

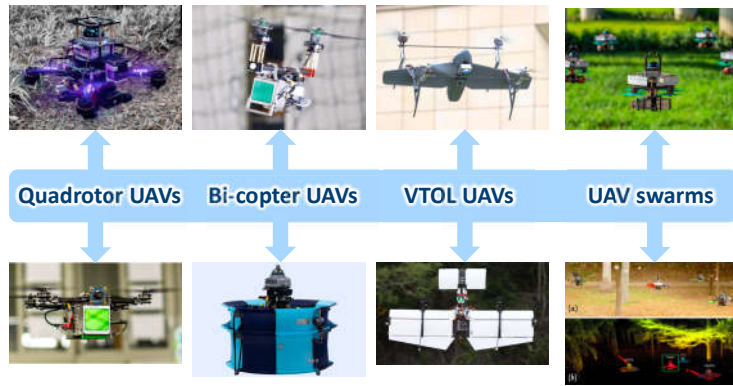


Autonomous LiDAR UAVs

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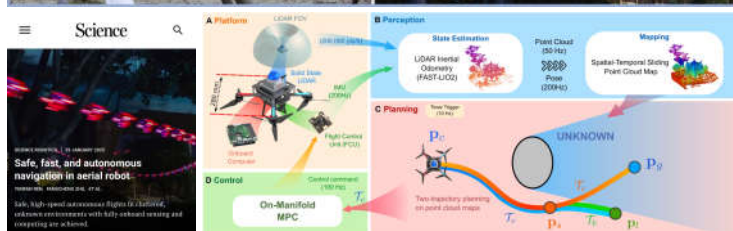
Overview of LiDAR UAV researches in MaRS Lab



- LiDAR-based new generation of UAV navigation system
- Advanced perception (e.g., high measurement precision, detecting small objects, working at daytime and night)

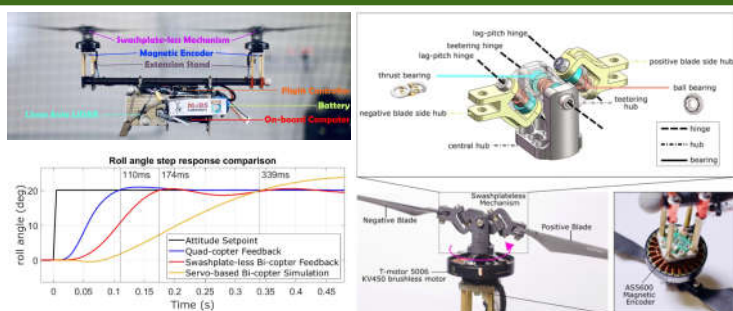
MaRS LAB

Research 1: Safe, high-speed navigation of UAV



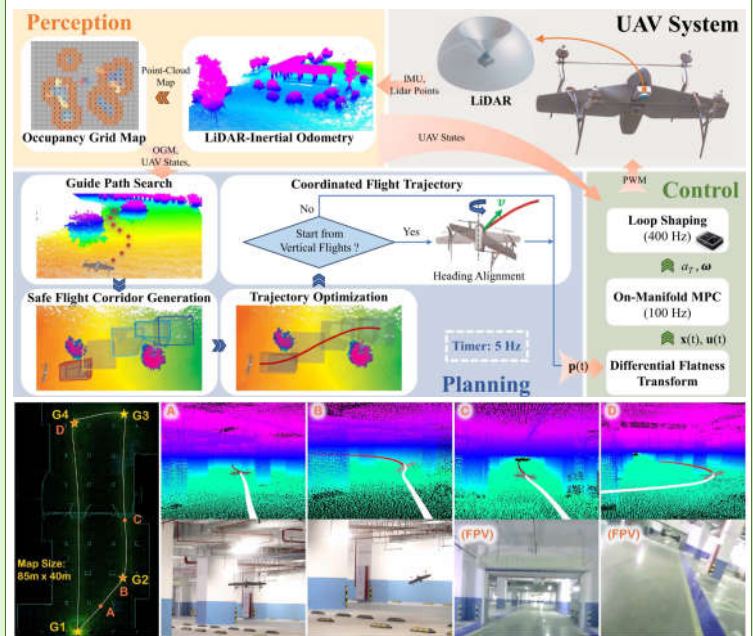
Y. Ren*, F. Zhu*, G. Lu, Y. Cai, L. Yin, F. Kong, J. Lin, N. Chen, and F. Zhang, "Safety-assured High-speed Navigation for MAVs," in *Science Robotics* '24 (Visual feature).

