Baisravan HomChaudhuri

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Education

Ph.D., Mechanical Engineering, University of Cincinnati (December 2013)
Title: Price-Based Distributed Optimization in Large-Scale Networked Systems
M.S., Mechanical Engineering, University of Cincinnati (April 2010)
Title: Genetic Algorithm Based Simulation-Optimization for Fighting Wildfires
B.E., Electrical Engineering, Jadavpur University, India (June 2007)

Research Interest

Distributed Optimization and Control, Optimal Control, Model Predictive Control, Reachability Analysis, Connected Vehicles, Power Systems, Robotics.

Academic Employment

Postdoctoral Research Associate, Electrical and Computer Engineering, University of New Mexico (October 2015-Present)
Developed robot navigation strategies with uncertain moving obstacles exploiting stochastic reachability. Developed reachability calculation and minimum fuel path for space vehicle docking. Developing robust model predictive control strategy for circadian control.

Postdoctoral Fellow, International Center for Automotive Research (ICAR), Clemson University (March 2014-September 2015)
Developed driver-in-the loop fuel economic control strategies using stochastic model predictive control. Developed fuel economic fast Model Predictive Control strategy for a group of conventional and hybrid Connected Vehicles. Developed distributed fault detection, isolation and estimation for Connected Vehicles. Task allocation and optimal communication for battery state of charge and health estimation in parallel. Developed overlapping decomposition based distributed LQR control for inter-area oscillation damping in power grids.

Research Assistant, University of Cincinnati (May 2010 - August 2013):
Developed primal-dual interior point distributed optimization technique for Network Utility Maximization (NUM) in large-scale networked systems with only local communication. Developed noise based stochastic distributed optimization method for NUM problems in large-scale networked systems with multi-modal/non-convex cost function. Applied dual decomposition based subgradient method/market based distributed optimization methods for utility maximization of a cloud system and optimal power flow (OPF) problem in power grids. Simulated artificial potential based decentralized control algorithm on multi-robot system and implemented the algorithm on multiple Khepera III robots for the Research Experiences for Undergraduates (REU) program. Implemented a noise based Ant Foraging Algorithm on the same multiple Khepera III robots to emulate different patterns exhibited by real ants.

Research Assistant, University of Cincinnati (September 2008 - April 2010):
Developed Genetic Algorithm based simulation-optimization technique for optimum resource allocation and fire-line building for fighting wildfires.

Project Assistant, Indian Institute of Science, India (June 2007- June 2008):
Responsible for the development and implementation of vision based algorithms in a bench top model of Star Sensor to estimate the orientation of Micro Satellites.

Summer Internship, Indian Institute of Science, India (May 2006 – July 2006):
State estimation and filtering of measurement noise by Kalman Filtering for Reusable Launch Vehicles.

Graduate Course Projects

Developed a Fuzzy logic based Counter Ant Algorithm for solving the maze problem using multiple robots. Applied Ant Colony Optimization Method to solve the Travelling Salesman Problem. Applied optimal control for missile guidance problem.

Teaching Experience

Graded course Kinematics of Machines for two quarters at University of Cincinnati. Invited talks to Undergraduate (Kinematics of Machines) and Graduate Courses (Intelligent Systems and Control). Help develop "Cyber Physical Systems" course at the Clemson University.

Publications

Journal Papers:

