

Boyang LI

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EDUCATION

Ph. D. in Mechanical Engineering

Anticipated Dec. 2018

Thesis: *Model Predictive Control and Transition Optimization for a Tail-Sitter Unmanned Aerial Vehicle*

Supervisor: Prof. Chih-yung Wen

The Hong Kong Polytechnic University, Kowloon, Hong Kong SAR

M. Eng. in Flight Vehicle Design, School of Aeronautics

Apr. 2015

Thesis: *Experimental Study about High-Lift Mechanism for 3-DOF Flapping Wings*

Supervisor: Prof. Bifeng Song

Northwestern Polytechnical University, Xi'an, China

B. Eng. in Flight Vehicle Design and Engineering, Honors College

Jun. 2012

Northwestern Polytechnical University, Xi'an, China

RESEARCH EXPERIENCE

1. Design, Modeling and Control of a VTOL Tail-sitter UAV

July, 2015 – Present

- Designed and built a quad-rotor vertical takeoff and landing (VTOL) tail-sitter UAV prototype
- Developed the nonlinear simulation model for the UAV based on wind tunnel experiments
- Developed the Model Predictive Controller (MPC) for hovering and deployed it into on-board flight computer to improve the disturbance rejection capability
- Optimized the hover-level flight transition trajectory with collocation method
- Carried out indoor flights in VICON and outdoor flight experiments to verify the performance

2. Search and Rescue UAV System (First Prize Awarded)

Jan. 2016- Apr. 2016

- Built a high efficiency fixed-wing UAV system equipped with image acquisition equipment
- Integrated onboard and post image processing program to identify targets with OpenCV-Python
- Developed two-UAV communication relay system to ensure the long-distance telemetry quality

3. Experimental Study about High Efficiency Flapping Wings

Mar. 2012- Jun. 2015

- Designed and built a flapping wing experimental mechanism with 3 degrees-of-freedom (DOF)
- Developed software for measure and control of the flapping wing with LabVIEW
- Carried out force/torque measurement experiments in the wind tunnel and water tank

4. China Robot Competition and Freescale Smart Car Competition

Jun. 2010- Sep. 2011

- Built a deformable robot with 24 degrees-of-freedom (transforms from a hand to a dog shape)
- Designed the PCB with ATmega 128 MCU to control the movement of 24 servo-motors
- Built a model car to recognize the road line with camera and turned the PID control system

PUBLICATIONS ([Google Scholar](#))

- [1] **B. Li**, J. Sun, W. Zhou, C.Y. Wen, and C.K. Chen, “An Optimal Transition Control Method for Tail-sitter VTOL UAVs,” *Autonomous Robots*, in prepare.
- [2] J. Sun, **B. Li**, C.Y. Wen, and C.K. Chen, “Wind Estimation Method for a Tail-Sitter UAV in all Flight Phases,” *IEEE Transactions on Aerospace and Electronic Systems*, submitted.
- [3] J. Sun, **B. Li**, C.-Y. Wen, and C.-K. Chen, “Design and implementation of a real-time hardware-in-the-loop testing platform for a dual-rotor tail-sitter unmanned aerial vehicle,” *Mechatronics*, vol. 56, pp. 1-15, 2018.
- [4] **B. Li**, W. Zhou, J. Sun, C. Y. Wen, and C. K. Chen, “Development of Model Predictive Controller for a Tail-Sitter VTOL UAV in Hover Flight,” *Sensors*, vol. 18, no. 9, 2018.
- [5] **B. Li**, W. Zhou, J. Sun, C. Y. Wen, and C. K. Chen, “Model Predictive Control for Path Tracking of a VTOL Tailsitter UAV in an HIL Simulation Environment,” in *AIAA Modeling and Simulation Technologies Conference*, Kissimmee, Florida, 2018.
- [6] J. Sun, **B. Li**, L. Shen, C. K. Chen, and C. Y. Wen, “Dynamic Modeling and Hardware-In-Loop Simulation for a Tail-Sitter Unmanned Aerial Vehicle in Hovering Flight,” in *AIAA Modeling and Simulation Technologies Conference*, Grapevine, Texas, 2017.
- [7] J. Sun, **B. Li**, Y. Jiang, and C. Y. Wen, “A Camera-Based Target Detection and Positioning UAV System for Search and Rescue (SAR) Purposes,” *Sensors*, vol. 16, no. 11, 2016.
- [8] **B. Li**, Y. Jiang, J. Sun, L. Cai, and C. Y. Wen, “Development and Testing of a Two-UAV Communication Relay System,” *Sensors*, vol. 16, no. 10, 2016.
- [9] **B. Li**, B. Song; L. Wang, “A Three-dimensional Flapping Wing Mechanism for Wind Tunnel Experiments,” in *29th Congress of the International Council of the Aeronautical Sciences (ICAS)*, St. Petersburg, Russian, 2014

INTERN

DJI Innovation

Department of Propulsion System

Shenzhen, China

July. 2014- Sep. 2014

- Designed, built and tested a new configuration of Hybrid Quadrotor VTOL UAV
- Developed vibration measurement platform for the propulsion system vibration isolation

HONORS & AWARDS

- Gold Medal, 45th International Exhibition of Inventions of Geneva, Geneva, Switzerland, 2017
- Talent Development Scholarship, the Hong Kong SAR Government, Hong Kong, 2017

- Second Prize, Search and Rescue Group, Taiwan UAV Competition, Tainan, Taiwan, 2017
- First Prize, Search and Rescue Group, Taiwan UAV Competition, Tainan, Taiwan, 2016
- First Prize, Innovation Group, Taiwan UAV Competition, Tainan, Taiwan, 2016
- Third Prize, AVIC Cup - International UAV Innovation Grand Prix, Beijing, China, 2013
- Second Prize, Walking Robot Competition, China Robot Competition, Lanzhou, China, 2011
- First Prize, Dancing Robot Competition, China Robot Competition, Erdos, China, 2010

SKILLS

- Experienced pilot for RC **fixed-wing/multi-rotor/helicopter** UAVs
- Matlab/Simulink, LabView, C, ROS, PX4, Gazebo, Git, LaTeX

ACADEMIC ACTIVITIES

- Reviewer for Aerospace Science and Technology
- Reviewer for 2019 International Conference on Robotics and Automation (ICRA)
- Reviewer for IEEE Transactions on Wireless Communications
- Reviewer for Journal of Communications and Networks
- Reviewer for International Journal of Micro Air Vehicles

RECORDS OF STANDARD TESTS

GRE: 320 (V: 153, Q: 167, AW: 3.5)

July. 2013

TOEFL: 105 (R: 29, L: 28, S: 22, W: 26)

Nov. 2013