

# Tairan Liu

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Baton Rouge, LA • U.S.A.

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## Education

Louisiana State University

Ph.D. Candidate

Control System and Engineering, Dept. of Mechanical & Industrial Engineering

University of Science and Technology of China

Bachelor of Natural Science

Theoretical and Applied Mechanics, Dept. of Modern Mechanics

BATON ROUGE, LA, U.S.A.

*Expected December 2019*

GPA: 4.0

HEFEI, ANHUI, P.R.CHINA

*July 2012*

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## Research Interests

- Multi-Agent System
- Networked System
- Cooperative Control
- Distributed Control
- Lyapunov-Based Nonlinear Control
- Robotics

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## Professional Experience

Louisiana State University

BATON ROUGE, LA, U.S.A.

**Aerial Robotic Network for Agricultural Applications - Research Assistant** *July 2016 – Present*

Designed and built quadrotor fleet from scratch. Developed autonomous flight control firmware on MCU and flight control/monitor applications on PC. Developed distributed control network for quadrotors. (Funded by the LSU Economic Development Assistantship (EDA) program.)

**Multi-Agent System Formation Control - Research Assistant**

*July 2016 – Present*

Developed new formation control methods, provided mathematical proofs, conducted simulational and experimental validation.

**Computational Molecule Synthesis - Research Assistant**

*October 2015 – May 2016*

Developed open-source software which can decompose large molecules to small bio-active fragments, then use fragments to generate target molecules or new molecules for drug design.

**Multicopter Copter Applications in Agriculture - Research Assistant**

*February 2015 – June 2015*

Developed an application to process aerial images. Optimized the software for better processing speed.

**Teaching Assistant**

*August 2015 – May 2016*

Machine Design Lab (ME 4201), Autonomous Vehicles (ENGR 4200).

**Enrichment Award**

*August 2014 – August 2015*

University of Science and Technology of China

HEFEI, ANHUI, P.R.CHINA

**Bionic Four-Tail Fin UUV (Mimic Dragonfly) - Research Assistant**

*August 2011 – January 2013*

Developed program on MCU for motor control, developed remote control and wireless data transfer programs on PC and MCU for the bionic UUV with four oscillatory tail fins. The tail fins were designed to mimic the motion pattern of a dragonfly.

**Bionic Long Undulatory Fin UUV (Mimic Black Ghost Knifefish)**

*November 2011 – June 2012*

Designed and built a UUV to mimic the propulsion pattern of black ghost knifefish. Developed program on Arduino for the UUV. Studied the effects of the frequency and amplitude of the swaying fin ray, wave number in the fin surface, and the speed of the incoming flow on propulsion thrust.

**Bionic Double-Tail Fin UUV**

September 2011 – May 2012

Conducted experiments to optimize the performance of the double tail fin UUV. Developed a whole system to automatically conduct experiment, collect and process data, and plot results.

**Flow Trajectory After Passing Dual Circular Cylinder**

October 2011 – November 2011

Designed and built an adjustable dual circular cylinder model for the fluid experiment. Conducted experiments with hydrogen bubbles, laser beam, and high resolution high speed camera to study the water flow trajectory after passing dual circular cylinder.

**Composite Bionic Actuators**

April 2011 – August 2011

Assisted with motion pattern design. Developed programs on Arduino for the actuators.

