Patrick Li-Yu Lo

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EDUCATION

The Hong Kong Polytechnic University ***Dec 2024***
M.Phil. in Robotics & Control (Presidential Fellowship) GPA: 3.77/4.3

The Hong Kong Polytechnic University ***Jun 2021***
B.Eng. (1st Honour) in Aeronautical and Aviation Engineering (APEC Entry Scholarship)
Exchange: University of Queensland, Australia GPA: 3.75/4.3

RESEARCH EXPERIENCE

Improving Adaptability of Koopman Operators for Legged Robots ***Sep 2024 - Present***
Research Assistant Prof. Chih-Yung Wen (PolyU)

- Proposed an adaptive framework to compensate for data insufficiency in Koopman operator-based controllers.
- Developed a policy network for tuning controller parameters.
- Demonstrated performance through simulation environments and physical experiments.

Adaptive Optimal Controllers via Extended State Observer (ESO) ***Sep 2023 - Aug 2024***
M.Phil. Student Prof. Chih-Yung Wen (PolyU)

- Proposed an adaptive framework for MPC, LQR, and EKF on mobile robots using disturbance observation.
- Improved, analyzed, and implemented General ESO (GESO) and Error-State ESO (ESESO) for lump disturbance estimation.
- Developed reinforcement learning (RL) for parameter optimization.
- Demonstrated performance on UUV MPC control, heterogeneous UAV-UGV relative state estimation, and multi-UAV sliding-mode control (SMC).

Non-Robocentric Dynamic Landing for Quadrotor UAVs ***Sep 2020 - Jul 2024***
Undergraduate/M.Phil. Student Prof. Chih-Yung Wen (PolyU)

- Proposed a non-inertial autonomous dynamic landing framework without using airborne exteroceptive sensors.
- Developed an IEKF-based state estimator on SE(3).
- Designed kinematic and dynamic constrained trajectories using differential flatness and minimized jerk.
- Demonstrated system applicability via physical experiments using a self-designed UAV-UGV hardware system.

WORK EXPERIENCE

Hong Kong Center for Construction Robotics (HKCRC) ***Jul 2021 - Jul 2022***
Research Assistant

- Developed a learning-based model via adversarial training and data augmentation for a CV-based construction logistics monitoring system.
- Developed PID controllers and EKF estimators for an automation system aiding prefabrication component installation, currently pending patent.

PUBLICATIONS

- **L.-Y. Lo**, B. Li, C.-Y. Wen, and C.-W. Chang, "Experimental Non-Robocentric Dynamic Landing of Quadrotor UAVs with On-Ground Sensor Suite," *IEEE Transactions on Instrumentation and Measurement (TIM)*, vol. 73, 2024. *Links*: pdf, code.
- **L.-Y. Lo**, Y. Hu, B. Li, C.-Y. Wen, and Y. Yang, "An Adaptive Model Predictive Control for Unmanned Underwater Vehicles Subject to External Disturbances and Measurement Noise," in *2024 14th Asian Control Conference (ASCC)*. IEEE, 2024, pp. 01–07. *Links*: pdf, code.
- Y. Yang, K. Liu, **L.-Y. Lo**, T. Huang, Y. Fu, and C.-Y. Wen, "Fixed-Time Adaptive Consensus Control for Multi-Quadrotor Subject to External Disturbances via Deep Reinforcement Learning," submitted to *IEEE Transactions on Automation and Science Engineering (TASE)*, 2024.
- W. Yang, Z. Tan, Y. Xue, **L.-Y. Lo**, K. Liu, and C.-Y. Wen, "Hierarchical 3D Scene Graph Based Metric Semantic SLAM for Object Mapping and Counting," submitted to *IEEE Transactions on Circuits and Systems II: Express Briefs*, 2024.

- **L.-Y. Lo**, B. Li, C.-Y. Wen, and C.-W. Chang, "Landing a Quadrotor on a Ground Vehicle Without Exteroceptive Airborne Sensors: A Non-Robocentric Framework and Implementation," in *2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC)*. IEEE, 2023, pp. 6080–6087. *Links*: pdf.
- **L.-Y. Lo**, C. H. Yiu, Y. Tang, A.-S. Yang, B. Li, and C.-Y. Wen, "Dynamic Object Tracking on Autonomous UAV System for Surveillance Applications," *Sensors*, vol. 21, no. 23, p. 7888, 2021. Editor's Choice Article. *Links*: pdf, code.

AWARDS & SCHOLARSHIP

- First Runner-up of UAV Challenge, 2023 & 2024 IEEE International Conference on Unmanned Aircraft Systems (ICUAS). *Links*: web 2023, web 2024.
- PolyU Presidential Postgraduate Fellowship Scheme ('22 - '24).
- Dean's List of PolyU Faculty of Engineering: '17/18, '18/19 & '20/21.
- PolyU Undergraduate APEC Entry Scholarship ('17 - '21).

CORE SKILLS

Languages & Tools: C++, Python, ROS, Matlab, Docker, PX4, BlueROV2, PyTorch, & OpenCV.
Robotics: Dynamic Analysis with Data, Optimal Control, Nonlinear Control Theory, Convex Optimization, Deep Learning, Reinforcement Learning.
Links: Project Pages, Learning Notes.

OTHERS

- **Languages**: English (IELTS 7.5), Mandarin (Native), Cantonese (Proficient), Taiwanese (Proficient).
- **Services**: Reviewer for IEEE Transactions on Instrumentation and Measurement; IEEE Transactions on Mechatronics; IEEE Transactions on Vehicular Technology; IEEE Sensors Journal; 2023 IEEE International Conference on Intelligent Transportation Systems.
- **Volunteering**: Student Ambassador at HKPolyU ('19-'21); Teaching Assistant at HeartFire Education Service, China (Dec '19), African Evangelistic Enterprise, Rwanda (Jun '19), Royal University of Phnom Penh, Cambodia (May - Jun '18).