Hann Woei Ho

Senior Lecturer/ Assistant Professor

School of Aerospace Engineering, Universiti Sains Malaysia
Nationality: Malaysian
Fluency: Malay, English, Chinese

About Me

My research focuses on bio-inspired vision and control, machine learning, advanced flight control, Micro Air Vehicle (MAV) design, and swarm. It involves creating autonomous MAVs by integrating theory and practice, which are extremely challenging, yielding numerous publications as the first/corresponding author, including IEEE Transactions on Robotics (**T-RO**), Aerospace Science and Technology (**AESCTE**), Robotics and Autonomous Systems (**RAS**), Journal of Aerospace Information Systems published by American Institute of Aeronautics and Astronautics (**AIAA**), Robotics: Science and Systems (**RSS**), IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), and other prestigious journals. I have successfully secured several highly competitive national grants and been awarded various prizes in both national and international conferences/competitions, including two best paper awards and four technology challenge awards.

Education

2013 – 2017 **Ph.D. in Aerospace Engineering**, Delft University of Technology (TU Delft), Delft, The Netherlands.

2010 – 2012 **M.Sc. in Aerospace Engineering**, Delft University of Technology (TU Delft), Delft, The Netherlands. [Awarded *cum laude*]

2005 – 2009 **B.Eng. in Aerospace Engineering**, Universiti Sains Malaysia (USM), Penang, Malaysia. [Awarded *gold medal*]

Working Experience

2017 – Present **Senior Lecturer/ Assistant Professor (Permanent)**, USM
- UAV Laboratory Manager, School of Aerospace Engineering.
- Coordinator for the Career & Alumni Unit, School of Aerospace Engineering.
- Advisor for the Drone Club, USM.

2017 – 2023 **Guest Researcher**, Faculty of Aerospace Engineering, TU Delft.

2019 **Visiting Scholar**, Northwestern Polytechnical University, China.

2018 – 2019 **University Associate**, Curtin University of Technology, Malaysia.

2010 **Design Engineer**, Matromatic Handling Systems (M) SDN. BHD., Malaysia.

2009 **Production Engineer**, Shimano Components (M) SDN. BHD., Malaysia.

Grants and Research Papers Summary

Competitive Research Grants

Grants	PI†	Co-PI	Total
National	2	2	4
University	1	4	5
Industry	1	2	3
Total	4	8	12

† PI = Principal Investigator.

Published Papers

Papers	Main⋆	Co-author	Total
Q1 & Q2	7	7	14
Q3 & Q4	3	2	5
Scopus, book, Conference	9	2	11
Total	19	11	30

⋆Main = First/Corresponding author.

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Research Grants

Principal Investigator (PI)

1. **Fundamental Research Grant Scheme (FRGS)** [**National-MoHE***], *Formulation of a Novel Spiking Neural Network Architecture for Enhancing Event-based Visual Perception and Control of Agile Micro Air Vehicles in complex environments*, 2024-2026.

2. **External Agency** [**International**], *Collaborative Research on Intelligent And Autonomous Unmanned Aerial Systems*, 2024-2025.

3. **Fundamental Research Grant Scheme (FRGS)** [**National-MoHE***], *Formulation of a Novel Online Target-oriented Navigation Method with Optical Flow for Unmanned Aerial Vehicles in Cluttered Environment*, 2020-2024.

4. **Short-Term Grant** [**University**], *Autonomous landing of miniature Unmanned Aerial Vehicles (UAVs) using monocular vision*, 2017-2020.

Co-Principal Investigator (Co-PI)

5. **Fundamental Research Grant Scheme (FRGS)** [**National-MoHE***], *Formulation of Hierarchical Multi-Agent Reinforcement Learning for Cooperative and Distributed Control of Unmanned Aerial Vehicle Teams*, 2024-2026.

6. **External Agency** [**International**], *Research on Advanced Aeronautical Technology and Aerial Robotics- Research Collaboration and Exchange Project on Aerospace Engineering*, 2023-2024.

7. **Fundamental Research Grant Scheme (FRGS)** [**National-MoHE***], *Formulation of Online Actor-Critic Reinforcement Learning with Multivariate Splines for Autonomous Control of Unmanned Aerial Vehicles*, 2020-2022.

8. **Research University Grants (RUI)** [**University**], *Development of Fully Autonomous MALE UAS for Monitoring and Surveillance Purposes (MALE UAS: Mid-altitude Long Endurance Unmanned Aerial System)*, 2020-2022.

