

# TAO ZHANG

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Current Address: Yuquan Campus, Zhejiang University, Hangzhou, China,

## RESEARCH INTEREST

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- Distributed System, Distributed Optimization
- Game Theory
- Graph Theory
- etc.

## EDUCATION

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- **Zhejiang University, China** **Sep 2020 – June 2023 (Expected)**  
*Master of Electrical Engineering*
- **Zhejiang University, China** **Sep 2016 – June 2020**  
*Bachelor of Engineering in Automation*
  - **Overall GPA:** 3.83/4.0;
  - **The last two years GPA:** 3.94/4.0

## JOURNAL ARTICLES

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- Tao Zhang, Chengchao Li, Dongying Ma, Xiaodong Wang and Chaoyong Li, “An Optimal Task Management and Control Scheme for Military Operations with Dynamic Game Strategy”, *Aerospace Science and Technology*, Vol. 115, 2021, 106815.
- Tao Zhang, Dongying Ma, Chaoyong Li and Xiaodong Wang, “Toward Rapid and Optimal Strategy for Swarm Conflict: A Computational Game Approach”, *IEEE Transactions on Aerospace and Electronic Systems*. **Currently Under Review**

## RESEARCH EXPERIENCE

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- **Control Scheme in Swarm Operations Based on Game Theory (Project leader)** **Oct 2020 – Mar 2021**
  - **Project Introduction**

In a swarm competition scenario, the real-time decision-making problem in terms of task assignment and motion control is hard to address. Under this scenario, a matrix-game-based model is developed, and a fast and optimal search algorithm is presented to solve the decision-making problem.
  - **Contribution**
    - Designed the kinetic model for robotic agents of the scenario.
    - Applied game theory to the decision-making problem and used the Action-Reaction Search method to search for the Nash equilibrium in real time.
    - Analyzed the underlying target assignment problem and turned it into a maximum weighted matching problem.
    - Modified and applied the Kuhn-Munkres algorithm to solve the target assignment problem while preserving the optimality of the decision.
    - Achieved a single decision-making processing speed of fewer than 400 milliseconds when the unit number reached 100.
- **A Parallel Algorithm of the Control Scheme in Swarm Operations (Project leader)** **Nov 2021 – Jul 2022**
  - **Project Introduction**

Based on the previous work, develop a distributed control scheme for competing clusters with more complex dynamic systems, mainly in terms of parallelization of the Nash strategies search and target assignment algorithm, to achieve a faster and near-optimal decision-making process.
  - **Contribution**

- Conducted the scenario modeling and simulation of the entire project.
- Proposed a new parallel target assignment algorithm and applied it to the Nash strategies search process.
- Used C++ and OpenMP support to construct the whole simulation scenario.
- Ensured 1/3-Nash solutions and significantly reduced the algorithmic complexity with graph maximum weight matching principle.
- Achieved a single decision-making processing speed of fewer than 50 milliseconds when the unit number reached 100. The running speed was ten times faster than the previous method when the unit number was large.

#### **Assisted Project: Software Design and Development**

**Apr 2021 – Nov 2021**

- **Project Introduction**

Assisted other laboratory members to convert MATLAB code to C++ code. Integrated the C++ code into a self-designed Graphical User Interface (GUI) software developed with Qt.

- **Contribution**

- Converted MATLAB code to C++ code.
- Analyzed bad code and streamlined the source code.
- Improved the source code quality with a tenfold performance boost.
- Designed a software with GUI using Qt.

#### **Simulation of Formation Control and Obstacle Avoidance (Project leader)**

**April 2020 – June 2020**

- **Project Introduction**

To study mixed formation control strategy of smart cars that move in a predefined formation and avoid obstacles on the ground.

- **Contribution**

- Developed the formation control algorithm with slide control theory.
- Developed the obstacle avoidance algorithm by introducing the rotating vector field method.

## **SELECTED AWARDS & HONORS**

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● Outstanding Graduate Student of Zhejiang University	Dec 2021
● Outstanding Graduate Merit of Zhejiang University	Dec 2021
● Inventronics Scholarship (College scholarship)	Dec 2021
● Second-Class Scholarship for Outstanding Merits of Zhejiang University	Dec 2019
● Second-Class Scholarship for Outstanding Students of Zhejiang University	Dec 2019
● National Encouragement Scholarship	Dec 2019
● Silan Scholarship (College scholarship)	Dec 2019
● Three-Star Volunteer of Zhejiang University	June 2019
● Third-class Scholarship for Outstanding Merits of Zhejiang University	Dec 2018
● Third-class Scholarship for Outstanding Students of Zhejiang University	Dec 2018
● National Encouragement Scholarship	Dec 2018

## **SKILLS SUMMARY**

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Highly skilled in MATLAB, MS Office applications, familiar with C++, C, Java, Python.

## **ADDITIONAL INFORMATION**

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### **Language proficiency**

TOEFL: 101 (Reading 29, Listening 24, Speaking 23, Writing 25)

TOEFL MyBest® Scores: 106 (Reading 29, Listening 25, Speaking 23, Writing 29)

### **Interests & hobbies**

Music, badminton, movie, photography, etc.