BOTAO HE

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EDUCATION

University of Maryland, College Park, U.S.   **08/2022 – Now**
Ph.D. student in Computer Science.

Nanjing Institute of Technology, Nanjing, China   **09/2018 – 07/2022**
B.Eng. in Robot Engineering, School of Automation.

COLLABORATION

Carnegie Mellon University, Pittsburgh, U.S.   **05/2023 – Now**
Advised by Dr. Ji Zhang.

Zhejiang University, Hangzhou, China   **01/2020 – 08/2022**
Advised by Prof. Fei Gao

RESEARCH INTERESTS

Field Robotics, Active Perception, Interactive Navigation.

PUBLICATIONS

- **Botao He***, Guofei Chen*, Wenshan Wang, Ji Zhang, Cornelia Fermuller, Yiannis Aloimonos
  "Interactive-FAR:Interactive, Fast and Adaptable Routing for Navigation Among Movable Obstacles in Complex Unknown Environments"
  Submitted to IROS 2024. [Paper] [Video] [Code]

- **Botao He**, Ze Wang, Yuan Zhou, Jingxi Chen, Chahat Deep Singh, Haojia Li, Yuman Gao, Kaiwei Wang, Yanjun Cao, Chao Xu, Yiannis Aloimonos, Fei Gao, and Cornelia Fermuller
  "Microsaccade-inspired Event Camera for Robotics"
  Accepted by **Science Robotics**, to be published.

- **Botao He**, Ze Wang, Yuan Zhou, Jingxi Chen, Chahat Deep Singh, Cornelia Fermuller, Yiannis Aloimonos, Chao Xu and Fei Gao.
  "Leveraging an Active Prism to Enhance Feature Detection in Event Cameras"
  Technical Report. [Report]

- Qianhao Wang*, **Botao He***, Zhiren Xun and Fei Gao.
  "GPA-Teleoperation: Gaze Enhanced Perception-aware Safe Assistive Aerial Teleoperation"
  IEEE Robotics and Automation Letters (**RA-L**) and IEEE International Conference on Robotics and Automation (ICRA 2022). [Paper] [Video] [Code]

- **Botao He***, Haojia Li*, Siyuan Wu, Dong Wang, Zhiwei Zhang, Qianli Dong, Chao Xu, and Fei Gao.
  "FAST-Dynamic-Vision: Detection and Tracking Dynamic Objects with Event and Depth Sensing"
  IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021). [Paper] [Video] [Code]

- Shaohui Yang, **Botao He**, Zhepei Wang, Chao Xu and Fei Gao.
  "Whole-Body Real-Time Motion Planning for Multicopters,"
  IEEE International Conference on Robotics and Automation(**ICRA 2021**), [Paper] [Video]

RESEARCH EXPERIENCE

Perception and Robotics Group, University of Maryland   **09/2022 – Now**
Active Perception for Autonomous Navigation

Advised by Prof. Yiannis Aloimonos and Dr. Cornelia Fermuller

- Designed a drone-view image generation framework using NeRF, supports infinite view-point sampling.

- Proposed a robust network running in real-time on the drone for estimating the best subset of the next viewing angles based on the current human pose observation.
- Designed a planner that combines the perspective-aware guidance with other navigation constraints into an optimization-based motion planning framework for improving human pose estimation.
- To submit to IROS 2024.

Microsaccade-inspired Event Camera for Robotics

Advised by Prof. Yiannis Aloimonos, Dr. Cornelia Fermuller and Prof. Fei Gao

- Proposed a new hardware design to make the event camera see static background even when it is static.
- Designed a new algorithm to transform the new data format to the same domain of standard event camera, making the proposed system a plug-in-and-use solution with existing event-based perception algorithms.
- Designed 6 real-world experiments to comprehensively validate the system under different low- and high-level vision tasks. Open-sourced all hardware design and code.
- Accepted by **Science Robotics**, to be published.

FAST(Field Autonomous System & compuTing) Lab, Zhejiang University **01/2020 – 08/2022**

Advanced Pilot Assistance System (APAS). Advised by Prof. Fei Gao

- Proposed a gaze enhanced assistive aerial teleoperation framework considering topological intent consistency and perception awareness. Make drone operation easy for everyone.
- Designed a topological path generation method, which significantly improves intention consistency.
- Published at **RA-L and ICRA 2022** (paper). Open-sourced on Github.

Event-based perception. Advised by Prof. Fei Gao

- Proposed a perception system for dodging fast-moving objects with low latency and high precision.
- Designed the ego-motion compensation algorithm that balances efficiency and accuracy.
- Implemented a novel moving object detection method that enables the drone to robustly detect high-speed (>12m/s) incoming object while flying at 1.5m/s.
- Published at **IROS 2021** (paper). Open-sourced on Github. Reported by media and got over 30,000 visits.

Whole-body Motion Planning for UAVs. Advised by Prof. Fei Gao

- Proposed a full-body, optimization-based, yaw-considered real-time motion planning framework for aerial robots. The time consumption and memory usage of our method surpasses others.
- Worked on real-world experiment implementation. Got familiar with the aerial motion planning framework.
- Published at **ICRA 2021** (paper).

All-terrain Vehicle Lab, Nanjing Institute of Technology **10/2018 – 12/2019**

Challenge Arena Fighting Robot. Advised by Prof. Guifang Qiao	*Team leader*
Electromagnetic Throw System.	*Team leader*
Lightweight quadruped robot.	*Team leader*

- Acquired the ability to independently build a robot system.

SERVICE

Reviewer for: Robotics and Automation Letters (RA-L), Frontiers in Robotics and AI, The Visual Computer, CVPR Workshop (2023)

Editor for: NeuroPAC

HONORS & AWARDS

NeuroPAC Fellowship, NeuroPAC,	2023, 2024
Dean's Fellowship, UMD,	2022-2023

SKILLS

Programming: C/C++, Python, Keil-C, Matlab, Git, OpenCV.
Robotics: ROS, Unity, Airsim, Gazebo, Adams, IoT chips(STM32, Arduino).
Hardware: SolidWorks, machining, circuit design.

ADDITIONAL ACTIVITIES

Summer volunteering at the Wangmengzhuang Primary School in Peixian. Taught Maths, Astronomy, PE, and Sex-education.

Volunteer teaching assistant at community autism school. 250+ volunteer hours in total.