CURRICULUM VITAE

FENG LIN

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Education

- *Ph.D.in Electrical and Computer Engineering*, National University of Singapore, March 2011
- *M.Eng. in System Engineering*, Beihang University, China, April 2003
- *B.S. in Control Engineering*, Beihang University, China, July 2000

Professional Experience

- *Chief Technology Officer*, October 2019–October 2022, Shenzhen MicroHiggs Technologies Pte. Ltd.
- *Research Assistant Professor* (20%), September 2014–October 2019, Department of Electrical and Computer Engineering, National University of Singapore
- *Senior Research Scientist* (80%), January 2014–October 2019, Temasek Laboratories, National University of Singapore
- *Research Scientist*, June 2011–December 2014, Temasek Laboratories, National University of Singapore
- *Research Associate*, August 2010–May 2011, Department of Electrical and Computer Engineering, National University of Singapore
- *Research Engineer*, April 2003–December 2004, Department of System Engineering, Beihang University

Research Interests

- Flight Control Systems; Vision-aided Control; Robust Control
- Machine Vision System; Vision-aided Inertial Navigation
- Autonomous Unmanned Aerial Vehicles; Deep Reinforcement Learning Theory

Membership in Professional Societies

- The IEEE (Institute of Electrical & Electronic Engineers) and IEEE Control Systems Society
- The (AIAA) American Institute of Aeronautics and Astronautics Society

Awards & Honors

- *2nd Place Overall (1st in Final Round)*, Rotor-Wing Competition, 2nd AVIC Cup – International UAV Innovation Grand Prix, Beijing, China, 2013
- *New Innovation Star Award*, 2nd AVIC Cup – International UAV Innovation Grand Prix, Beijing, China, 2013
- *DARPA UAVForge Challenge Finalist*, Defense Advanced Research Projects Agency (DARPA) and Space and Naval Warfare Systems Center, Atlantic, USA, 2012
- *Best Application Paper Award*, 8th World Congress on Intelligent Control and Automation, Jinan, China, 2010

Editorial Work

- *Associated Editor*, Unmanned Systems, 2012—
- *Technical Committee Member*, 8th International Conference on Intelligent Unmanned Systems, 2012
- *Technical Committee Member*, 16th International Conference on Information Fusion, 2013

Invited Speakers at International Conferences

- *Guest Speaker*, Aerospace System Design Project at University of Glasgow Singapore, Singapore, March 2014
- *Guest Speaker*, Aerospace Technology Seminar, Singapore, March 2013
- *Lecture*, Full Day Workshop on Unmanned Rotorcraft Systems, China, July 2013
- *Guest Speaker*, DRTech DCCM, Singapore, October 2012

- *Keynote Speaker*, One Day Robotic Workshop on Autonomous Unmanned Aerial Vehicles, Singapore, February 2012

Funded Research Projects

- *Laser-aided Stereo Vision Study*, with Ben M. Chen (PI) and K. M. Peng, Temasek Laboratories, National University of Singapore, 2014–2015, S$50,000.
- *Reconfigurable multi-attitude autonomous flight control system design*, with Ben M. Chen (PI) and K. M. Peng, Temasek Laboratories, National University of Singapore, 2014–2015, S$50,000.
- *Vision System for Micro UAVs*, with Ben M. Chen, K. M. Peng and F. Liao, Temasek Laboratories, National University of Singapore, 2013–2014, S$50,000.

Industry Experience

- As the Chief Technology Officer (CTO) at Shenzhen Microhiggs Technologies from 2019 to 2022, I have been in charge of the development of the world's first fishfinder drone, which is able to operate in sea and air for fish population surveillance, fishing, and rescue operations. I have collaborated with cross-functional teams to design, prototype, and test UAVs with state-of-the-art sonar sensors in sea environments.
- This drone is specially designed with a durable, waterproof, and anti-corrosive airframe for sustained performance in sean environments. It is able to resist a wind speed of 10.8 to 13.8 m/s, which is a level 6 wind force, automatically take off and land on the sea surface, automatically maintain posture in the sea surface, as well as automatically glide at low speed on the sea surface with a durable, waterproof, and anti-corrosive airframe, etc., ensuring safe and reliable operation in complex sea environments.

