameter using MMAE approach and IMM estimator by implementing them in Matlab and successfully estimated the damping coefficient of Van der Pol system, with the error within Three-Sigma Limits for respective methods
- Implemented Covariance Intersection in Matlab for given data from multiple sensor models with different error covariances and achieved sensor data fusion and produced most optimised 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%

Publication

Academic Research/Thesis : <http://hdl.handle.net/10106/27661>

- Computed reachable set and invariant set of Liénard systems of Lipschitz kind with bounded control input in Matlab and provided information of all the states the system can achieve
- Computed overapproximated reachable set of errors of multi rotor system in Matlab and provided the “region of risk” where collision could occur due to nonlinear disturbance of first-order aerodynamic effect

Key Skills

- Language** - C++, Python
- Softwares** - ROS, Visual Studio code, MATLAB, Solidworks, Simulink, AutoCAD, Abaqus, Excel, LaTeX, MS Office
- Skills** - Linear and Nonlinear Control, Optimal Control, Optimal Estimation, Optimization, Reachable Sets, Functional Analysis, Path Planning, Motion Planning