PENGGAO YAN

PhD Candidate
Dept. of Aeronautical and Aviation Engineering
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EDUCATION

The Hong Kong Polytechnic University, Dept. of Aeronautical and Aviation Engineering Hong Kong, China
PhD, Satellite Communication and Navigation 2022-now

The Hong Kong Polytechnic University, Dept. of Civil and Environmental Engineering Hong Kong, China
PhD, Construction and Transportation 2021-2022

Wuhan University, School of Remote Sensing and Information Engineering Wuhan, China
MSc, Pattern Recognition and Intelligent System 2018-2021

Wuhan University, Electronic Information School Wuhan, China
BSc, Communication Engineering 2014-2018

RESEARCH EXPERIENCE

***The Hong Kong Polytechnic University*, Hong Kong**

Doctoral Researcher, supervised by Dr. Li-Ta Hsu 2023-2024

- Develop a non-Gaussian overbound for heavy-tailed error distributions by leveraging the characteristics of the Gaussian mixture model.
- Reduce the mean vertical protection level by more than 52% compared to the two-step Gaussian overbounding method on the Urban dataset.

Doctoral Researcher, supervised by Dr. Li-Ta Hsu 2023-2024

- Develop a rigorous method for faulty GNSS measurements detection under non-Gaussian noises; prototype an integrity monitoring framework with non-Gaussian nominal error.
- The detection delay is only 30s in detecting real-world satellite clock anomalies, which is 8 minutes less than the MHSS detector.

Doctoral Researcher, supervised by Dr. Li-Ta Hsu 2022-2023

- Develop a fault detection algorithm for an EKF-based LiDAR/IMU integrated localization system under non-Gaussian noises, where a rigorous relationship between non-Gaussian noises and residuals is established.
- A 30% improvement in the detection rate and a 23% reduction in detection delay are achieved in a self-established simulated environment when compared to the conventional Gaussian-based method.

Doctoral Researcher, supervised by Dr. Li-Ta Hsu 2021-2022

- Develop a sensor-free localization method by integrating the system response of autonomous vehicles into the design of vehicle dynamic models, enhancing the performance of ego-localization under sensor failures.
- A 70% reduction in the mean absolute translation error is achieved when compared to the localization methods based on the conventional vehicle dynamic model.

MENTORSHIP EXPERIENCE

Intelligent Positioning and Navigation Laboratory, PolyU Hong Kong, China
Mentor 2023-2024

- Supervise a research assistant to conduct the overbounding research through weekly meetings.
- Provide guidance and feedback to a PhD student on writing conference and journal papers

Electronic Design and Robotics Innovation Laboratory, Wuhan University Wuhan, China
Trainer Summer 2019

- Led undergraduate students to participate in the robot modeling competition, designed the robot to

complete the fixed-point firefighting task

- Designed competition plans, organized workshops to discuss and solve technical difficulties, conducted experimental skills training for undergraduates
- One of the three teams that I led won the first prize in the competition

HONORS & AWARDS

■ Best Student Paper Award in ION GNSS+ 2024	2024
■ HKSAR Government Scholarship Fund - Reaching Out Award	2024
■ ION Student Registration Grants	2023
■ PolyU Presidential PhD Fellowship	2021
■ Postgraduate Scholarship	2019
■ Excellent Bachelor's Thesis	2018
■ National Encouragement Scholarship	2017
■ Second Price in National College Student Intelligent Car Race	2017
■ First Price in National Undergraduate Electronics Design Contest	2017

PUBLICATIONS (*: Corresponding author)

