Tairan Liu

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Baton Rouge, LA • U.S.A.

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   *July 2012*
      Theoretical and Applied Mechanics, Dept. of Modern Mechanics

Research Interests

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

Professional Experience

Louisiana State University   Baton Rouge, LA, U.S.A.
   Multi-Agent System Formation Control   *July 2016 – Present*
      Proposed new formation control methods, provided mathematical proofs, conducted computational and experimental validation.

   Aerial Robotic Network for Agricultural Applications   *July 2016 – October 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   *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.

   Multirotor Copter Applications in Agriculture   *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).

University of Science and Technology of China   Hefei, Anhui, P.R.China
   Bionic Four-Tail Fin UUV (Mimic Dragonfly)   *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.

Publications

Refereed Journal Articles

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

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

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.

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.

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.

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.

Graduate Level Courses

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

Professional Activities

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

Reviewer
> IEEE Transactions on Cybernetics