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Ishak Hilton Pujantoro Tnunay

Lecturer in Robotic Control Systems

Profile

Hilton Tnunay is a lecturer in the School of Electrical Engineering and Informatics, Institut Teknologi Bandung (ITB), and the research director of Beehive Drones. His research interests include cooperative control, computer vision, sensor fusion, nonlinear estimation, distributed optimisation, and trajectory generation in robotics systems.

Education

2016 - 2020   **Doctoral degree (PhD)**
- Thesis title: Distributed Coordination and Estimation of Multi-agent Systems,
- Affiliation: Control Systems, Dept. of Electrical and Electronic Engineering, The University of Manchester, UK,
- Promotor: Prof Zhengtao Ding.

2011 - 2015   **Bachelor degree (ST, equivalent to BEng) with Cumlaude**
- Thesis title: Mapless Path Planning and Formation Control using Potential Field for UAV Quadrotor,
- Affiliation: Dept. Electrical Engineering and Information Technology, Universitas Gadjah Mada, Indonesia,
- Promotor: Dr Adha Imam Cahyadi.

Research Experiences

2024-Now   **Lecturer at Institut Teknologi Bandung (ITB)**
- Lecturer in the School of Electrical Engineering and Informatics and a member of Computer Engineering Research Group.
- Role: conducting research, giving lectures and participating in community service.
- Research projects: Development of Experimental and Exploratory Photogrammetry for Supporting Underwater Archaeological Studies using Remotely Operated Vehicle (DEEP-UNDER ROV) funded by ITB, 2025; Co-operative Aerial Robotics for Goods Operation (CARGO), 2025; Seeker Drone funded by Kemdiktisaintek, 2025-Now.

2022-Now   **Co-founder and Research Director at Beehive Drones, Indonesia**
- A drone system research-based company aiming to design a swarm of autonomous robots for various applications, e.g., package delivery, environmental mapping, underwater explorations and agricultural payload spreading.
- Role: directing Beehive Intelligent Robotics Laboratory (BIRL); supervising researchers in control and perception systems; developing control and perception software packages for UAV and AUV robots.

2022-2024   **Postdoctoral researcher at Geomatics Section, KU Leuven, Belgium**
- Conducting research within the Deep Sewer Project, an applied-research project about a deep learning approach to general digital twins of sewer infrastructure using low-cost sensors to automate sewer inspection and management in Flanders, Belgium.
- Role: developing a sensor module consisting of multiple cameras and lidar; developing sensor-fusion algorithm for multi-modal simultaneous localisation and mapping (SLAM); building a 3D model of pipes; detecting anomalies and defects in pipes using deep learning using the gathered data; testing the systems in actual sewer pipes in Flanders.

2021   **Postdoctoral researcher at GIPSA Lab, CNRS, Grenoble INP, Université Grenoble Alpes, France**
- A collaborative project, TActical Multi-Objective Swarming UAVs (TAMOS), between GIPSA lab, Squadrone System and Safran and Directorate General of Armaments (DGA), France.
- Role: developing mission manager of multiple UAVs equipped with cameras for various missions; developing optimisation solution for trajectory planning, visual coverage optimisation, and task allocation.
- Funding: Directorate General of Armament (DGA), France.

2018-2022   **Co-founder and Technology Director at Beehive Drones, Indonesia**
- A drone system research-based company aiming to design a swarm of autonomous UAVs for various applications, e.g., package delivery, mapping and agricultural payload spreading.
- Role: directing a technology development team; developing high-level control interface for hexacopter and hybrid-VTOL UAVs for non-pilot users; developing intelligent control and perception package of UAVs; developing flight management systems for generic UAV application.

2017-2018	**Doctoral researcher in Agri-Tech Newton Fund Project, The University of Manchester, UK**

- A collaborative project of multiple universities in the UK aiming to develop robotic platform and control algorithms for agricultural applications.
- Role: developing distributed nonlinear estimation and coverage control algorithms for UAVs in agricultural applications.

2016	**Doctoral researcher in UoM-MBDA Project, The University of Manchester, UK**

- A collaborative project between Autonomous Systems group of The University of Manchester and MBDA Company. The aim was to develop a dynamic path planning algorithm of an autonomous robot equipped with vision sensors.
- Role: developing dynamic path planning algorithm on a mobile robot to make it compatible with the localisation-and-mapping systems.

2013-2016	**Undergraduate researcher in UAV Formation Control Group, Universitas Gadjah Mada, Indonesia**

- A collaborative project between Universitas Gadjah Mada, Indonesia, and Tokai University, Japan, to develop path planning and formation control algorithm for multiple quadcopters.
- An short-time research exchange was also conducted at Tokai Univeristy with an opportunity to test a path planning algorithm using a Pioneer mobile robot.
- Role: developing potential field-based path planning and formation control algorithms of multiple quadrotors.

