

LIWEN ZHANG

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Education

Northeastern University

Master in Control Engineering, advised by Linying Xiang and Fei Chen

Sep. 2020 – Present

China

Publications

- **Liwen Zhang**, Linying Xiang. "Controllability of Boolean Control Networks under Three Mixed Control Inputs." *Preprint*.
- **Liwen Zhang**, Linying Xiang and Jiawei Zhu. "Relationship between Fragility and Resilience in Complex Networks." *Physica A: Statistical Mechanics and its Applications (Physica A)* 128039, 2022, ISSN 0378-4371, <https://doi.org/10.1016/j.physa.2022.128039>.
- Yubin Wang, Karnika Biswas, **Liwen Zhang**, Hakim Ghazzai and Yehia Massoud. "3D Autonomous Navigation of UAVs: An Energy-Efficient and Collision-Free Deep Reinforcement Learning Approach." *2022 IEEE Asia Pacific Conference on Circuits and Systems (APCCAS)*. **Accepted**.
- Fei Chen, **Liwen Zhang** and Linying Xiang. "A Method of Analysis of the Relationship between Fragility and Resilience of Complex Networks" *National Patent*. **Accepted**.

Experience

Innovative Technologies Laboratories, KAUST

External Collaborator

Saudi Arabia

Mar. 2022 – July. 2022

- The co-author paper 3D-AutoNav was accepted to *APCCAS'22*

Selected Projects

Controllability of Boolean Control Networks under Three Mixed Control Inputs | NEU

Oct. 2022

- A necessary and sufficient condition is derived for the controllability of Boolean control networks by transforming the problem into a set controllability problem. In addition, the concept of a set state reachable matrix is proposed to measure the difficulty of network controllability. Another necessary and sufficient condition for system controllability is derived based on this concept. Furthermore, Tarjan's algorithm is utilized to reduce the dimensionality of the controllability matrix, thereby reducing the complexity of the controllability algorithm.

Relationship between Fragility and Resilience in Complex Networks. | NEU

Sep. 2020

- The paper was accepted to *Physica A* and the patent was accepted to *National Patent*.
- Explained the phenomenon that the fragility will increase and the resilience will decrease when the network is attacked from a mathematical perspective. Provided analytical and numerical supporting evidence for the relationship that fragility and resilience of complex network subjects to a linear negative correlation in double logarithmic coordinates.

3D Autonomous Navigation of UAVs via Deep Reinforcement Learning | KAUST

March. 2022

- The paper 3D-AutoNav was accepted to *APCCAS'22*.
- Proposed a novel deep reinforcement learning-based architecture for planning energy-efficient and collision-free paths for a quadrotor UAV, using a unique combination of remaining flight distance and local knowledge of energy expenditure to compute an optimized route, with the key element - Attention-based neural network based on the partial knowledge of the environment.

Technical Skills

Languages: Python, C, MATLAB, Latex, Qt

Others: Unity, ROS, Solidworks, AD

Honors, Awards and Service

- Outstanding Fellowships, Northeastern University (2021)
- National Encouragement Scholarship (2018, 2019)
- Reviewer for *CCC* (2021, 2023)
- National Finals Third Prize Shandong Province Division First Prize, The 13th National Undergraduate Smart Car Competition Creative Group
- Shandong Province First Prize, The 14th National Undergraduate Smart Car Competition Transformer-Third Round Group
- First Prize, The 9th Shandong Undergraduate Science and Technology Festival Intelligent Technology Application Design Competition
- Project leader of the national undergraduate innovation and entrepreneurship training project, "Design of automatic buoy drone based on GPS waypoints positioning and path planning"