CHANGHUANG (CHARLIE) WAN

Phone: 334-727-8950 Email: cwan@tuskegee.edu
Assistant Professor, Aerospace Science Engineering Department
Tuskegee University, Tuskegee, AL 36088

EDUCATION

The Ohio State University, Columbus, OH *Aug 2017 – expected Feb 2021*
Ph.D in Mechanical & Aerospace Engineering
PhD Dissertation: *Scalable Decision-Making for Autonomous Systems in Space Missions*

Iowa State University, Ames, IA *Attended from August 2016- July 2017*
Ph.D in Aerospace Engineering
Beihang University, Beijing, China *Sep 2013 – Jan 2016*
M.S. in Aerospace Engineering
Area of Study: *Structural optimization, multidisciplinary design and optimization*
Beihang University, Beijing, China *Sep 2009 – June 2013*
B.S. in Aerospace Engineering
Area of Study: *Autonomous system, control theory, spacecraft system design,*

RESEARCH INTERESTS

Robotics	Energy-aware unmanned ground/aerial vehicles
Control & Dynamics	Modeling and optimal control design of autonomous systems
Optimization	Nonconvex optimization & Distributed optimization of multi-agent systems/networks

ACADEMIC SERVICES

Reviewed articles for IEEE Access, Mechatronics, Neurocomputing
Reviewed articles for conferences in robotics and control, namely: IEEE International Conference on Robotics and Automation (ICRA), American Control Conference (ACC), IEEE Conference on Decision and Control

COURSE TAUGHT

AENG 0340	Fundamentals of Space Mechanics
AENG 0370	Aircraft Stability and Control
AENG 0460	Automatic Flight Controls
AENG 0460L	Automatic Flight Controls Laboratory

RESEARCH EXPERIENCE

Automation & Optimization Laboratory, The Ohio State University August 2016 – present
—PhD student and Research Assistant *—Supervisor: Prof. Ran Dai*

Project 1. Optimized Entry and Powered Descent Guidance for Precision Planetary Landing *—Funded by NASA*
Developed a guidance approach that optimizes the end-to-end entry, powered descent, and landing (EDL) trajectories toward the fuel-optimal and precise landing. The work was published in *2020 AIAA SciTech conference* and submitted to *Journal of Guidance, Control and Dynamics* (**JGCD**).

Project 2. Learning-based Methods for Optimal Control Problems *—Funded by NSF*
Developed learning-based framework to deal with large scale optimal control problems. The major idea is combining the Machine Learning method (Supervised learning/Reinforcement learning/CNN) with the optimal

control theory. Instead of learning all state-control pairs, our method only need to learn some identified parameters, such as the initial values of adjoint variables, switch time, etc.ne advantage of this idea is that it could significantly reduce computational load required for database training. The work will be presented in *2021 AIAA SciTech conference*, and it has been accepted by *Journal of Guidance, Control and Dynamics* (**JGCD**).

Project 3. Network localization and Formation Control

Developed a milder graph condition for unique localizability by considering non-adjacency inequality constraints,. Proposed an alternating rank minimization algorithm (ARMA) to solve the distance-based SNL problem. The work was presented in *2019 American Control Conference* (**ACC**) and published in *IEEE Transactions on Control of Network Systems*(**TCNS**).

Investigated the angle-based sensor network localization (ASNL) problem. Proposed a notion termed angle fixability to recognize frameworks that can be uniquely determined by angles up to translations, rotations, scalings and reflections. Proved that any framework with a non-degenerate bilateration ordering is angle fixable. Proposed the centralized and distributed approach to solve ASNL problems in noise-free and noisy environment. This work was presented in *2019 IEEE Conference on Decision and Control* (**CDC**) and conditionally accepted by *IEEE Transactions on Automatic Control* (**TAC**).

Project 4. Design and Mission Planning for Energy-aware Robotic Systems *—Funded by NSF*

The project aims at developing and integrating heterogeneous aerial and ground vehicles to achieve long-duration high-efficiency operations for missions across wide areas.The ultimate goal is to actively exploit renewable solar energy from the environment to overcome time and distance limitations for long-duration unmanned missions while also reducing the environmental impact of robotic systems. The work was published in *AIAA SciTech conference* and *2020 IEEE International Conference on Robotics and Automation (***ICRA***)*

Spacecraft Design, Optimization & Dynamic Laboratory, Beihang University

[J3] **C. Wan**, G. Jing, S. You, and R. Dai, Sensor Network Localization via Alternating Rank Minimization Algorithms, *IEEE Transactions on Control of Network Systems*. 2019, pp.1-12.

[J2] **C. Wan**, R. Dai, and P. Lu, Alternating Minimization Algorithm for Polynomial Optimal Control Problems, *Journal of Guidance, Control, and Dynamics*, Vol. 42, No. 4, 2019, pp. 723-736.

[J1] X. Wang, **C. Wan**, R. Xia. Parameters optimization design method of complex space-web system. *Acta aeronautica et astronautica sinica*, Vol. 37, No. 10, 2016, pp.3064-3073.

— Conference Articles —

[C14] **C. Wan**, G. Jing, R. Dai and R. Zhao, "Local Shape-Preserving Formation Maneuver Control of Multi-agent Systems: From 2D to 3D," 2021 60th IEEE Conference on Decision and Control (CDC), 2021, pp. 6251-6257.

[C13] **C. Wan**, C. Pei, R. Dai, G. Jing, J. Rea, "Six-Dimensional Atmosphere Entry Guidance based on Dual Quaternion", *AIAA Science and Technology Forum and Exposition*, 2021.

[C12] S. You, **C. Wan**, R. Dai, J. Rea, "Learning-based Optimal Control for End-to-End Human-Mars Entry, Powered-Descent, and Landing Mission", *AIAA Science and Technology Forum and Exposition*, 2021.

[C11] M. Jung, Q. Ze, C. Pei, **C. Wan**, K. Tan, R. Zhao, R. Dai,, "Enhanced Power Generation of AirborneWind Energy System by Foldable Aircraft", *AIAA Science and Technology Forum and Exposition*, 2021.

[C10] **C. Wan**, G. Jing, R. Dai, and J. Rea, "Fuel-Optimal Guidance for End-to-End Human-Mars Entry, Powered-Descent, and Landing Mission", *AIAA Science and Technology Forum and Exposition*,pp1472. 2020.

[C9] S. You, **C. Wan**, R. Dai, and J. Rea, "Learning-based Optimal Control for Planetary Entry, Powered Descent and Landing Guidance", *AIAA Science and Technology Forum and Exposition*, 2020.

(C8) IEEE Conference on and ICRAC n