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**Publications**

## Refereed Journal Articles

5. Milad Khaledyan, **Tairan Liu**, Victor Frenandez-Kim, and Marcio de Queiroz. Flocking and target interception control for formations of nonholonomic kinematic agents. *IEEE Transactions on Control Systems and Technology*. In press
4. **Tairan Liu**, Marcio de Queiroz, Pengpeng Zhang, and Milad Khaledyan. Further results on the distance and area control of planar formations. *International Journal of Control*. In press
3. Pengpeng Zhang, Marcio de Queiroz, Milad Khaledyan, and **Tairan Liu**. Control of directed formations using interconnected systems stability. *Journal of Dynamic Systems, Measurement, and Control*, 141(4):041003, 2019
2. Limeng Pu, Misagh Naderi, **Tairan Liu**, Hsiao-Chun Wu, Supratik Mukhopadhyay, and Michal Brylinski. eToxPred: a machine learning-based approach to estimate the toxicity of drug candidates. *BMC Pharmacology and Toxicology*, 20(1):2, 2019
1. **Tairan Liu**, Misagh Naderi, Chris Alvin, Supratik Mukhopadhyay, and Michal Brylinski. Break down in order to build up: Decomposing small molecules for fragment-based drug design with eMolFrag. *Journal of Chemical Information and Modeling*, 57(4):627–631, 2017

## Manuscripts in Submission

2. **Tairan Liu**, Victor Fernandez-Kim, and Marcio de Queiroz. Switching formation shape control with distance + area/angle feedback. *Systems & Control Letters*. Under review
1. **Tairan Liu** and Marcio de Queiroz. Distance + angle-based control of 2d rigid formations. *IEEE Transactions on Cybernetics*. Under review

## Conference Proceedings

1. **Tairan Liu**, Marcio de Queiroz, Pengpeng Zhang, and Milad Khaledyan. Directed formation control of  $n$  planar agents with distance and area constraints. In *2019 Annual American Control Conference (ACC)*, pages 1824–1829, Philadelphia, PA, Jul. 2019

## Conference Posters, Presentations, and Talks

2. **Tairan Liu**. Directed formation control of planar agents with distance and area constraints. In *2019 MIE Graduate Student Conference*, LSU, Baton Rouge, LA, Apr. 2019
1. **Tairan Liu**, Misagh Naderi, Supratik Mukhopadhyay, and Michal Brylinski. Decomposing small molecules for fragment-based drug design with eMolFrag. In *SCALA 2018 - Scientific Computing Around Louisiana*, LSU, Baton Rouge, LA, Feb. 2018

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**Awards and Honors**

## Outstanding Research Assistant, 2019

Department of Mechanical and Industrial Engineering, Louisiana State University, Baton Rouge, LA, U.S.A.

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## Grants

### Co-authored Proposal

Transportation Consortium of South-Central States, *Real-Time Work Zone Traffic Management via Unmanned Air Vehicles*, \$79,991, 18 months, Co-PIs: Charles Malveaux, Marcio de Queiroz, Xin Li, and Hany Hassan. (Under review, the only candidate in the final stage.)

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## Skills

**Hardware:** Arduino, Raspberry Pi, STM32 FC, NodeMCU, XBee, etc.

**Software:** XCTU, QT Creator, Microsoft Office, TeXstudio, Inkscape, AutoCAD, Arduino IDE, etc.

**Programming Languages:** Python, MATLAB/Simulink, C, C++ (*associated with GUI design with QT*) .

**Natural Languages:** Chinese (*mother tongue*) and English.

**Others:** HPC (*Philip@LSU, SuperMike-II@LSU, QB2@LONI*), LaTeX.

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## Other Experience

University of Science and Technology of China (USTC)

HEFEI, ANHUI, P.R.CHINA

**Robo-Game Competition of USTC (2010)**

June 2010 – October 2010

Participated in prototyping and building of autonomous and manned robots, and developed program on MCU for the autonomous robot.

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## Graduate Level Courses

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|---|---|
| • Advanced Mechanical Systems Control   | • Advanced Engineering System Dynamics                  |
| • Introduction to Modern Control Theory | • Sensors and Actuators                                 |
| • Advanced Linear Systems               | • Numerical Methods in Applied Mechanics                |
| • Advanced Topics in Control            | • Advanced Vibrations                                   |
| • Industrial Robotics                   | • Intelligent Control and Applications in Power Systems |
| • Topics in Modern System Science       |   |
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## Professional Activities

### Membership

Institute of Electrical and Electronics Engineers (IEEE), Student Member since 2017.

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