

Yifu Wang | Curriculum Vitae

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PERSONEL PROFILE

Date of Birth: 27/09/1993
Citizenship: Chinese
Visa Status: Permanent Residency in Australia
Address: ShanghaiTech University, Huanke Road 199, Shanghai, China
Languages: Chinese & English
Driving License: Chinese License
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Education

- **Australian National University** **Australia**
Doctor of Philosophy in Computer Vision and Robotics *Mar 2016 – now*
- **Australian National University** **Australia**
Bachelor's degree in Engineering Honors *Feb 2014 – Dec 2015*
 - **Major:** Electronics and Communications **Minor:** Mechatronics.
 - Second Class Honors Division A.
- **Beijing Institute of Technology** **China**
Bachelor's degree in Engineering *Sep 2011 – Jul 2015*
 - **Major:** Automation.
 - Grade Average: 82% (from 2011 to 2013).

Research Experience

○ **PhD Project: (Finished)** *'Dynamic Event Camera Calibration'*

Shanghai, China July 2020 – Nov 2020.

- We present the first dynamic event camera calibration algorithm. It calibrates directly from events captured during relative motion between camera and calibration pattern. The method is propelled by a novel feature extraction mechanism for calibration patterns, and leverages existing calibration tools before optimizing all parameters through a multi-segment continuous-time formulation. As demonstrated through our results on real data, the obtained calibration method is highly convenient and reliably calibrates from data sequences spanning less than 10 seconds.
- Submitted to CVPR 2021 conference.

○ **PhD Project: (Finished)** *'B-splines for Purely Vision-based Localization and Mapping on Non-holonomic Ground Vehicles'*

Shanghai, China Sep 2019 – Jul 2020.

- Purely vision-based localization and mapping is a cost-effective and thus attractive solution to localization and mapping on smart ground vehicles. However, the accuracy and especially robustness of vision-only solutions remain rivalled by more expensive, lidar-based multi-sensor alternatives. We show that a significant increase in robustness can be achieved if taking non-holonomic kinematic constraints on the vehicle motion into account. We demonstrate the use of B-splines for an exact imposition of smooth, non-holonomic trajectories inside the 6 DoF bundle adjustment can provide a significant improvement in robustness and accuracy in degrading visual conditions.
- Submitted to ICRA 2021 conference.

○ **PhD Project: (Finished)** *'Visual Odometry with an Event Camera Using Continuous Ray Warping and Volumetric Contrast Maximization'*

Shanghai, China Sep 2019 – Jul 2020.

- Event cameras are bio-inspired sensors that perform well in HDR conditions and have high temporal resolution. We introduce a new solution to handle the localization and mapping problem of single event camera by continuous ray warping and volumetric contrast maximization, which can perform joint optimization over motion and structure for cameras exerting both translational and rotational displacements in an arbitrarily structured environment.
- Submitted to ICRA 2021 conference.

○ **PhD Project: (Finished)** *'Globally-Optimal Event Camera Motion Estimation'*

Shanghai, China Sep 2019 – Mar 2020.

- Event cameras are bio-inspired sensors that perform well in HDR conditions and have high temporal resolution. The present paper looks at fronto-parallel motion estimation of an event camera. In stark contrast to prior art, a globally optimal solution to this motion estimation problem is derived by using branch-and-bound optimization scheme. The practical validity of our approach is supported by a highly successful application to AGV motion estimation with a downward facing event camera, a challenging scenario in which the sensor experiences fronto-parallel motion in front of noisy, fast moving textures.