9. **Research University Grants (RUI)** [**University**], *Investigation into Perpetual Solar-Powered UAV Designs for Global Operation*, 2019-2022.

10. **Research University Grants (RUI)** [**University**], *Seismic Risk Assesment and Vulnerability Study for Lahad Datu, Sabah*, 2018-2021.

11. **Short-Term Grant** [**University**], *Development of YOLO on Drone based Deep Learning Method using High Performance Edge Computation for Palm Oil Tree Detection and Health Assessment*, 2023-2025.

12. **External Agency** [**Industry**], *Research and Development with Lestari Aero Technology PLT-To Design, Develop, Test & Commission of Our Unmanned Aerial System (UAS) Layang-layang & Lang Merah*, 2020-2021.

*MoHE-Ministry of Higher Education, Malaysia

Research Publications

Selected Articles

1. **H. W. Ho***, G. C. H. E. de Croon, E. van Kampen, Q. P. Chu, and M. Mulder, *Adaptive gain control strategy for constant optical flow divergence landing*, IEEE transactions on robotics, 34(2):508-516, 2018.
2. **H. W. Ho***, C. De Wagter, B. D. W. Remes, and G. C. H. E. de Croon, *Optical-flow based self-supervised learning of obstacle appearance applied to MAV landing*, Robotics and Autonomous Systems, 100:78-94, 2018.
3. **H. W. Ho***, C. De Wagter, B. D. W. Remes, and G. C. H. E. de Croon, *Optical flow for self-supervised learning of obstacle appearance*, in IEEE/RSJ International Conference on Intelligent Robots and Systems, 2015 (**IROS** 2015) (IEEE, Hamburg, Germany, 2015).
4. Y. Zhou, **H. W. Ho***, Q. Chu, *Extended Incremental nonlinear dynamic inversion for optical flow control of micro air vehicles*, Aerospace Science and Technology, 106889, 2021.
5. H. Y. Lee, **H. W. Ho***, Y. Zhou, *Deep learning-based monocular obstacle avoidance for unmanned aerial vehicle navigation in tree plantations*, Journal of Intelligent and Robotic Systems, 101(1):1-18, 2021.
6. **H. W. Ho**, Y. Zhou, *Incremental Nonlinear Dynamic Inversion based Optical Flow Control for Flying Robots: An Efficient Data-driven Approach*, in Robotics: Science and Systems, 2023 (**RSS** 2023) (Daegu, Republic of Korea, 2023).

Other Articles

7. **Hann Woei Ho**, Ye Zhou, Yiting Feng, and Guido C.H.E. de Croon *Optical Flow-based Control for Micro Air Vehicles: An Efficient Data-driven Incremental Nonlinear Dynamic Inversion Approach*, Autonomous Robots, 48, 22, 2024.
8. Yiting Feng, Ye Zhou, **Hann Woei Ho**, Hongyang Dong, Xiaowei Zhao, *Online adaptive critic designs with tensor product B-splines and incremental model techniques*, Journal of the Franklin Institute, 107357, 2024.
9. Weijie Kuang, **Hann Woei Ho***, Ye Zhou, Shahrel Azmin Suandi, and Farzad Ismail *A comprehensive review on tree detection methods using point cloud and aerial imagery from unmanned aerial vehicles*, Computers and Electronics in Agriculture, 227, 109476, 2024.
10. Yiting Feng, Ye Zhou, and **Hann Woei Ho**, *Reinforcement learning based robust tracking control for unmanned helicopter with state constraints and input saturation*, Aerospace Science and Technology, 109549, 2024.
11. Wenjie Hu, Ye Zhou, **Hann Woei Ho** and Chun Zhang, *Double Critics and Double Actors Deep Deterministic Policy Gradient for Mobile Robot Navigation Using Adaptive Parameter Space Noise and Parallel Experience Replay*, IEEE Access, vol. 12, pp. 173192-173208, 2024.
12. Wenjie Hu, Ye Zhou, and **Hann Woei Ho**, *Mobile Robot Navigation Based on Noisy N-Step Dueling Double Deep Q-Network and Prioritized Experience Replay*, Electronics, 13(12), 2024.
13. Zhi Wei Lee, Wai Hoe Chin, and **Hann Woei Ho***, *Air-to-air Micro Air Vehicle Interceptor with an Embedded Mechanism and Deep Learning*, Aerospace Science and Technology, 108192, 2023.
14. Yiting Feng, Ye Zhou, **Hann Woei Ho**, Nor Ashidi Mat Isa, *Reinforcement learning control with function approximation via multivariate simplex splines*, International Journal of Adaptive Control and Signal Processing, 2023.
15. H. Jiang, Y. Zhou, **H. W. Ho**, E. A. Bakar, *Modeling of two-stroke aviation piston engines for control applications*, Advances in Mechanical Engineering, 15(2), 16878132231153234, 2023.
16. Ye Zhou and **Hann Woei Ho**, *Online robot guidance and navigation in non-stationary environment with hybrid Hierarchical Reinforcement Learning*, Engineering Applications of Artificial Intelligence, 114, 105152, 2022.