Teaching and Supervision Experiences

2024 Teaching at STEI, ITB, Indonesia
- Course: Sustainability, Introduction to Electric Circuit, Problem Solving by Programming, and Control Systems.

2022-2023 Master's theses supervision at Geomatics, KU Leuven, Belgium
- Topic 1: Georeferenced BIM of sewer pipes (2023).
- Topic 2: Real-time detection and geolocation of objects using AI stereo cameras (2022).

2022-2023 Bachelor student project supervision at Geomatics, KU Leuven, Belgium
- Course: Introduction to Research.

2021 Teaching assistant at ENSE3, Grenoble INP, France
- Course: Automatic Control.

2016-2020 Teaching assistant and laboratory assistant at The University of Manchester, UK
- Course: Microcontroller Engineering I, Microcontroller Engineering II, and Data Networking.

2012-2016 Teaching assistant and laboratory assistant at Universitas Gadjah Mada, Indonesia
- Course: Fundamentals of Electrical Engineering, Control Systems, Instrumentation and Control, Telecommunication Systems, Signal and Systems, Microprocessor Systems, Robotics.

Notable Publications

2024 Performance Analysis of PID and SMC Control Algorithms on AUV under the Influence of Internal Solitary Wave in the Bali Deep Sea
Published in Journal of Robotics and Control (JRC)

2023 Distributed Finite-Time Coverage Control of Multi-Quadrotor Systems with Switching Topology
Published in Mathematics, MDPI, Volume 11, Issue 12, Pages 2621

2022 Intrinsic Cramér-Rao Bounds for Distributed Bayesian Estimator
Published in Journal of Information Fusion, Elsevier, Volume 81, Pages 129-142

2020 Fully Distributed Affine Formation Control of General Linear Systems with Uncertainty
Published in Journal of The Franklin Institute, Elsevier, Volume 357, Issue 17, November 2020, Pages 12143-12162

2020 Bearing-Only Formation Control With Prespecified Convergence Time
Published in Transactions on Cybernetics, IEEE, April 2020

2020 Distributed Nonlinear Kalman Filter with Communication Protocol
Published in Information Sciences, Elsevier, Volume 513, March 2020, Pages 270-288

2019 Affine Formation Algorithms and Implementation Based on Tripe-Integrator Dynamics
Published in Unmanned Systems, World Scientific Vol. 07, No. 01, pp. 33-45 (2019)

2019 Affine Formation Maneuver Control of Multi-Agent Systems with Triple-Integrator Dynamics
Published in American Control Conference, IEEE, 10-12 July 2019

2018 Fixed-Time Formation Control of Multi-Robot Systems: Design and Experiments
Published in Transactions on Industrial Electronics, IEEE, VOL. 66, NO. 8, AUGUST 2019

2018 Distributed Coverage Optimization and Control with Applications to Precision Agriculture
Published in Chinese Control Conference, IEEE, 25-27 July 2018

2017 Distributed Collision-free Coverage Control of Mobile Robots with Consensus-based Approach
Published in International Conference on Control and Automation, IEEE, 3-6 July 2017

For more details, please visit Google Scholar account (Hilton Tnunay)

Peer-reviewing Experiences

IEEE Transactions on Control of Network Systems

IEEE Transactions on Cybernetics

IEEE Transactions on Industrial Electronics

IEEE Robotics and Automation Letters

Journal of Franklin Institute

International Journal of Control, Automation, and Systems

Awards

2024	Best Paper Awards in 2024 IEEE International Conference on Computer, Control, Informatics and its Applications (IC3INA)
2019	Best Paper Awards (Theory Category) in Journal of Unmanned Systems, World Scientific
2018	Finalist in The World Final of Microsoft Imagine Cup 2018 in Seattle, Washington, US
2018	Fourth place in The Asia-Pasific Session of Microsoft Imagine Cup 2018 in Kuala Lumpur, Malaysia
2018	First place in The National Final of Microsoft Imagine Cup 2018 in Jakarta, Indonesia
2017	First place in The Venture Out 2017 on Research Category at The University of Manchester
2016	Awardee of LPDP (Indonesia Endowment Fund for Education) Scholarship, Ministry of Finance, Indonesia

Skills and Qualifications

Language	English (professional), Indonesia (native),
Programming	Language: C/C++, Python, Octave
	Libraries: ROS/ROS2, OpenCV, pyTorch, Tensorflow, PX4
	Environment: Linux Terminal
Software	Cloud platform: Microsoft Azure, Google Cloud Platform
	Mathematics: MATLAB
	IDE: MPLAB X, Arduino IDE, Keil μVision
	Electronics: Eagle, ISIS Proteus, LT Spice, PSIM
	Word editor: LaTeX

References

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○ **Dr Ahmad Hably**
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○ **Prof Maarten Vergauwen**
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