Involved Research Projects

- *Special Project for DARPA UAVForge Competition*, DSO National Laboratories, Jan.-–May 2012, S$230,040.
- *Development of Multi-UAV Testbeds and Vision-Based Navigation and Motion Coordination*, Temasek Laboratories, National University of Singapore, 2009–2013, S$200,000.
- *Guidance and Control of Multiple Air-Vehicle System*, Defence Science and Technology Agency, 2009–2013, S$3,680,000

Technical Skills

- Flight control software development, familiar with PX4 autopilot software
- Design and development of micro aerial vehicle systems
- Modeling and simulation of flight control system
- Vision aided navigation for unmanned systems
- Multi-sensor fusion for control and navigation
- Vision-based target detection and tracking
- C++/Matlab/ROS

Undergraduate Students Supervised/Co-Supervised

- Mengmi Zhang, Graduated in 2015
- Zhangyuan Hu, Graduated in 2013
- Yuxiang Wang, Graduated in 2011

Publications

A. Published Journal Articles

1. K. C. Liu, Z. Gao, F. Lin, B. M. Chen, "FG-Net: A Fast and Accurate Framework for Large-Scale LiDAR Point Cloud Understanding," *IEEE Transactions on Cybernetics*, Vol. 68, No. 2, April 2022.

2. Y. Zhou, S. P. Lai, H. M. Chen, ..., F. Lin, B. M. Chen, "Towards Autonomy of Micro Aerial Vehicles in Unknown and GPS-denied Environments," *IEEE Transactions on Industrial Electronics* , Vol. 68, No. 8, August 2021.

3. S. N. Huang, F. Lin, "Model-based Fault Accommodation Control of Multiagent Systems," *Advanced Control for Applications* , Vol. 2, No. 2, June 2020.

4. H. L. Qin, Z. H. Meng, W. Meng, X. D. Chen, H. Sun, F. Lin, M. H. Ang, "Autonomous Exploration and Mapping System Using Heterogeneous UAVs and UGVs in GPS-Denied Environments," *IEEE Transactions on Vehicular Technology*, Vol. 68, No. 2, February 2019.

5. H. L. Qin, Y. B. Cai, F. Lin, Y. F. Zhang, and B. M. Chen, "A 3D Rotating Laser-Based Navigation Solution for Micro Aerial Vehicles in Dynamic Environments," *Unmanned Systems*, Vol. 6, No. 4, pp. 297–305, 2018.

6. C. Y. Tan, S. N. Huang, K. K. Tan, R. Teo, W. Q. Liu and F. Lin, "Collision Avoidance Design on Unmanned Aerial Vehicle in 3D Space," *Unmanned Systems*, Vol. 6, No. 4, pp. 277–295, 2018.

7. Y. Z. Tang, Z. Gao, F. Lin, Y. F. Li, and W. Fei, "Visual Adaptive Tracking for Monocular Omnidirectional Camera," *Journal of Visual Communication and Image Representation*, Vol. 55. pp. 253–262, August 2018.

8. Y. Z. Tang, Y. C. Hu, J. Q. Cui, F. Liao, M. J. Lao, F. Lin, R. Teo, "Vision-aided Multi-UAV Autonomous Flocking in GPS-denied Environment," *IEEE Transactions on Industrial Electronics*, April 2018.

9. K. M. Peng, F. Lin, B. M. Chen, "Online schedule for autonomy of multiple unmanned aerial vehicles," *Science in China Series F Information Sciences*, July 2017.

10. Z. H. Meng, H. L. Qin, Z. Y. Chen, X. D. Chen, H. Sun, F. Lin, M. H. Ang, "A Two-Stage Optimized Next-View Planning Framework for 3-D Unknown Environment Exploration, and Structural Reconstruction" , IEEE Robotics and Automation Letters, Vol. 2. No. 3, pp. 1680–1687, July 2017.

11. S. Y. Zhao, F. Lin, K. M. Peng, X. X. Dong, B. M. Chen, and T. H. Lee, "Vision-aided Estimation of Attitude, Velocity, and Inertial Measurement Bias for UAV Stabilization," *Journal of Intelligent*

& Robotic Systems, February 2015.

12. S. Y. Zhao, Z. Hu, M. Yin, K. Z. Y. Ang, P. Liu, F. Wang, X. Dong, F. Lin, B. M. Chen and T. H. Lee, "A Robust Real-time Vision System for Autonomous Cargo Transfer by an Unmanned Helicopter," *IEEE Transactions on Industrial Electronics*, Vol. 62, No. 2, pp. 1210–1219, February 2015.

