Hao GONG

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Work Experience

Enjoy Move Technology Co., Ltd. 2022/09 – 2023/08
Expert in Autonomous Driving/Visual Perception Tech Lead Shanghai, China

- In charge of all the research and engineering related to visual perception and localization problems (from visual-semantic feature representation to mapping and localization optimization).
- Spearheaded a team of 2 senior researchers and 4 junior engineers to build from ground-up a semantic vSLAM framework for self-localization feature in L4 Automated Valet Parking (AVP) application. Designed and implemented the proposed algorithms using inputs from CNN-based semantic detection of Bird's Eye View (BEV) of road markings and IMU-wheel encoder coupled odometry. Re-localization initialized via trajectory matching and pre-intergration of GNSS/IMU/in-vehicle sensors. (Ceres Solver/ROS2/C++)
- Enhanced stereotype performance: Achieved mapping capabilities up to 1km, positioning accuracy within 20cm, angular error within 1°, over 98% positioning success rate, and real-time impl. on NVIDIA Jetson AGX Orin at cruising speed of up to 15kph.
- Closely worked with planning and control engineers to improve the driving behavior of AVP.

Landmark Vision Technology Co., Ltd. 2019/01 – 2023/11
Co-Founder/Algorithm Scientist - lead core algorithm research and product development Shanghai, China

- Proposed an innovative class-wise triplet loss function to efficiently enhance the discriminative capability and reduce computational costs for face verification tasks [**code**]. Combined w/ face detection (MTCNN), Hungarian Kalman Filter based multi-object tracking (MOT), enables high-accuracy, low-resolution facial recognition in uncontrolled environments for real-time impl. on both CPU/GPU servers in smart access control systems. (C++/TensorFlow)
- Led a core R&D project for real-time and high accuracy 2.5D multi-target multi-camera (MTMC) human tracking with ReID. Proposed and co-implemented a Pose Estimation and Occlusion Augmentation Based Vision Transformer (POVT) for significant improvement on real-world occluded person re-identification. Details in [Wei+22]. Responsible for building the pipeline system comprising an anchor-free pedestrian detector (DarkNet53 backbone), a multi-object tracker using generic data association compatible with ReID feature similarity to handle occlusions and a homography-based perspective mapping to convert 2D pedestrian positions into real-world coordinates for trajectory plotting. This system enables inter-camera MOT and intra-camera ID assignment, optimized for real-time performance across platforms via inferencing accelerators (TensorRT/ONNX/OpenVINO). Work patented in[5] and[6].
- Closely worked with the co-founders to refine the company's research and engineering direction.

OFilm Group Co., Ltd. 2016/06 – 2018/11
Expert in ADAS/Auto-Driving R&D Shanghai, China

- Built independently an optimized vehicle motion model via Ackermann Steering/Levenberg-Marquardt algo., deployed to all of core ADAS/Autonomous Driving products (e.g. Moving Object Detection and Trained Parking) of the company. (C/C++)
- Designed and implemented independently an ADAS feature: Detection and Tracking of Moving Objects from Non-stationary Fisheye Cameras, which leverages epipolar constraints to segment dynamic objects from static backgrounds while SfM, powered by feature-level tracking, object-level detection and tracking, with detection rate over 95%, false alarm rate less than 1% and latency less than 65ms on TI Jacinto 5 upon delivery to leading domestic OEMs with initial mass-production orders of over 200,000 units and cumulative sales of 243 million CNY. Related work is patented in[2]. (C++/OpenCV)
- Led a core R&D project for Trained Parking with mapping distance up to 100m and centimeter-level localization accuracy. First in China to apply vSLAM to mass-produced L3 self-parking solution, launched on SAIC Motor's premium e-SUV, Roewe Marvel X.
- Redesigned ORB-SLAM and developed a multi-fisheye visual SLAM system tailored to vehicle trims and delivery standards. To address the lack of loop-closing and fisheye-induced radial distortions, I proposed special descriptors to enhance feature matching and integrated precise absolute scale information from my vehicle motion model. Led the validation through real-world ground truth and the "Multi-FoV" synthetic datasets, confirming centimeter-level accuracy in 3D landmark reconstruction. Proposed a mapping environment evaluator and a map quality evaluator to improve practicality and deployability. (C++/OpenCV/DBoW/g2o)
- In close collaboration with embedded softeware engineers to enhance system performance on Renesas RH850 MCU and TI TDA2x SoC for real-time operation at 15fps during the localization phase.