17. Poh Ling Ching, Shu Chuan Tan, and **Hann Woei Ho***, *Ultra-wideband Localization and Deep Learning based Plant Monitoring using Micro Air Vehicles*, **AIAA** Journal of Aerospace Information Systems, 1-12, 2022.

18. N.A.M. Yussof and **H.W. Ho***, *Review of Water Leak Detection Methods in Smart Building Applications*, Buildings, 12(10):1535, 2022.

19. H. Jiang, Y. Zhou, **H. W. Ho**, *Aerodynamic Design and Evaluation of a Ducted Fan Lift System for VTOL Flying Cars*, Proceedings of the Institution of Mechanical Engineers, Part A: Journal of Power and Energy, 09576509221106395, 2022.

20. Seng Man Wong, **Hann Woei Ho***, Mohd Zulkifly Abdullah, *Design and fabrication of a dual rotor-embedded wing vertical take-off and landing unmanned aerial vehicle*, Unmanned Systems, 9(01): 45-63, 2021.

21. B.H. Cheaw, **H. W. Ho***, E. Abu Bakar, *Wing design, fabrication, and analysis for an X-wing flapping-Wing micro air vehicle*, Drones, 3: 65, 2019.

22. **H. W. Ho***, G. C. H. E. de Croon, and Q. P. Chu, *Distance and velocity estimation using optical flow from a monocular camera*, International Journal of Micro Air Vehicles, 9(3):198-208, 2017.

23. G. C. H. E. de Croon, **H. W. Ho**, C. De Wagter, E. van Kampen, B. D. W. Remes, and Q. P. Chu, *Optic-flow based slope estimation for autonomous landing*, International Journal of Micro Air Vehicles, 5(4):287–298, 2013.

Conference Papers

24. **H. W. Ho** and Y. Zhou, *Frontal Target Approaching and Height Control of Micro Air Vehicles using Multi-perspective Optical Flow Observables*, in IEEE 20th International Conference on Automation Science and Engineering 2024 (CASE 2024) (Bari, Italy, 2024), p. 3754-3759.

25. A. Janarthanan, **H. W. Ho**, L. Gopal, V. Shanmugam, and W. K. Wong, *An Unmanned Aerial Vehicle Framework Design for Autonomous Flight Path*, in International Conference on Smart Computing & Communications 2019 (ICSCC 2019) (Sarawak, Malaysia, 2019) p. 1-5.

26. **H. W. Ho***, G. C. H. E. de Croon, and Q. P. Chu, *Distance and velocity estimation using optical flow from a monocular camera*, in International Micro Air Vehicle Conference and Competition 2016 (IMAV 2016) (Beijing, PR of China, 2016) p. 121-128. [**Best Paper Award Finalist**].

27. **H.W. Ho*** and G. C. H. E. de Croon, *Characterization of flow field divergence for MAVs vertical control landing*, in AIAA Guidance, Navigation, and Control Conference (San Diego, California, USA, 2016) p. 0106.

28. G. C. H. E. de Croon, **H. W. Ho**, C. De Wagter, E. van Kampen, B. D. W. Remes, and Q. P. Chu, *Optic-flow based slope estimation for autonomous landing*, in International Micro Air Vehicle Conference and Competition 2013 (IMAV 2013) (Ecole Nationale de l'Aviation Civile, Toulouse, France, 2013).

29. **H. W. Ho***, Q. P. Chu, *Automatic Landing System of a Quadrotor UAV Using Visual Servoing*, in CEAS EuroGNC conference 2013 (Delft University of Technology, Delft, The Netherlands, 2013). [**Best Graduate Student Paper Award**].

Books

30. **H. W. Ho***, *Autonomous landing of Micro Air Vehicles through bio-inspired monocular vision*, Delft University of Technology, 2017. ISBN: 978-94-6186-818-3.