1. **HomChaudhuri B.,** Vahidi A., and Pisu P., "Fast Model Predictive Control Based Fuel Efficient Control Strategy for a Group of Connected Vehicles in Urban Road Conditions," *to appear* IEEE Transactions on Control Systems Technology, 2016.
2. **HomChaudhuri B**., Lin R., and Pisu. P, "Hierarchical Control Strategies for Energy Management of Connected Hybrid Electric Vehicles in Urban Roads," Transportation Research Part C: Emerging Technologies, 62, pp. 70-86, 2016.
3. Du Z., **HomChaudhuri B.,** and Pisu. P, "Distributed Coordination of Connected and Automated Vehicles at Multiple Interconnected Intersections." International Journal of Computer, Electrical, Automation, Control and Information Engineering, 10, pp- 842-848, 2016**.**
4. **HomChaudhuri B.**, and Kumar M., "A Noise Based Distributed Optimization Method for Multi-Robot Task Allocation with Multi-modal Utility," ASME Journal of Dynamic Systems, Measurement and Control, 137, pp. 1-8, 2014.
5. **HomChaudhuri B.**, Kumar M. and Cohen K., "Genetic Algorithm Based Simulation-Optimization for Fighting Wildfires," International Journal of Computational Methods, 10, pp 1-28, 2013.
6. **HomChaudhuri B.**, and Kumar M., "Market Based Distributed Optimization Approaches for Three Classes of Resource Allocation Problems," Parallel and Distributed Computing and Networks, 1, pp 1-12, 2012.
7. Kumar M., Cohen K., and **HomChaudhuri B.**, "Cooperative Control of Multiple Uninhabited Aerial Vehicles for Monitoring and Fighting Wildfires," Journal of Aerospace Computing, Information and Communication, 8, pp 1-16, 2011.

Papers Under Review:

8. Du Z., **HomChaudhuri B.**, and Pisu P., "Hierarchical Distributed Coordination Strategy of Connected and Automated Vehicles at Multiple Intersections," *submitted to* Journal of Intelligent Transportation Systems: Technology, Planning, and Operations, 2015.
9. **HomChaudhuri B.**, and Pisu P., "A Driver-in-the Loop Fuel Economic Control Strategy for Connected Vehicles in Urban Roads," *submitted to* IEEE Transactions on Intelligent Transportation Systems, 2015.
10. **HomChaudhuri B.**, and Kumar M., "A Newton Based Distributed Optimization Method with Local Information for Large-Scale Networked Optimization Problems," *submitted* to Optimization, 2015.

Conference Papers (Peer Reviewed):

1. **HomChaudhuri B.**, Oishi M., Shubert M., Baldwin M., Erwin R.S., "Computing Reach-Avoid Sets for Space Vehicle Docking under Impulsive Thrust," *to appear* IEEE Conference on Decision and Control, 2016.
2. Lin R., **HomChaudhuri B**., Pisu. P, "Fuel Efficient Control Strategies for Connected Hybrid Electric Vehicles in Urban Roads," Dynamic Systems and Control Conference, pp. 1-7, 2015.
3. **HomChaudhuri B.,** Pisu P., Özgüner Ü., "Secure Vehicle Localization and Cruise Control for Connected Vehicles," IFAC SafeProcess, pp. 1192—1197, 2015.
4. **HomChaudhuri B.,** Vahidi A., Pisu P., "A Fuel Economic Model Predictive Control Strategy for a Group of Connected Vehicles in Urban Roads," American Control Conference, pp. 2741-2746, 2015.
5. Biron A.Z., **HomChaudhuri B.**, Pisu P., "Observer Design Based Cyber Security for Cyber Physical Systems," 10th Cyber and Information Security Research Conference, 2015.
6. Calyam P., Seetharam S., **Homchaudhuri B.**, Kumar M, "Resource Defragmentation using Market-Driven Allocation in Virtual Desktop Clouds," IEEE International Conference on Cloud Engineering, pp. 246-255, 2015.
7. **HomChaudhuri B.**, Kumar M., "A Distributed Optimization Method with Local Interactions for Large-Scale Networked Optimization Problems," American Control Conference, pp. 4336-4341, 2014.
8. **HomChaudhuri B.**, Kumar M., Devabhaktuni V., "A Distributed Market Based Solution for DC Optimal Power Flow Problem," ASME Dynamic Systems and Control Conference, 2012.
9. **HomChaudhuri B.**, Kumar M., Devabhaktuni V., "Market Based Approach in Solving Optimal Power Flow Problem in Smart Grid," American Control Conference, pp. 3095-3100, 2012.
10. Jérôme G., Sharma B., Ferenc W., Kastein H., Lieu L., Wilson R., Huang Y. R., Bertozzi A.L., **HomChaudhuri B.**, Ramakrishnan S., Kumar M., "Robot Swarming over the Internet," American Control Conference, pp. 6065-6070, 2012.
11. **HomChaudhuri B.**, Kumar M., Devabhaktuni V., "A Market Based Distributed Optimization for Power Allocation in Smart Grid," Proceedings of ASME Dynamic System and Control Conference, 2011.
12. **HomChaudhuri B.,** Kumar M., "Market Based Allocation of Power in Smart Grid," American Control Conference, pp 3251—3256, 2011.

