Chenxuanyin Zou

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Education & Awards

University of British Columbia (*Ph.D. student*) — Since Jan. 2024
Chemical and Biological Engineering Department — Prof. *Yankai Cao*

Northeastern University (*Master*) — Sep. 2020 – Jul. 2023
Laboratory of Synthetical Automation For Process Industries — Prof. *Jun Fu*

Outstanding Master's Thesis,	Thesis Award	(<2%)	2023
Suzhou Industrial Park Scholarship,	Enterprise Scholarship	(1/31)	2023
First-class Scholarship,	Graduate Scholarship	(40%)	2021-2023

Northeastern University (*Bachelor*) — Sep. 2016 – Jun. 2020
College of Information Science And Engineering — GPA: 3.8/5.0 (20%)

Second-class Scholarship,	Undergraduate Scholarship (10%)	2020
Third-class Scholarship,	Undergraduate Scholarship (30%)	2017-2019
Meritorious Winner,	MCM/ICM	2019

Research Interests

1. **Dynamic optimization of nonlinear systems (2019-2022)**
   We construct a finite-constraint upper bounding problem that can iteratively approximate the semi-infinite problem by restricting the right-hand side of the constraints. The algorithm can converge to a sub-optimal solution with rigorous satisfaction of the inequality constraints. Then we integrate the **semi-infinite programming** algorithms and optimal control methods to solve the dynamic multiobjective optimization problems of nonlinear systems with path constraints. (Cases: Fed-batch bioreactor and Lysine Fermentation).
2. **Multiobjective optimization (2021-2023)**
   We proposes a descent-direction-constrained method without a priori parameters for locating Pareto optimal solutions of multiobjective optimization problems by iteratively searching descent directions for a fixed objective with consideration to the others and evaluating their step lengths. Under certain differentiability assumptions, the algorithm is shown to converge to a point satisfying the proposed first-order necessary conditions for Pareto optimality, simultaneously avoiding weakly Pareto solutions and superlinearly and quadratically to the Pareto points with further sufficient conditions satisfied under strict convex assumptions.

Publications

1. **Multiobjective dynamic optimization of nonlinear systems with path constraints**
   Jun Fu, **Chenxuanyin Zou**, Mingsheng Zhang, Xinglong Lu, and Yuzhe Li
   IEEE Transactions on Systems, Man, and Cybernetics: Systems, 2023, 53(3), 1530-1542.
   DOI: 10.1109/TSMC.2022.3201685

Academic Experience

Research in the Laboratory — 2019 – 2023

- Integrate the heuristic algorithms and deterministic algorithms to adopt their advantages. I use the gradient-type method to converge to the local minimum because of their efficiency and the genetic algorithm to jump out of the local part through the mutation operator.
- Design two dynamic multiobjective optimization algorithms to solve the optimal control problems of nonlinear systems path constraints.
- Propose a descent-direction-constrained method for multiobjective optimization problems.

MCM/ICM – ***Meritorious Winner*** 2018 – 2019

Aim: Design an escape plan for Louvre Museum for terrorist attacks.

- Utilize the charging and discharging process of capacitance to approximate the process of people entering and leaving the rooms, design a charged circuit according to the building structure of the Louvre Museum, then discharge it. The best escape plan is the path through which electrons move in the circuit.

Internship and Hand-on Experience 2018 – 2021

- China Baowu Steel Group Corporation Limited & SIASUN Robot & Automation CO., LTD
- Quanser experimental equipment through **Simulink** (Linear Flexible Inverted Pendulum, etc. **in** Videos)
- Control an experimental blowing machine through PLC (SIEMENS & ABB).

Related Courses

- Numerical analysis(97), Fundamental of modern control theory(95), Process control systems(95), Introduction to modern robust control(100), Optimal control(96), Modern control systems I-II (I-95, II-93), Design of computer control systems for industrial processes(92), Data-driven intelligent modeling methods(89), Linear and non-linear control systems, and Fundamental of Artificial Intelligence(87), etc.

Others

- Fabrication of welding circuit board - made a voice controlled vehicle (Altium Designer, Multsim, etc.)
- Video production - made a 3-minute introductory video (Adobe Premiere Pro)
- Driving skills - got the driver's license in 2016.