刘健恒

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我目前的研究兴趣聚焦于**机器人的感知定位与运动规划**，现于陈浩耀教授带领的nROS-Lab(NRSL)) 攻读学术型研究生学位。

Education

○ **哈尔滨工业大学（深圳）** **推免生**
控制科学与工程 *(研究生学位),* *2021/09–Present*

○ **哈尔滨工业大学（深圳）** **15/70**
自动化 *(学士学位),* *2017/09–2021/06*

Publication

○ **RGB-D Inertial Odometry for a Resource-restricted Robot in Dynamic Environments**
Jianheng Liu, XuanFu Li, Yueqian Liu and Haoyao Chen
RA-L and IROS, 2022

○ **Vision-encoder-based Payload State Estimation for Autonomous MAV With a Suspended Payload**
Jianheng Liu, Yunfan Ren, Haoyao Chen and Yunhui Liu
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS, 2021)

Honor & Awards

○ Graduate Academic Scholarship of First-class (2021-2022), Undergraduate Academic Scholarship of First-class (2019-2020), Third-class (2018-2019), Second-class (2017-2018)

○ National ROBOCON competition of First Price (2020), Second Price (2019)

○ the Third Prize for 2019 National Challenge Cup, the Bronze Prize for 2019 Internet plus of Heilongjiang Province, the Golden Price for 2019 ZuGuang Cup of Harbin Institute of Technology (Shenzhen)

○ the Second Prize for 2018 National English Competition for College Strudents

○ the Grand Prize for the second International Youth Drone Competition

Research

○ **RGB-D Inertial Odometry for a Resource-restricted Robot in Dynamic Environments:**
Jianheng Liu, XuanFu Li, Yueqian Liu and Haoyao Chen
RA-L and IROS, 2022

We develops a novel real-time system for estimating the payload position; the system consists of a monocular fisheye camera and a novel encoder-based device. A Gaussian fusion-based estimation algorithm is developed to obtain the payload state estimation. Based on the robust payload position estimation, a payload controller is presented to ensure the reliable tracking performance on aggressive trajectories. Several experiments are performed to validate the high performance of the proposed method.

- **Referred Code:** Code
- **Referred Video:** Video

○ **Dynamic-VINS:** Dynamic-VINS is a SLAM system based on VINS-RGBD-FAST. I try to combine YOLOv3 to eliminate the impact of the dynamic feature to SLAM system. The whole system is conducted in HUAWEI Atlas 200DK. A resposity adapting YOLOv3 and ROS to Atlas200DK is released to **YOLOv3-Atlas-ROS**.

○ **VINS-RGBD-FAST:** VINS-RGBD-FAST is a SLAM system based on VINS-RGBD. I do some refinements both in frontend and backend to improve the system's efficiency in resource-constrained embedded paltform, like HUAWEI Atlas 200DK, Raspberry Pi. For example, this system extracts FAST feature instead of Harris feature and solved feature clusttering problem, adds stationary initialization function, add IMU-aided feature tracking and extracted-feature area's quality judgement function, lowers the required bandwidth of the system, makes a trade-off of accuracy and efficiency by constrain the optimized variables in backend. Furthermore, we made this system as a module and applied it into UAV as a state feedback to track a generative trajectory stably.

- **Referred Code:** Code.

○ **Vision-encoder-based Payload State Estimation for Autonomous MAV With a Suspended Payload:**
Jianheng Liu*, Yunfan Ren*, Haoyao Chen and Yunhui Liu
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS, 2021)
We develops a novel real-time system for estimating the payload position; the system consists of a monocular fisheye camera and a novel encoder-based device. A Gaussian fusion-based estimation algorithm is developed to obtain the payload state estimation. Based on the robust payload position estimation, a payload controller is presented to ensure the reliable tracking performance on aggressive trajectories. Several experiments are performed to validate the high performance of the proposed method.

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○ **MatRix:** A extreme interesting prototype developed in 2020 XBOT PARK Smart Product Innovation Boot Camp. An interactive smart carpet, which can achieve infinite splicing through the magnetic suction connector with anti-dull design. MatRix can be used as your home intelligent terminal, game console, decoration and so on.

- **Referred Video:** Video

○ **quad-controller-SE3 & FlightController:** quadrotor controller based on PX4/mavros and SE3 geometric control. And I also develop a simulation based on CoppeliaSim software to compute the desired thrust and

torque of quadroter according to dynamic modelling, and use distribution matrix to decide the motor's speed. Furthermore, I conduct a trajectory tracking controller to follow a generative minimum snap trajectory for experiment.

- **Referred Code:** quad-controller-SE3, FlightController
- **Referred Video:** Video1, Video2

○ **BezierTrajGenerator & MinimumSnapTrajGenerator & MapManager:** Trajectory Generator based on Bezier Curve and Minimum Snap for autonomous robot. And I develop a 2D Map Manager for the verification and visualization for different algorithms.

- **Referred Code:** BezierTrajGenerator, MinimumSnapTrajGenerator, MapManager

○ **CoppeliaSim/V-Rep Steeling Wheel Robot Tutorial:** A detailed tutorial for a CoppeliaSim/V-Rep beginner to construct their own Steeling Wheel Robot and control it via ROS.

- **Referred Code:** CoppeliaSim-Steeringwheel-Tutorial

○ **Manipulator-GUI:** C++ Course Project (Complied in CodeBlocks). A three dimentional manipulator's forword/inverse kinematics calculation and visualization.

- **Referred Code:** Manipulator-GUI