

# Tairan Liu

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Baton Rouge, LA • U.S.A.

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## Education

Louisiana State University

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

Mechanical Engineering, Dept. of Mechanical & Industrial Engineering

BATON ROUGE, LA, U.S.A.

*Expected May 2020*

GPA: 4.0

University of Science and Technology of China

**Bachelor of Natural Science**

Theoretical and Applied Mechanics, Dept. of Modern Mechanics

HEFEI, ANHUI, P.R.CHINA

*July 2012*

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## Research Interests

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

Louisiana State University

**Multi-Agent System Formation Control**

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

BATON ROUGE, LA, U.S.A.

*July 2016 – Present*

**Aerial Robotic Network for Agricultural Applications**

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.)

*July 2016 – October 2019*

**Computational Molecule Synthesis**

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.

*October 2015 – May 2016*

**Multirotor Copter Applications in Agriculture**

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

*February 2015 – June 2015*

**Teaching Assistant**

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

*August 2015 – May 2016*

University of Science and Technology of China

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

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.

HEFEI, ANHUI, P.R.CHINA

*August 2011 – January 2013*

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

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.

*November 2011 – June 2012*

**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

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** 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

## Ph.D. Thesis

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

## 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)**

*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.

Reviewer

IEEE Transactions on Cybernetics

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