**corresponding authors*

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Selected Awards

2023 USM Excellent Service Award 2022 ("Anugerah Perkhidmatan Cemerlang 2022") [**University**].
2023 Fifth place in the International Unmanned System Swarm Technology Competition (IUSC) [**International**].
2022 First runner-up of AIoT, FPGA & Embedded Systems Design Challenge in Innovate Malaysia 2022 "Guardian Of Area 51: Detecting, Tracking, And Intercepting Intruders From The Sky" [**National**].
2021 Winner of CREST Design Challenge in Innovate Malaysia 2021 "Plant Health Monitoring and Indoor Positioning for Micro Air Vehicles Using Deep Convolutional Neural Network and Ultra-Wideband" [**National**].
2021 IEM Best Paper Award in Innovate Malaysia 2021 "Plant Health Monitoring and Indoor Positioning for Micro Air Vehicles Using Deep Convolutional Neural Network and Ultra-Wideband" [**National**].
2021 Sanggar Sanjung Award, Journal Publication Category, USM [**University**].
2019 First runner-up in Petronas Technology Challenge 6 "Autonomous Drone Capable of Performing Ultrasonic Thickness (UT) Measurement at Height" [**National**].
2019 Sanggar Sanjung Award, Journal Publication Category, USM [**University**].
2018 Hadiah Sanjungan Award, Journal Publication Category, USM [**University**].
2016 Best Paper Award Finalist in International Micro Air Vehicle Competition and Conference "Distance and velocity estimation using optical flow from a monocular camera" [**International**].
2013 Best Graduate Student Paper in CEAS EuroGNC Conference "Automatic Landing System of a Quadrotor UAV Using Visual Servoing" [**International**].
2013 First prize in International Micro Air Vehicle competition 2013 (IMAV 2013) [**International**].
2012 Distinction/ Cum laude for MSc. in Aerospace Engineering, TU Delft [**University**]
2010 Academic Staff Training Scheme (ASTS), a fellowship co-funded by Malaysia Ministry of Higher Education (MOHE) and USM [**National**].
2009 USM Gold Medal for the best final year student in Aerospace Engineering [**University**].

Other Income Generation

Consultation, Training, and Short Courses

2021-2023 *Providing Educational Services & Research Guidance In Robotics.*
2023-2024 *Delivering Academic Support & Research Mentorship In Robot Intelligence.*
2023 *Agricultural Drone Consultation.*

Academic Activities

Editorial Role:

2024-2026 **Early career editorial board member**,
Biomimetic Intelligence and Robotics (BIRob).

Invited Speaker:

2023 **Plenary speaker**,
in the 3rd International Conference on Unmanned Aerial System in Geomatics 2023 (UASG 2023), Kuala Lumpur, Malaysia.

Conference Role:

2024 **Session Co-chair**,
in the 2024 IEEE 20th International Conference on Automation Science and Engineering (CASE 2024), Bari, Italy.

Trainer - Certified Train-The-Trainer (TTT):

2021-2023 *Introduction and Hands-on to Arduino*, professional training for industries: Western Digital, Analog Digital, Malaysia, etc.

2024 *Introduction to Aerial Robotics*, short course for Bachelor's students from China: Northwestern Polytechnical University, Nanjing University of Aeronautics and Astronautics, Harbin Institute of Technology, etc.

2023 *Intelligent Control & Future Smart Cities*, workshop for Bachelor's students from China: Foshan University.

Reviewer:

-IEEE Transactions on Automation Science and Engineering
-IEEE Transactions on Mechatronics
-IEEE Robotics and Automation Letters
-IEEE Transactions on Aerospace and Electronic Systems
-Applied Soft Computing
-International Journal of Micro Air Vehicles
-etc.
-Journal of Field Robotics
-IEEE ICRA & IEEE/RSJ IROS
-Expert Systems With Applications
-Aerospace Science and Technology
-Knowledge-Based Systems
-npj Robotics

Supervision:

Degree	Supervision Type	Ongoing	Graduated	Total
Ph.D.	Main Supervisor	3	-	3
	Co-Supervisor	1	1	2
M.Sc.	Main Supervisor	4	1	5
	Co-Supervisor	-	1	1
Total		8	3	11

Teaching Courses

1. **ESA412 Final Year Project** (Fourth-Year Engineering).
2. **ESA369 Flight Stability and Control** (Third-Year Engineering).
3. **ESA352 Modern Control for Autopilot** (Third-Year Engineering).
4. **ESA211 Aerospace Laboratory I** (Second-Year Engineering).