Third Research Institute of Ministry of Public (TRIMP) 2013/09 – 2016/05
Research Scientist Shanghai, China

- Responsible for R&D on information retrieval, object identification and tracking on image and video data from traffic management network and intersection control scenario.
- Led a team of 2 PhD researchers and 3 junior engineers in developing the main pipeline for vehicle image retrieval based on annual inspection marks. Proposed to employ Deformable Parts Model for coarse-detection of vehicle and its front windshield, and template matching method for fine-localization of annual inspection marks. Image retrieval with Bag of Words and re-ranking subsequently applied to identify target vehicles within seconds from a large gallery database containing hundreds of thousands of high-definition vehicle surveillance images. Related work is patented in[3]. (Matlab/C++/OpenCV)

Education

Université Grenoble Alpes 2010/01 – 2013/06
Ph.D. in Signal and Image Processing, GIPSA (Grenoble Images Parole Signal et Automatique)-Lab Grenoble, France
- Research Topic: Medical Image Segmentation and Classification. Publications at ICIP[GD12a][Kéc+14] and ICIAR[GD12b]
- Thesis: Segmentation d'Images Couleurs et Multispectrales de la Peau[Gon13] (Matlab/C++)
- Advisor: Prof. Michel Desvignes
- Awards: National Scholarship of China (2010/01/11 - 2013/01/10)

Southeast University 2007/09 – 2009/07
M.S. in Pattern Recognition & Intelligent System, School of Automation Nanjing, China
- Research Topic: Image Inpainting and Restoration. Related work patented[4].
- Thesis: Study on Digital Image Inpainting and Its Application in Blotches Removal in Video Image Sequences (C++)
- Advisor: Prof. Xiaohui Yuan
- Awards: Second-Class Academic Scholarship of Southeast University (2007)

Southeast University 2003/09 – 2007/07
B.S. in Automation Nanjing, China
- GPA 85/100; Ranked 12/120
- Honors: Outstanding Undergraduate of Southeast University (2004); Outstanding Graduate of School of Automation (2007)

Academic Services

Conference Reviewer: ICIP2014, ACCV2022, ICASSP2023, ICASSP2024

Skills

Programming Languages: C/C++, Python, Matlab
Frameworks and Tools: TensorFlow, PyTorch, OpenCV, Git, ROS
Tech Skills: Combinatorial Optimization, Dimensionality Reduction, 3D Vision Geometry, CNN, Transformer

Publications

[Link] to my Google Scholar Profile.

[GD12a] H. Gong, and M. Desvignes, "Quantification of pigmentation in human skin images," in *19th IEEE Int. Conf. Image Process. (ICIP 2012)*, Oct. 2012A, pp. 2853–2856, doi: 10.1109/ICIP.2012.6467494.

[GD12b] H. Gong, and M. Desvignes, "Hemoglobin and melanin quantification on skin images," in *9th Int. Conf. Image Anal. Recognit. (ICIAR 2012)*, Berlin, Heidelberg, Jun. 2012B, pp. 198–205, doi: 10.1007/978-3-642-31298-4_24.

[Gon13] H. Gong, "Segmentation d'images couleurs et multispectrales de la peau," Thesis, Université de Grenoble, 2013. [Online]. Available: https://theses.hal.science/tel-00934789

[Kéc+14] R. Kéchichian*, H. Gong*, M. Revenu, O. Lezoray, and M. Desvignes, "New data model for graph-cut segmentation: application to automatic melanoma delineation," in *21st IEEE Int. Conf. Image Process. (ICIP 2014)*, Oct. 2014, pp. 892–896, doi: 10.1109/ICIP.2014.7025179.

[Tan+20a] T. Tang, H. Wang, X. Zhou, and H. Gong, "Understanding electric bikers' red-light running behavior: predictive utility of theory of planned behavior vs prototype willingness model," *J. Adv. Transp.*, vol. 2020, p. 7097302, Feb. 17, 2020A, doi: 10.1155/2020/7097302. [Online]. Available: https://doi.org/10.1155/2020/7097302

[Tan+20b] T. Tang, Y. Guo, X. Zhou, Q. Shi, and H. Gong, "Identifying psychological factors of e-bike riders' traffic rule violating intention and accident proneness in china," in *20th COTA Int. Conf. Transp. Professionals (CICTP 2020)*, Aug. 2020B, pp. 4420–4432, doi: 10.1061/9780784482933.379.

[Wei+22] Y. Wei, D. Niu, H. Gong, Y. Dong, and X. Chen, "Pose estimation and occlusion augmentation based vision transformer for occluded person re-identification," in *Jiangsu Annu. Conf. Automat. (JACA 2022)*, vol. 2022, Nov. 2022, pp. 82–87, doi: 10.1049/icp.2023.0150.

Patents

[1] H. Gong, L. Mei et al. "System and method for realizing gait recognition by virtue of fusion of depth information and gray-scale information". C.N. Patent 104200200, filed Aug. 28, 2014, and issued Nov. 10, 2017.

[2] H. Gong, B. Duan et al. "Moving object detection system, moving object detection method and vehicle". C.N. Patent 109598747, filed Sep. 30, 2017, and issued Apr. 09, 2019.

[3] H. Gong, T. Tang et al. "Traffic checkpoint vehicle intelligent retrieval system and method based on annual inspection marks". C.N. Patent 110807415, filed Oct. 31, 2019, and issued Apr. 07, 2023.

[4] H. Gong, F. Deng et al. "Digital video file restoration method and device". C.N. Patent 111127376, filed Dec. 13, 2019, and issued May 23, 2023.

[5] H. Gong, D. Niu et al. "Intelligent building online cross-camera multi-object tracking method". C.N. Patent 114240997, filed Nov. 16, 2021, and issued Jul. 28, 2023.

[6] H. Gong, Y. Wei et al. "Occluded pedestrian re-identification method based on pose estimation and Transformer". C.N. Patent 115841682, filed Nov. 08, 2022. Patent Pending.