13. **HomChaudhuri B.,** Kumar M., Cohen K., "Optimal Fireline Generation for Wildfire Fighting in Uncertain and Heterogeneous Environment," American Control Conference, pp 5638-5643, 2010.
14. Ahuja M., **HomChaudhuri B.**, Cohen K., Kumar M., "Fuzzy Counter Ant Algorithm for Maze Problem," Proceedings of 48th AIAA Aerospace Sciences Meeting, 2010.
15. **HomChaudhuri B.,** Zhao S., Cohen K., Kumar M., "Generation of Optimal Fire–Line for Fighting Wildland Fires Using Genetic Algorithms", ASME Dynamic Systems and Control Conference, 2009**.**
16. Zhao S., **HomChaudhuri B.**, Kumar M. "A Method for Distributed Optimization for Task Allocation", Proceedings of ASME Dynamic Systems and Control Conference 2009.
17. Pal M., **HomChaudhuri B.**, Moridhara D., Bhat M. S., Rao G. N., "Development of Indigenous Micro Star Tracker and Gyroless Satellite Attitude Estimation: Preliminary Study," 24th Annual In-house Seminar of Indian Institute of Science, 2008.
18. Pal M., **HomChaudhuri B.**, Bhat M. S., "A Comparative Study of Centroiding Algorithms for Star Images Captured by a Star Tracker in a Satellite," Conference on Advances in Space Science and Technology, 2008.

Papers Under Review:

19. Chiang H.T., **HomChaudhuri B.**, Vinod A.P., Oishi M., Tapia L., "Dynamic Risk Tolerance: Planning by Balancing Short-Term and Long-Term Stochastic Dynamic Predictions," *submitted to* International Workshop on the Algorithmic Foundations of Robotics (WAFR) 2016.

Technical Reports

HomChaudhuri B., Pal M., Bhat M.S., Rao G.N., Moridhara D., "Development of Indigenous Micro-Star Tracker and Gyroless Satellite Attitude Estimation", Space technology Cell and ISRO sponsored Project.

Grant proposals

Written parts of the award winning NSF proposal 1544910.
Written parts of many research proposals to NSF and AFRL

Awards/ Honors

University Research Council Award, University of Cincinnati, 2009 and 2012.
Student Travel Award, paper presentation in (i) American Control Conference, 2010, 2011 and 2012; (ii) ASME Dynamic Systems and Control Conference, 2009, 2011 and 2012.
University Graduate Scholarship Award to Support Graduate Education, University of Cincinnati (Fall 2008-Summer 2012).
University Graduate Assistantship Award, University of Cincinnati (Fall 2008-Summer 2012)
Graduate Mentor for Research Experiences for Undergraduates, University of Cincinnati, 2011.

Software Tools

Programming: Matlab, C++, C
Operating Systems: Linux, Windows
Robotics Software: Player/Stage

Graduate Coursework

Intelligent Systems and Control; Introduction to Modern Control; Optimal Control; Intelligent Control (Fuzzy Control); Intelligent Systems (Neural Networks); Applied Linear Algebra; Applied Probability and Stochastic Process; Applied Statistical Inference; Advanced Decision Process; Monte Carlo Methods; Introduction to Random Processes.

Volunteer Work

•**Robotics Coordinator** in Emerging Ethnic Engineers (E3) program, University of Cincinnati, 2009, 2010 and 2011
•**Workshop:** Co-organized Robot Guru 2 workshop at the Robotics Science and Systems conference 2016
•**Technical Reviewer**: Conference on Decision and Control; ASME Dynamic Systems and Control Conference American Control Conference: IEEE International Symposium on Resilient Control Systems; Robotics Science and Systems; Hybrid Systems Computation and Control; IEEE Transactions on Smart Grid; IEEE Transactions of Intelligent Transportation System Magazine