HO Hann Woei

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.

Personal Data

Nationality	Malaysian
Date of Birth	September 1984
Fluency	Malay, English, Chinese

Education/ Research

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

2010–2012 **MSc. Degree**, *Delft University of Technology (TU Delft)*, Delft, The Netherlands
Aerospace Engineering (Distinction/ cum laude)

2005–2009 **BEng. Degree**, *Universiti Sains Malaysia (USM)*, Nibong Tebal, Malaysia
Aerospace Engineering (Gold Medal)

Working Experience

2017–current **Senior Lecturer/ Assistant Professor (Permanent)**, *Universiti Sains Malaysia*
- **UAV Laboratory Manager**, School of Aerospace Engineering
- **Coordinator for the Career and Alumni Unit**, School of Aerospace Engineering
- **Advisor for the Drone Club**, USM

2017–2023 **Guest Researcher**, *Department of Control & Operations, Faculty of Aerospace Engineering, Delft University of Technology (TU Delft)*, The Netherlands

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

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Research Publications

(*corresponding authors)

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)

Others:

[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, 2024. (accepted)

[8] 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.

[9] 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.

[10] 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.

[11] 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.

[12] 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.

[13] 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.

[14] 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.

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

[16] 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.

[17] 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.

[18] 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.

[19] **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.

[20] 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.

Conferences:

[21] 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.

[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*, in International Micro Air Vehicle Conference and Competition 2016 (IMAV 2016) (Beijing, PR of China, 2016) p. 121-128. [**Best Paper Award Finalist**]

[23] **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.

[24] 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).

[25] **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**]

Book:

[26] **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

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**]

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Computer Skills

category 1	C, C++, MATLAB, Fotran, Python
category 2	Paparazzi/Pixhawk/Crazyflie Autopilot, OpenCV, Tensorflow, Ubuntu Linux
category 3	Advanced Aircraft Analysis (AAA), DATCOM, XFOIL
category 4	CATIA, Solidworks, Autodesk Inventor
category 5	MS Word, Excel, Power Point, Latex

Research Grants

Principal Investigator

[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", 1.8.2024-31.7.2026

[2] External Agency [**International***], "Collaborative Research on Intelligent And Autonomous Unmanned Aerial Systems", 16.6.2024-15.6.2025

[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", 1.11.2020-30.4.2024

[4] Short-Term Grant [**Research University Grant**], "Autonomous landing of miniature Unmanned Aerial Vehicles (UAVs) using monocular vision", 14.8.2017-14.11.2020 - **KPI Achieved**

Co-Principal Investigator

[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", 1.8.2024-31.7.2026

[6] External Agency [**International***], "Research on Advanced Aeronautical Technology and Aerial Robotics- Research Collaboration and Exchange Project on Aerospace Engineering", 1.1.2024-31.12.2024

[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", 1.11.2020-31.10.2022

[8] Research University Grants (RUI) [**Research University Grant**], "Development of Fully Autonomous MALE UAS for Monitoring and Surveillance Purposes (MALE UAS: Mid-altitude Long Endurance Unmanned Aerial System)", 1.11.2020-31.10.2022

[9] Research University Grants (RUI) [**Research University Grant**], "Investigation into Perpetual Solar-Powered UAV Designs for Global Operation", 1.12.2019-28.2.2022

[10] Research University Grants (RUI) [**Research University Grant**], "Seismic Risk Assesment and Vulnerability Study for Lahad Datu, Sabah", 1.11.2018-31.10.2021

[11] Short-Term Grant [**Research University Grant**], "Development of YOLO on Drone based Deep Learning Method using High Performance Edge Computation for Palm Oil Tree Detection and Health Assessment", 1.4.2023-31.3.2025

[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", 1.12.2020-31.7.2021 - **KPI Achieved**

*MoHE-Ministry of Higher Education, Malaysia

Other Income Generation

Consultation, Training, and Short Courses

Principal Investigator

[1] "PROVIDING EDUCATIONAL SERVICES & RESEARCH GUIDANCE IN ROBOTICS", 2021-2023

[2] "DELIVERING ACADEMIC SUPPORT AND RESEARCH MENTORSHIP IN ROBOT INTELLIGENCE", 2023-2024

[3] "AGRICULTURAL DRONE CONSULTANTATION", 2023

Academic Activities

Editorial Role:

- Early career editorial board member in Biomimetic Intelligence and Robotics (BIRob)

Invited Speaker:

- Plenary speaker, "Deep Learning based Monocular Navigation and Tracking for Micro Air Vehicles", in the 3rd International Conference on Unmanned Aerial System in Geomatics 2023 (UASG 2023), Kuala Lumpur, Malaysia

Conference Role:

- Session Co-chair, "Advanced Control and Modeling Techniques for Robotic Systems", in the 2024 IEEE 20th International Conference on Automation Science and Engineering, Bari, Italy

Trainer:

- Certified Train-The-Trainer (TTT):
  - "Introduction and Hands-on to Arduino", professional training for industries: Western Digital, Analog Digital, Malaysia, etc.
  - "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.
  - "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
- Journal of Field Robotics

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

Main Supervision:

- On-going PhD students: 2
- On-going MSc students: 3

Co-Supervision:

- On-going PhD students: 1
- Graduated PhD students: 1
- Graduated MSc students: 1

Teaching Courses

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

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