7 SCI Journal Papers in JCR Q1 and 6 Conference papers (as of 21 Oct 2024)

Google Scholar Citations: 151 **WOS** Citations: 106

1. **Yan, P.** (2024). Jackknife Test for Faulty GNSS Measurements Detection under Non-Gaussian Noises. In *Proceedings of the 37th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2024).* (**Best Student Paper Award**)
2. **Yan, P.**, Zhong, Y., & Hsu, L. T. (2024). Principal Gaussian Overbound for Heavy-tailed Error Bounding. *IEEE Transactions on Aerospace and Electronic Systems.* https://doi.org/10.1109/TAES.2024.3448405
3. **Yan, P.**, Li, Z., Huang, F., Wen, W., & Hsu, L. T. (2024). Fault Detection Algorithm for Gaussian Mixture Noises: An Application in LiDAR/IMU Integrated Localization Systems. Submitted to *NAVIGATION.* (Accept)
4. **Yan, P.**, Xia, X., Brizzi, M., Wen, W., & Hsu, L. T. (2024). Subspace-based Adaptive GMM Error Modeling for Fault-Aware Vehicular GNSS Positioning in Urban Canyons. *IEEE Transactions on Intelligent Vehicles.* https://doi.org/10.1109/TIV.2024.3450198
5. **Yan, P.**, Wen, W., & Hsu, L. T. (2024). Integration of Vehicle Dynamic Model and System Identification Model for Extending the Navigation Service Under Sensor Failures. *IEEE Transactions on Intelligent Vehicles*, 9(1), 2236-2248.
6. Luo, X., **Yan, P.***, Yan, R., & Wang, S. (2024). Covariate balancing for high-dimensional samples in controlled experiments. *Journal of the Operational Research Society*. (Accept)
7. **Yan, P.**, Wen, W., Huang, F., & Hsu, L. T. (2024). A Fault Detection Algorithm for LiDAR/IMU Integrated Localization Systems with Non-Gaussian Noises. In *Proceedings of the 2024 International Technical Meeting of The Institute of Navigation* (pp. 561-574). (**Invited Paper**)
8. **Yan, P.**, Zhong, Y., & Hsu, L. T. (2024). Bounding the Heavy-tailed Pseudorange Error by Leveraging Membership Weights Analysis of Gaussian Mixture Model. In *Proceedings of the ION 2024 Pacific PNT Meeting* (pp. 541-555).
9. Zhang, Y., Wen, W., & **Yan, P.** (2024). Safe-assured Learning-based Deep SE(3) Motion Joint Planning and Control for UAV Interactions with Dynamic Environments. In *Proceedings of 27th IEEE International Conference on Intelligent Transportation Systems (ITSC).*
10. **Yan, P.**, Hsu, L. T., & Wen, W. (2023). Extending Navigation Service under Sensor Failures: An Approach by Integrating System Identification and Vehicle Dynamic Model. In *2023 IEEE/ION Position, Location and Navigation Symposium (PLANS)* (pp. 630-636).

11. **Yan, P.**, Hsu, L. T., & Wen, W. (2023). Integration of Vehicle Dynamic Model and System Identified Model for Navigation in Autonomous Mobile Robots. In *Proceedings of the 2023 International Technical Meeting of The Institute of Navigation* (pp. 153-160).
12. Li, X., Li, Z., Jia, T., **Yan, P.**, Wang, D., & Liu, G. (2021). The Sense of Community Revisited in Hankow, China: Combining the Impacts of Perceptual Factors and Built Environment Attributes. *Cities*, 111, 103108.
13. Jia, T., & **Yan, P.** (2020). Predicting Citywide Road Traffic Flow Using Deep Spatiotemporal Neural Networks. *IEEE Transactions on Intelligent Transportation Systems*, 22(5), 3101-3111.

PUBLICATIONS IN PROGRESS (*: Corresponding author)

1. **Yan, P.**, Hu, Y., Wen, W., & Hsu, L. T. Isolation of Multiple Faults for GNSS Positioning: An Incrementally Expanding Approach. Submitted to *IEEE Sensors Journal*. (Second revision)
2. **Yan, P.**, Wang, R., Wen, W., & Hsu, L. T. Fault Detection for Integrity with Non-Gaussian Nominal Errors. Submitted to *IEEE Transactions on Aerospace and Electronic Systems.*
3. Li Z., **Yan, P.***, & Li-Ta Hsu. Cauchy-Gaussian Overbound for Heavy-tailed Distributions. Submitted to *Measurements.*
4. Zhang, Y., Wang, Y., **Yan, P.**, & Wen, W. Learning Safe, Optimal, Real-Time Flight Interaction with Deep Confidence-enhanced Reachability Guarantee. Submitted to *IEEE Intelligent Transportation Systems Transactions*.

PATENTS

1. Jia, T & **Yan, P**. (2020). Self-adaptive compact image segmentation method of vector road network. (China, CN111815636A).

2. Jia, T & **Yan, P** (2020). Urban road traffic flow prediction method and device based on space-time deep learning mode. (China, CN111009129A).