Jingkai Chen

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Research Overview

My research interests are primarily in the areas of planning and scheduling, control, combinatorial search, and mathematical optimization with the applications in interconnected robotic systems for manufacturing and warehouse logistics. My Ph.D. thesis is to develop a hybrid concurrent planner to plan high-fidelity models with mixed discrete-continuous specifications (e.g., vehicles, robotic arms, embedded devices) [1] for multiple agents [2] and multiple temporally concurrent goals [3] with the purpose of minimizing costs or maximizing rewards.

Education

Massachusetts Institute of Technology — Cambridge, WA
Ph.D. in Aeronautics and Astronautics — *Sept.2016-present*

Advisors: Prof. Brian C. Williams
Research Interests: Cyber-physical Systems; Robotics; Planning and Scheduling.

Zhejiang University — Hangzhou, China
B.S. in Control Science and Engineering — *Sept.2012-Jun.2016*

Enrolled in Chu Kochen Honors College, Advisor: Prof. Jiming Chen.
Concentration on Control Theory and System Engineering.

Work Experience

Research Assistant, MIT CSAIL — Cambridge, CA
Planning and Decision Making (mentored by Prof. Brian WIlliams) — *Sep.2016-present*

· Leading to develop a multi-arm assembly planner for CAD models (Kawasaki Assembly project).
· Led and developed a hybrid planner for scientific exploration (DARPA Creative Problem Solver project).
· Developed a routing planner to optimize utilities with network uncertainties (DARPA EdgeCT project).
· Developed a constraint optimization solver, OpSat, supporting various search methods and propagators.

Research Intern, McGovern Institute of Brain Research at MIT — Cambridge, CA
Data Mining in Brain Signals for Object Recognition (mentored by Dr. Dimitrios Pantazis) *Oct.2015-Apr.2016*

· Developed clustering methods to capture brain responses relevant to face identity and eye gaze processing in the MEG and fMRI date.

Undergraduate Research Trainee, UCLA — Los Angeles, CA
Adaptive Control Algorithm on Wireless Networks (mentored by Prof. Mario Gerla) — *July.2015-Sep.2015*

· Developed and tested an architecture to improve the client-slide experience for video streaming in MPEG-DASH protocol over mobile networks.

Honors and Awards

· Zhejiang University ECE Department Chunhui Scholarship 2016
· Chu Kochen Honors College Outstanding Talents Plan Fellowship 2015

· UCLA Cross-disciplinary Scholars in Science & Technology Scholarship 2015
· Zhejiang University First-Class Scholarship for Outstanding Students 2014
· The Dean Scholarship (Highest Honor in Zhejiang University Chu Kochen Honors College) 2014
· Zhejiang University First-Class Scholarship for Outstanding Students 2013
· First Prize of State Physics Competition for Undergraduate Students (China) 2013

Publications

1. Yuening Zhang, Jingkai Chen, Eric Timmons, Marlyse Reeves, and Brian C. Wiiliams. State-temporal decoupling of multi-agent plans under limited communication. In *The Ninth ICAPS Workshop on Planning and Robotics* (*PlanRob 2021*), 2021

2. Jingkai Chen, Yuening Zhang, Cheng Fang, and Brian C. Wiiliams. Generalized conflict-directed search for optimal ordering problems. In *Proceedings of the Fourteenth International Symposium on Combinatorial Search* (*SoCS 2021*), 2021

3. Zengyi Qin, Kaiqing Zhang, Yuxiao Chen, Jingkai Chen, and Chuchu Fan. Learning safe multi-agent control with decentralized neural barrier certificates. In *Proceedings of the Nineth International Conference on Learning Representations* (*ICLR 2021*), 2021

4. Jingkai Chen, Brian C. Williams, and Chuchu Fan. Optimal mixed discrete-continuous planning for linear hybrid systems. In *Proceedings of the Twenty-Fourth ACM International Conference on Hybrid Systems: Computation and Control* (*HSCC 2021*), 2021

5. Jingkai Chen, Jiaoyang Li, Chuchu Fan, and Brian C. Williams. Scalable and safe multi-agent motion planning with nonlinear dynamics and bounded disturbances. In *Proceedings of the Thirty-Fifth AAAI Conference on Artificial Intelligence* (*AAAI 2021*), 2021

6. Jingkai Chen. Fast execution of temporal plans with mixed discrete-continuous state constraints (master thesis), 2019

7. Jingkai Chen, Cheng Fang, David Wang, Andrew Wang, and Brian C. Williams. Efficiently exploring ordering problems through conflict-directed search. In *Proceedings of the Twenty-Ninth International Conference on Automated Planning and Scheduling* (*ICAPS 2019*), volume 29, pages 97–105, 2019

8. Jingkai Chen, Cheng Fang, Christian J Muise, Howard Shrobe, Brian C. Williams, and Peng Yu. Radmax: Risk and deadline aware planning for maximum utility. In *AAAI Workshop on Artificial Intelligence for Cyber Security* (*AICS-2018*), 2018

Technical Skills

Programming Languages	Python, MATLAB, C++, Common Lisp
Technologies	Drake, ROS, Bullet, GUROBI, CPLEX, MiniZinc, Android, Arduino
Github	github.com/jkchengh

Leadership & Activities

3rd Summer School on Cognitive Robotics University of Southern California, CA
Lecturer & Lab Assistant *July.2019*

Designed lab and tutorials about the model based programming for autonomous systems with the applications in scientific exploration.

MIT-China Innovation and Entrepreneurship Forum Cambridge, MA

Startup Mentor & Director & Vice President *Feb.2017-Nov.2018*

Organized conference focusing on collaborations between China and the United States on innovation and entrepreneurship; Mentored and helped early-stage American startups to establish business in China.

Zhejiang University Internet of Things (IoT) Club Hangzhou, China

Co-Founder & President *Apr.2014 - Jun.2015*

Organized monthly events and invited renowned IT companies' executives to share their vision of Internet technologies; Organized Internet of Things innovation and entrepreneurial competition for commercializing research discoveries.

Tibetan Area Voluntary Teaching Hongyuan, China

Team Leader *Aug.2013 - Sep.2013*

Organized a voluntary teacher team with 11 people to remote Tibetan area in Hongyuan, China; provided detailed research reports for local educational systems.

Service

Conference and Journal Reviewing

Journal of Artificial Intelligence Research (JAIR)

ACM International Conference on Hybrid Systems: Computation and Control (HSCC)

Conference Organization

PlanRob2021 Planning and Execution Session Chair

Selected Graduate Coursework

Autonomy and Robotics

16.413 Principles of Autonomy and Decision Making — Fall 2016

16.412 Cognitive Robotics — Spring 2017

16.322 Stochastic Estimation and Control — Fall 2017

Machine Learning and Optimization

6.252 Nonlinear Optimization — Spring 2017

6.867 Machine Learning — Fall 2017

6.435 Bayesian Modeling and Inference — Spring 2018