Research 2: Servo-less bi-copter UAV



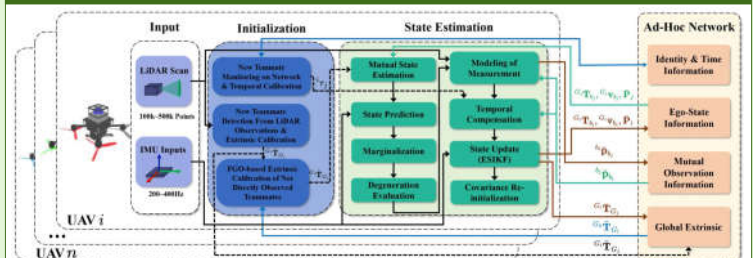
Y. Qin*, N. Chen*, Y. Cai, W. Xu and F. Zhang, "Gemini II: Design, Modeling, and Control of a Compact Yet Efficient Servoless Bi-copter," in *T-MECH* '23 (Best paper award finalist).

Research 3: Autonomous tail-sitter VTOL UAV

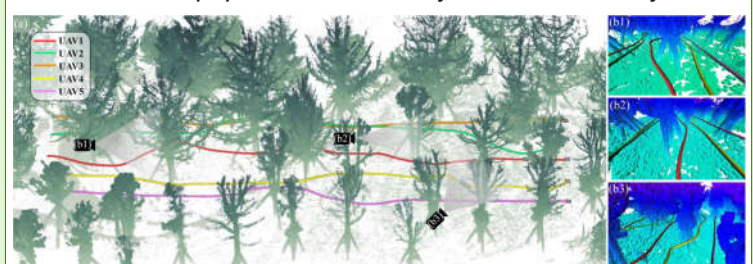


G. Lu*, Y. Ren*, F. Zhu, H. Li, R. Xue, Y. Cai, X. Lyu, and F. Zhang, "Autonomous Tail-Sitter Flights in Unknown Environments," in *T-RO* '25.

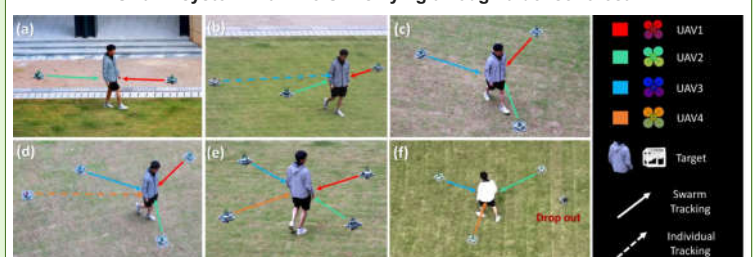
Research 4: State estimation for UAV swarm



Framework of the proposed state estimation system for aerial swarm systems.



Swarm system with five UAVs flying through a dense forest.



Collaborative target tracking experiment in an outdoor environment. Each UAV in the swarm system estimates its own and teammate UAVs' states by Swarm-LIO2.

F. Zhu*, Y. Ren*, L. Yin, F. Kong, Q. Liu, R. Xue, W. Liu, Y. Cai, G. Lu, H. Li, and F. Zhang, "Swarm-LIO2: Decentralized Efficient LiDAR-Inertial Odometry for Aerial Swarm Systems," in *T-RO* '25.