- Accepted by ECCV 2020 conference.
- **PhD Project: (Finished)** *'Reliable frame-to-frame motion estimation for vehicle-mounted surround-view camera systems'*
 Shanghai, China Dec 2018 – Jun 2019.
 - This paper introduces a reliable solution for relative motion estimation with a non-overlapping surround-view camera system. Besides state-of-the-art performance, we also present a detailed analysis of the rotation-translation ambiguity for both forward and side-ways moving cameras. We further more introduce a novel two-view optimization scheme which minimizes a geometrically relevant error without relying on 3D point related optimization variables.
 - Accepted by ICRA 2020 conference.
- **PhD Project: (Finished)** *'Motion estimation of non-holonomic ground vehicles from a single feature correspondence measured over n views'*
 Shanghai, China Jul 2018 – Dec 2018.
 - We introduce an n -linear constraint adapted to the case of planar non-holonomic motion. It can transparently handle both point and vertical line feature correspondences measured over an arbitrary number of views.
 - Our results prove that it successfully handles a variety of relevant scenarios, eventually outperforming the 1-point two-view solver.
 - Accepted by CVPR 2019 conference.
- **PhD Project: (Ongoing)** *'Semi-dense VO with non-overlapping multi-perspective camera arrays'*
 Canberra, Australia Jul 2017 – now.
 - Based on our previous work "On Scale Initialization in Non-Overlapping Multi-Perspective Visual Odometry".
 - Move from the traditional technique of tracking and mapping to a more complete approach that tracks and maps all the edges that can be observed in the images.
 - Lift works to semi-dense region in mapping stages.
 - Prepare for a Journal paper.
- **Master Project: (Finished)** *'On Scale Initialization in Non-Overlapping Multi-Perspective Visual Odometry'*
 Canberra, Australia Apr 2016 – Jul 2017.
 - A front-end which tracks features in the image and estimates the pose of each live frame given a set of known 3D points.
 - A back-end which performs joint bundle adjustment over a set of key frames.
 - Presents a solution to the scale initialization problem.
 - Accepted by ICVS 2017 conference.
- **Bachelor Project: (Finished)** *'Monocular Visual Odometry on Android Mobile Phone'*
 Canberra, Australia Feb 2015 – Nov 2015.
 - Test and evaluate monocular-VO on Android mobile phone.
 - Using JNI (Java Native Interface) to enables Java code to run in libraries written in C++ languages.
 - Evaluate the efficiency and accuracy of the algorithm and do real-data test.

Publications

- **Y Wang** and L Kneip. On scale initialization in non-overlapping multi-perspective visual odometry. In Proceedings of the International Conference on Computer Vision Systems, Shenzhen, July 2017. **Best Student Paper Award**
- K Huang, **Y Wang** and L Kneip. Motion estimation of non-holonomic ground vehicles from a single feature correspondence measured over n views. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition(CVPR), June. 2019.
- **Y Wang**, K Huang, X Peng, H Li and L Kneip. Reliable frame-to-frame motion estimation for vehicle-mounted surround-view camera systems. In Proceedings of the 2020 IEEE International conference on robotics and automation (ICRA), June. 2020.
- X Peng*, **Y Wang***, L Gao* and L Kneip. Globally-Optimal Event Camera Motion Estimation. In Proceedings of the European Conference on Computer Vision (ECCV), Aug. 2020.

Technical and Personal skills

- **Programming Languages:** Proficient in: C++, Java, Matlab, TeX
Also basic ability with: Assembly, Arduino, VHDL.
- **Platforms:** Windows, Ubuntu 16.04, Mac OS.
- **Industry Software and Libraries Skills:** CLion, Matlab, OpenCV, Ceres, ROS, Most MS Office products.
- **General Business Skills:** Good presentation and communication skills.

Internship and Visiting History

- **ShanghaiTech University** **China**
Visiting Student *Nov 2017 –Feb 2018, Aug 2018 – now*
Working with Dr. Laurent Kneip on topic: novel camera architectures for localization and mapping on Intelligent mobile devices.
- **Motovis Intelligent Technologies** **China**
Internship *Jul 2019 –Aug 2019*
Internship at v-SLAM Group of Motovis Intelligent Technologies.
- **B.R.S Lab in Beijing Institute of Technology** **China**
Lab Assistance *Dec 2014 – Feb 2015*
OpenCV Programming and debug for sealing blocking plate of steam generator robot system based on visual guidance. Worked as lab assistance and responsible for testing mandible reconstruction surgical robot.
- **The First Research Institute of Ministry of Public Security of P.R.C** **China**
Internship Student *Jun 2013 – Jul 2013*

Checking some accomplished circuit board. Participate the Project of 'Security Detector of Explosive'(assist).

References

- Hongdong Li. Professor, Research School of Engineering and Computer Science, ANU, Australia. Email: Hongdong.Li@anu.edu.cn
- Laurent Kneip. Associate Professor, PI, School of Information Sciences and Technology (SIST), ShanghaiTech, China. Email: lkneip@shanghaitech.edu.cn