

## Bin-Bin Hu (Male)

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### EDUCATION

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<b>Huazhong University of Science and Technology, Wuhan, P.R. China</b> <i>Ph.D.</i> , Control Science and Technology    Grades: 89.52/100 (2/13) Advisor: Prof. Hai-Tao Zhang	Sep. 2017–Jun. 2022
<b>Jiangnan University, Wuxi, P.R. China</b> <i>B.Sc.</i> , Electrical Engineering and Automation    GPA: 3.82/4 (1/75)	Sep. 2013–Jun. 2017

### PROFESSIONAL EXPERIENCE

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<b>Nanyang Technological University, Singapore</b> Research Fellow, Advisor: Prof. Chen Lv	Aug. 2022–Now
<b>University of Groningen, Groningen, The Netherlands</b> Visiting <i>Ph.D.</i> , Advisor: Prof. Ming Cao	May. 2021–May. 2022

### PROFILE

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**Research Interests:** Networked control system, Robot navigation, Motion planning, Unmanned surface vessels. Extensive theoretical research experience in collective control, robot navigation for multi-robot systems with research papers in professional venues e.g., Automatica, TCST, TCNS, TIE) and real-world applications (with our platform such as (HUSTER-0.3, HUSTER-16, HUSTER-30 USVs).

### AWARDS/HONORS:

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<b>National Scholarship</b> (PhD., rate: 1%)	2021
The Outstanding Reviewers of 2020, Asian Journal of Control	2020
<b>National Scholarship</b> (Master, rate: 1%)	2018
Gold medal (5/8), the 46th International Inventions of Geneva	2018
<b>National Scholarship</b> (Undergraduate, rate: 1%)	2015

### PUBLICATIONS

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#### Journals:

- B.-B. Hu**, Y. Zhou, H. Wei, Y. Wang, C. Lv, “Ordering-Flexible Multi-Robot Coordination for Moving Target Convoying Using Long-Term Task Execution,” submitted to Automatica, 2022.
- B.-B. Hu**, H.-T. Zhang, W. Yao, J. Ding, M. Cao, “Ordering-Flexible Platoon Control for Multi-Robot Path Navigation Using Guiding Vector Fields,” submitted to IEEE Transactions on Robotics (T-RO), 2022.
- B.-B. Hu**, H.-T. Zhang, W. Yao, Z. Sun, M. Cao, “Coordinated Guiding Vector Field Design for Ordering-Flexible Multi-Robot Surface Navigation,” submitted to IEEE Transactions on Automatic Control (T-AC), 2022.
- Hai-Tao. Zhang, **B.-B. Hu**, B. Liu, J.-T. Ye, J. Zhao, H. Su, C. Zhu, Y. Yuan, Y. Shi, “Unified Cooperative Cyber-Physics Framework for Aerial-Marine Cross-Domain Unmanned Systems,” submitted to Proceedings of the IEEE, 2021.
- B.-B. Hu**, H.-T. Zhang, Y. Shi, “Cooperative Label-Free Moving Target Fencing for Second-Order Multi-Agent Systems with Rigid Formation,” Automatica, vol. 148, p. 110788, 2023.
- B.-B. Hu**, H.-T. Zhang, B. Liu, H. Meng, G. Chen, “Distributed Surrounding Control of Multiple Unmanned Surface Vessels with Varying Interconnection Topologies,” IEEE Transactions on Control System Technology (T-CST), vol. 30, no. 1, pp. 400-407, 2022.
- B.-B. Hu**, Z. Chen, H.-T. Zhang, “Distributed Moving Target Fencing in a Regular Polygon Formation,” IEEE Transactions on Control of Network System (T-CNS), vol. 9, no. 1, pp. 210-218, 2022.
- B.-B. Hu**, H.-T. Zhang, “Bearing-only Motional Target-Surrounding Control for Multiple Unmanned Surface Vessels,” IEEE Transactions on Industrial Electronics (T-IE), vol. 69, no. 4, pp. 3988-3997, 2022.
- B.-B. Hu** and H.-T. Zhang, “Bearing-based localization of multi-agent system with event-triggered strategy”, Control Theory & Applications, vol. 38, no. 11, pp. 1845-1854, 2021.

10. **B.-B. Hu**, H.-T. Zhang, J. Wang, “Multiple-Target Surrounding and Collision Avoidance of A Second-Order Nonlinear Multi-Agent System,” *IEEE Transactions on Industrial Electronics (T-IE)*, vol. 68, no. 8, pp. 7454-7463, 2020.
11. H.-T. Zhang, **B.-B. Hu**, Z. Xu, Z. Cai, B. Liu, X. Wang, T. Geng, S. Zhong, J. Zhao “Visual Navigation and Landing Control of a Unmanned Aerial Vehicle on a Moving Autonomous Surface Vehicle via Adaptive Learning,” *IEEE Transactions on Neural Networks and Learning Systems (T-NNLS)*, vol. 32, no. 12, pp. 5345-5355, 2021.
11. B. Xu, H.-T. Zhang, F. Meng, **B.-B. Hu**, D. Chen, G. Chen, “Moving Target Surrounding Control of Linear Multi-agent Systems With Input Saturation,” *IEEE Transactions on Systems, Man, and Cybernetics (TSMC)*, vol. 52, no. 3, pp. 1705-1715, 2022.

