**Jaskaran Singh Grover**

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**Research Interests**

Nonlinear Control, Motion Planning, System Identification, Optimization, Multirobot Systems, Learning for Control

**Education**

2018-Current **Carnegie Mellon University**

PhD. Student in Robotics. GPA 4.00 (Advisors: Prof. Katia Sycara and Prof. Changliu Liu)

2016-2018 **Carnegie Mellon University**

Master of Science in Robotics. GPA 4.00 (Advisors: Prof. Howie Choset and Dr. Matthew Travers)

2015-2016 **University of California, Los Angeles**

Master of Science in Electrical Engineering. GPA 3.97

2010-2014 **Birla Institute of Technology and Science, Pilani, India**

Bachelor of Engineering in Electronics and Instrumentation (Distinction) GPA 9.00/10

**Skills**

Python, C++, MATLAB, Simulink, Mathematica, Solidworks, Open-CV, COMSOL Multiphysics, NI LabVIEW

**Relevant Coursework**

Convex Optimization, Robust Control, Optimal Control, Robot Kinematics and Dynamics, Linear Systems, Underactuated Robotics, Deep Learning, Machine Learning, Adaptive Filtering, Real Analysis, Math for Robotics, Differential Geometry, Calculus of Variations, Reinforcement Learning

**Papers**

* **J. Grover,** C. Liu, K. Sycara, “Adversarial Identification for Multirobot Systems using Duality” (In preparation)
* **J. Grover,** C. Liu, K. Sycara, “Parameter Identification for Multirobot Systems Using Optimization-Based Controllers” (Submitted to ACC 2021)
* **J. Grover,** C.Liu, K. Sycara, “Why Does Symmetry Cause Deadlocks?” (IFAC World Congress 2020)
* **J. Grover,** C. Liu, K. Sycara, “Deadlock Analysis and Resolution in Multirobot Systems” (WAFR 2020)
* K. Shih, C. Ho, **J. Grover**, C. Liu, S. Scherer, “Provably Safe in the Wild: Testing Control Barrier Functions on a Vision Based Quadrotor in Outdoor Environments” (RSS 2020 Workshop on Robust Autonomy)
* **J. Grover**, D. Vedova, N. Jain, H. Choset, M. Travers, “Motion Planning, Design Optimization and Fabrication of Ferromagnetic Swimmers”, (RSS 2019)
* S. Kelly, R. Abrajan, **J. Grover**, H. Choset, M. Travers, “Planar Motion Control, Coordination and Dynamic Entrainment in Chaplygin Beanies”, (DSCC 2018)
* C.Gong, J. Whitman, **J. Grover,** B. Zhong, H. Choset, “Geometric Mechanics and Gait Design on Cylindrical and Toroidal Shape spaces”, (DSCC 2018)
* **J. Grover**,J. Zimmer, T. Dear, M.Travers, H. Choset, S. Kelly, “Geometric Motion Planning for a Three-Link Swimmer in a Three-Dimensional Low Reynolds-Number Regime”, (ACC 2018)
* **J. Grover**, V. Natarajan, “Estimation and Tracking of Knee Angle Trajectory using Inertial Sensors and a Smartphone Application”, (BodyNets 2015)
* **J. Grover**, A. Gupta, “Studying Crosstalk Trends for Signal Integrity on Interconnects using Finite Element Modeling”, (COMSOL Conference 2013)

**Research Experience**

**Graduate Research Assistant, Intelligent Control Lab, Advanced-Agent Robotics Technology Lab**

**Development of an Integrated Prediction, Estimation, Planning and Control Framework**

* Working in a collaboration with team from Intelligent Control Lab to develop a Python based software package for doing prediction, estimation, planning and control for model free and model-based control tasks

**Multirobot exploration, path planning and room clearing with mixed integer linear programming**

* Working on exploration of rooms in unknown nonconvex environments to search for friendly/hostile robots
* Integrated PRM based path planning and barrier certificate controllers for collision avoidance and room clearing

**Adversarial Robustness, Multirobot and Swarm System Identification**

* Derived parameter estimation algorithms for identifying controller and model parameters of multirobot systems and swarms using their position information with theoretical guarantees
* Exploring human intent estimation using inverse optimization and system identification

**Graduate Research Assistant, Biorobotics Lab**

**Geometric gait design for a novel 3D low-Reynolds swimmer with yaw-pitch inputs**

* Derived a dynamics model for a novel three-dimensional swimmer in a viscous regime
* Validated gaits derived from simulations on a physical robot in corn syrup

**Dynamics modeling, design optimization and planning for elastomagnetic swimmers**

* Developed a geometric framework for locomotion control of ferromagnetic swimmers
* Fabricated elastomagnetic swimmers, designed and programmed a Helmholtz coil setup for locomotion using magnetic fields

**Achievements**

* Recipient of Uber Presidential Fellowship (2019)
* Distinction Divsion, BITS Pilani (2014)
* All India Rank 8 in Graduate Aptitude Test in Engineering, GATE 2014, Instrumentation Engineering (2014)

**Work Experience**

**Systems Engineer, Biosignals and Systems Research Group, Intel Labs (07.2014 – 07.2015)**

**Pedestrian position tracking and gait analysis using inertial sensors**

* Developed extended Kalman filtering algorithms for measuring foot trajectory using inertial sensors
* Developed quaternion based orientation estimation algorithm for tracking 3D orientation from IMUs

**Intern, Biosignals and Systems Research Group, Intel Labs (01.2014 – 07.2014)**

**Smart knee motion tracking Solution using wearable bands and mobile phone**

* Created a smart-fabric knee band instrumented with a WSN, IMU and stretch sensors.
* Integrated sensor measurements to track the ‘flexion’ angle of knee joint on a BLE android-tablet.

**Teaching Experience**

Provably Safe Robotics (Fall 2019), Underactuated Robotics (Fall 2018), Robot Kinematics and Dynamics (Fall 2017)

**Mentoring Activities**

Michael Cheng (CMU), Kenneth Shaw (Georgia Tech), Raghavv Goel (IIIT Delhi), Daniel Vedova (CMU), Nalini Jain (CMU)