

# Tairan Liu

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Baton Rouge, LA • U.S.A.

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## Education

Louisiana State University

BATON ROUGE, LA, U.S.A.

**Ph.D. Candidate (Dissertation Defended)**

*Expected May 2020*

Mechanical Engineering, Dept. of Mechanical & Industrial Engineering

GPA: 4.0

University of Science and Technology of China

HEFEI, ANHUI, P.R.CHINA

**Bachelor of Natural Science**

*Jul. 2012*

Theoretical and Applied Mechanics, Dept. of Modern Mechanics

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## Research Interests

- Multi-Agent System
  - Cyber-Physical System
  - Networked System
  - Cooperative Control
  - Distributed System
  - Lyapunov-Based Nonlinear Control
  - Robotics
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## Professional Experience

Louisiana State University

BATON ROUGE, LA, U.S.A.

**Teaching Assistant**

*Jan. 2020 – May 2020*

Fundamentals of Instrumentation and Measurement (ME 3603).

**Multi-Agent System Formation Control**

*Jul. 2016 – May 2020*

Proposed new formation control methods, provided mathematical proofs, conducted computational and experimental validation.

**Aerial Robotic Network for Agricultural Applications**

*Jul. 2016 – Oct. 2019*

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.)

**Computational Molecule Synthesis**

*Oct. 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.

**Multirotor Copter Applications in Agriculture**

*Feb. 2015 – Jun. 2015*

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

**Teaching Assistant** Jan. 2016 – May 2016  
Autonomous Vehicles (ENGR 4200).

**Teaching Assistant** Aug. 2015 – Dec. 2015  
Machine Design Lab (ME 4201).

**University of Science and Technology of China** HEFEI, ANHUI, P.R.CHINA  
**Bionic Four-Tail Fin UUV (Mimic Dragonfly)** Aug. 2011 – Jan. 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)** Nov. 2011 – Jun. 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** Sep. 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** Oct. 2011 – Nov. 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** Apr. 2011 – Aug. 2011  
Assisted with motion pattern design. Developed programs on Arduino for the actuators.

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## Publications

### Refereed Journal Articles

7. **Tairan Liu** and Marcio de Queiroz. Distance + angle-based control of 2d rigid formations. *IEEE Transactions on Cybernetics*. Accepted
6. **Tairan Liu**, Victor Fernandez-Kim, and Marcio de Queiroz. Switching formation shape control with distance + area/angle feedback. *Systems & Control Letters*. In press
5. Milad Khaledyan, **Tairan Liu**, Victor Fernandez-Kim, and Marcio de Queiroz. Flocking and target interception control for formations of nonholonomic kinematic agents. *IEEE Transactions on Control Systems 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

1. **Tairan Liu**, Marcio de Queiroz, and Farid Sahebsara. An orthogonal basis approach to planar formation control. In *IEEE Conference on Control Technology and Applications*. 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

#### Ph.D. Dissertation

**Tairan Liu**. *Distance-Based Formation Control: Theory, Applications, and Issues*. PhD dissertation, Louisiana State University, May 2020

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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.

##### LSU-ME Enrichment Award, 2014

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.

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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)**

*Jun. 2010 – Oct. 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 |
| • Topics in Modern System Science       | Power Systems                             |
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## Professional Activities

### Membership

Institute of Electrical and Electronics Engineers (IEEE)

Institute of Electrical and Electronics Engineers - Control Systems Society (IEEE-CSS)

### Reviewer

Automatica

IEEE Transactions on Cybernetics

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