13. S. Y. Zhao, F. Lin, K. M. Peng, B. M. Chen and T. H. Lee, "Finite-time stabilization of circular formations using bearing-only measurement," *International Journal of Control*, Vol. 87, No. 4, pp. 715–727, April 2014.

14. S. Y. Zhao, F. Lin, K. Peng, B. M. Chen and T. H. Lee, "Distributed control of angle-constrained circular formation using bearing-only measurements," *Systems & Control Letters*, Vol. 63, No. 1, pp. 12–24, January 2014.

15. F. Lin, Kevin Z. Y. Ang, F. Wang, B. M. Chen, T. H. Lee, B. Q. Yang, M B. Dong, X. X. Dong, J. Q. Cui, S. K. Phang, B. Wang, D. L. Luo, S. Y. Zhao, M. F. Yin, K. Li, K. M. Peng and G. W. Cai, "Development of an unmanned coaxial rotorcraft for the DARPA UAVForge Challenge," *Unmanned Systems*, Vol. 1, No. 2, pp. 2111–245, October 2013.

16. F. Lin, X. X. Dong, B. M. Chen, K. Y. Lum and T. H. Lee, "A robust real-time embedded vision system on an unmanned rotorcraft for ground target following," *IEEE Transactions on Industrial Electronics*, Vol. 59, No. 2, pp. 1038–1049, February 2012.

17. F. Lin, K. Y. Lum, B. M. Chen and T. H. Lee, "Development of a vision-based ground target detection and tracking system for a small unmanned helicopter," *Science in China – Series F: Information Sciences*, Vol. 52, No. 11, pp. 2201–2215, November 2009.

18. G. W. Cai, F. Lin, B. M. Chen and T. H. Lee, "Systematic design methodology and construction of UAV helicopters," *Mechatronics*, Vol. 18, No. 10, pp. 545–558, December 2008.

B. Journal Articles in Preparation

1. F. Lin, K. M. Peng, S. Y. Zhao, B. M. Chen and T. H. Lee, "Formation flight control of multiple UAVs using relative vision measurement."

2. Kai-Yew Lum, Xiangxu Dong, K. Z. Y. Ang and F. Lin, "Homography-based vision-aided inertial navigation for aerial vehicles."

C. Book Chapters

1. F. Lin, F. Wang, X. Dong, K. Peng and B. M. Chen, Mechatronics design of unmanned aircraft systems, *Mechatronics: Fundamentals and Applications*, (Edited by C. de Silva), Taylor & Francis (CRC Press), London, U.K., 2014 (in press).

2. F. Lin, K. Z. Y. Ang, F. Wang, B. M. Chen, et al., Development of an unconventional unmanned coaxial rotorcraft: GremLion, *Lecture Notes on Computer Science: Design, User Experience, and Usability*, (Edited by A. Marcus), Volume 8014, pp. 120—129, Springer-Verlag, Berlin, Germany, 2013 (ISBN: 978-3-642-39237-5).

D. Conference Publications

1. F. Lin, K. M. Peng, X. X. Dong, S. Y. Zhao and B. M. Chen, Vision-based formation for UAVs, To be presented at the *11th IEEE International Conference on Control & Automation*, Taichung, Taiwan, June 2014.

2. K. M. Peng, T. Pang, F. Lin and B. M. Chen, Autonomous mission execution for multiple unmanned aerial vehicles with hierarchical-distributed methodology, To be presented at the *11th IEEE International Conference on Control & Automation*, Taichung, Taiwan, June 2014.

3. Kai-Yew Lum, X. X. Dong, K. Z. Y. Ang and F. Lin, Simulation study of homography-based vision-aided inertial navigation for aerial vehicles, To be presented at the *11th IEEE International Conference on Control & Automation*, Taichung, Taiwan, June 2014.

4. F. Liao, X. X. Dong, F. Lin, R. S. H. Teo and J. L. Wang, Robust formation and reconfiguration control of multiple VTOL UAVs: design and flight test, To be presented at the *22nd Mediterranean Conference on Control and Automation*, Palermo, Italy, June 2014.

5. K. M. Peng, F. Lin, S. Y. Zhao and B. M. Chen, Design of Vision based target tracking/following system for quadrotors, To be presented at the *19th IFAC World Congress*, Cape Town, South Africa, August 2014.