#### Conferences:

1. **B.-B. Hu**, B. Liu, H.-T. Zhang, “Cooperative Hunting Control for Multi-Underactuated Surface Vehicle, The 37th Chinese Control Conference (CCC), 2018, pp. 1934-1768.
2. **B.-B. Hu**, B. Liu, Z. Xu, T. Geng, Y. Yuan, H.-T. Zhang, “Distributed Hunting for Multi USVs Based on Cyclic Estimation and Pursuit, The 11th International Conference on Intelligent Robotics and Applications (ICIRA), 2018, pp. 101-112.
3. J.-T. Ye, **B.-B. Hu**, Z.-C. Xu, B. Liu, H.-T. Zhang, “Autonomous Landing Allocation of Multiple Unmanned Aerial Vehicles on Multiple Unmanned Surface Vessels Subject to Energy Consumption, The 14th International Conference on Intelligent Robotics and Applications (ICIRA), 2021, pp. 611-621.
4. M.-Y. Gao, **B.-B. Hu**, B. Liu, N. Qiu, H.-T. Zhang, “Constrained Path-Planning Control of Unmanned Surface Vessels via Ant-Colony Optimization, The 40th Chinese Control Conference (CCC), 2021, pp. 1-6.
5. Z.-C Xu, **B.-B. Hu**, B. Liu, X. Wang, H.-T. Zhang, “Vision-based Autonomous Landing of Unmanned Aerial Vehicle on a Motional Unmanned Surface Vessel, The 39th Chinese Control Conference (CCC), 2020, pp. 6845-6850.

#### Patents:

1. H.-T. Zhang, **B.-B. Hu**, B. Liu, et. al, “A self-balancing grabbing device and grabbing method for unmanned aerial vehicle”, Invention patent, authorized, NO. 109501969, 2020.
2. H.-T. Zhang, B. Liu, **B.-B. Hu**, et. al, “A kind of autonomous vessel based on indoor research”, Invention patent, authorized, NO. 108100199, 2020.
3. H.-T. Zhang, B. Liu, **B.-B. Hu**, et. al, “A method for coordination of multiple unmanned vessels”, Invention patent, authorized, NO. 108037755, 2020.

#### CONFERENCE ACTIVITY

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| 1. IFAC Workshop Control for Smart Cities 2022, Sozopol, Bulgaria (Invited talk)                    | Jun. 27–30, 2022 |
| 2. The 11th International Conference on Intelligent Robotics and Applications, Newcastle, Australia | Aug. 9–11, 2018  |
| 3. The 37th Chinese Control Conference, Wuhan, China (Oral)   | Jul. 25-27, 2018 |
| 4. The 46th International Inventions of Geneve, Geneve, Switzerland (Oral)                          | Apr. 10-15, 2018 |

#### RESEARCH PROJECT

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1. **NTU-Schaeffler Joint Project:** Brake-by-wire System Design and Regenerative Braking Control for AMR  
Proposed safety-critical control algorithm and conducted experiments on the real AMRs, including path generating and tracking, collision avoidance in the warehouse.
2. **Ordering-Flexible Control for Multi-Robot Navigation System:** Proposed a coordinated guiding vector field to guide robots to form an ordering-flexible coordination while maneuvering along the desired manifolds (path, surface, etc.). Potential applications of arbitrary-dimension desired paths including self-intersected, non-convex, closed and non-closed one.
3. **Target Convoying for Multi-USV System:** Proposed methods concerning target convoying in presence of different situations: rigid and flexible patterns, bearing-only measuring, varying topologies and collision avoidance.
4. **Navigation and Landing for UAV-USV System:** Proposed a visual navigation and landing control paradigm for an unmanned aerial vehicle (UAV) to land on a moving autonomous surface vehicle (ASV). Conducted landing experiments with our HUSTER-30 ASV and the M-100 UAV.

## RESEARCH PROJECTS

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1. **Chief Investigator**, Theory and application for cooperative formation of multiple autonomous surface vessels, Fundamental Research Funds for Central Universities: HUST, 20000 CNY, 2020–2021.

## SELECTED EXTRACURRICULAR

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**Reviewer:** IEEE Transactions on Automatic Control (TAC), IEEE Transactions on Control of Network Systems (TCNS), IEEE Transactions on Intelligent Transportation Systems (TITS), IEEE Transactions on Industrial Electronics (TIE), IEEE Transactions on Intelligent Vehicles (TIV), Asian Journal of Control (AJC), Control Theory and Technology (CTT), IEEE Conference on Decision and Control (CDC), American Control Conference (ACC), Chinese Control Conference (CCC), Chinese Control and Decision Conference (CCDC).

**Skills:** Practical experience in Python (Tensorflow, Pytorch), Reinforcement Learning (DQN, AC, A3C, SAC, PPO, DDPG), Motion Planning (RRT, Vector Field, A\*) Matlab, C++, C, ROS, Altium Designer (Hardware Design).

## REFEREES

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1. **PhD. Supervisor**, Hai-Tao Zhang, Professor, Huazhong University of Science and Technology, P.R. China, zht@mail.hust.edu.cn
2. **Supervisor**, Zhiyong Chen, Professor, The University of Newcastle, Australia, zhiyong.chen@newcastle.edu.au
3. **Supervisor**, Ming Cao, Professor, University of Groningen, the Netherlands, m.cao@rug.nl
4. **Supervisor**, Chen Lv, Nanyang Assistant Professor, Nanyang Technological University, Singapore, lyuchen@ntu.edu.sg