6. K. M. Peng, S Y. Zhao, F. Lin and B. M. Chen, Vision based target tracking/following and estimation of target motion, *Proceedings of the 2013 AIAA Guidance, Navigation, and Control Conference and Co-located Conferences*, Boston, USA, AIAA 2013–5036, 2013.

7. S. Zhao, X. Dong, J. Q. Cui, K. Z. Y. Ang, F. Lin, K. M. Peng, B. M. Chen and T. H. Lee, Design and implementation of homography-based vision-aided inertial navigation of UAVs, *Proceedings of the 32nd Chinese Control Conference*, Xi'an, China, pp. 5210–5215, July 2013.

8. S. Y. Zhao, F. Lin, K. M. Peng, B. M. Chen and Tong Heng Lee, Distributed control of angle-constrained circular formations using bearing-only measurements, *Proceedings of the 9th Asian Control Conference*, Istanbul, Turkey, pp.1–6, June 2013.

9. S. Y. Zhao, F. Lin, K. M. Peng, B. M. Chen and T. H. Lee, Finite-time stabilization of circular rormations using bearing-only measurements, *Proceedings of the 10th IEEE International Conference on Control & Automation*, Hangzhou, China, pp. 693–700, June 2013.

10. F. Lin, K. Z. Y. Ang, F. Wang, B. M. Chen, T. H. Lee, et al., Development of an Unconventional Unmanned Coaxial Rotorcraft: GremLion, *Presented at the 15th International Conference on Human-Computer Interaction*, Las Vegas, USA, July 2013.

11. F. Lin, F. Liao, J. W. Hu, K. M. Peng, J. Xu, S. Y. Zhao, Kai-Yew Lum, R. Teo, J. L. Wang, L. H. Xie, B. M. Chen and T. H. Lee, Control and guidance of multiple air-vehicle systems, *Presented at Aerospace Technology Seminar*, Singapore, March 2013.

12. S. Y. Zhao, F. Lin, K. M. Peng, B. M. Chen and T. H. Lee, Homography-based vision-aided inertial navigation of UAVs in unknown environments, *Proceedings of the 2012 AIAA Guidance, Navigation, and Control Conference*, Minneapolis, USA, AIAA 2012–5033, August 2012.

13. K. M. Peng, S. Y. Zhao, F. Lin and B. M. Chen, Vision based stabilization for aircraft in unknown environment without GPS signal, *Proceedings of the 2012 AIAA Guidance, Navigation, and Control Conference and Co-located Conferences*, Minneapolis, USA, AIAA 2012–4597, August 2012.

14. A. Karimoddini, X. Dong, G. Cai, F. Lin, H. Lin, B. M. Chen and T. H. Lee, A composed hybrid structure for the autonomous flight control of unmanned helicopters, *Proceedings of the 18th IFAC World Congress*, Milan, Italy, pp. 2632–2637, August-September 2011.

15. G. W. Cai, F. Lin, B. M. Chen and T. H. Lee, Development of fully functional miniature unmanned rotorcraft systems, *Proceedings of the 29th Chinese Control Conference*, Beijing, China, pp. 32–40, July 2010.

16. F. Lin, B. M. Chen, K. Y. Lum and T. H. Lee, A robust vision system on an unmanned helicopter for ground target seeking and following, *Proceedings of the 8th World Congress on Intelligent Control & Automation*, Jinan, China, pp. 276–281, July 2010 ($\star$ Best Application Paper Award $\star$).

17. F. Lin, B. M. Chen and T. H. Lee, Vision aided motion estimation for unmanned helicopters in GPS denied environments, *Proceedings of the 2010 IEEE International Conference on Cybernetics and Intelligent Systems*, Singapore, pp. 64–69, June 2010.

18. X. X. Dong, G. W. Cai, F. Lin, B. M. Chen, H. Lin and T. H. Lee, Implementation of formation flight of multiple unmanned aerial vehicles, *Proceedings of the 8th IEEE International Conference on Control and Automation*, Xiamen, China, pp. 904–909, June 2010.

19. F. Lin, B. M. Chen and T. H. Lee, Robust vision-based target tracking control system for an unmanned helicopter using feature fusion, *Proceedings of the 11th IAPR Conference on Machine Vision Applications*, Yokohama, Japan, pp. 398–401, May 2009.

20. F. Lin, B. M. Chen and K. Y. Lum, Integration and implementation of a low-cost and vision UAV tracking system, *Proceedings of the 26th Chinese Control Conference*, Zhangjiajie, China, pp. 731–736, July 2007.