SONG JINGWEI

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AREA OF INTEREST

SLAM, Computer Vision, Surgical Robotics, Non-Rigid Structure from Motion, CUDA programming.

EDUCATION AND EXPERIENCE

United Imaging Research Institute of Intelligent Imaging, Beijing *July. 2022- Present*
Senior software engineer

Robotic institute, University of Michigan, Ann Arbor, USA *July. 2020- May. 2022*
Research associate

FX Palo Alto Laboratory, Inc, Palo alto, USA *May. 2019 - Jun. 2020*
Research intern

Centre for Autonomous Systems, University of Technology, Sydney *Jan. 2016 - May.2019*
PhD candidate

Institute of remote sensing and digital earth, Chinese Academy of Sciences, Beijing, China
Jun. 2015 - Sep. 2012
M.S. of Geographical information system

School of Remote Sensing and Information Engineering, Wuhan University, Wuhan, China
Sep. 2008 - Jun. 2012
B.S. of Remote Sensing Science and Technology

PUBLICATIONS

Selected publications:

- **Song Jingwei**, Ray Zhang, Wenwei Zhang, Hao Zhou, Maani Ghaffari. SLAM assisted 3D tracking system for laparoscopic surgery. 2025 IEEE International Conference on Robotics and Automation (ICRA), Accepted.
- **Song Jingwei**, Keke Yang, Han Chen, Jiayi Liu, Yinan Gu, Qianxin Hui, Yanqi Huang, Meng Li, Zheng Zhang, Tuoyu Cao, Maani Ghaffari. VascularPilot3D: Toward a 3D fully autonomous navigation for endovascular robotics. 2025 IEEE International Conference on Robotics and Automation (ICRA), Accepted.
- **Song Jingwei**, Keke Yang, Zheng Zhang, Meng Li, Tuoyu Cao and Maani Ghaffari. Iterative PnP and its application in 3D-2D vascular image registration for robot navigation. 2024 IEEE International Conference on Robotics and Automation (ICRA), Yokohama, Japan, 2024, pp. 17560-17566, doi: 10.1109/ICRA57147.2024.10610392.
- **Song Jingwei**, Ray Zhang, Qiuchen Zhu, Jianyu Lin and Maani Ghaffari. BDIS-SLAM: A lightweight CPU-based dense stereo SLAM for surgery in nternational Journal of Computer Assisted Radiology and Surgery, 2024: 1-10..
- Keke Yang, Zheng Zhang, Meng Li, Tuoyu Cao, Maani Ghaffari, and **Song Jingwei (Corresponding author)**. Optical Flow-Based Vascular Respiratory Motion Compensation in IEEE Robotics and Automation Letters, vol. 8, no. 11, pp. 6987-6994, Nov. 2023, doi: 10.1109/LRA.2023.3313936.
- **Song Jingwei**, Zhu Qiuchen, Lin Jianyu and Ghaffari Maani. BDIS: Bayesian Dense Inverse Searching Method for Real-Time Stereo Surgical Image Matching, in IEEE Transactions on Robotics, vol. 39, no. 2, pp. 1388-1406, April 2023.

- **Song Jingwei**, Zhu Qiuchen, Lin Jianyu and Ghaffari Maani. Bayesian dense inverse searching algorithm for real-time stereo matching in minimally invasive surgery[C]//International Conference on Medical Image Computing and Computer-Assisted Intervention. Springer, Cham, 2022: 333-344. (Oral presentation)
- **Song Jingwei**, Patel Mitesh, M. Jasour Ashkan and Ghaffari Maani, A Closed-Form Uncertainty Propagation in Non-Rigid Structure From Motion, in IEEE Robotics and Automation Letters, vol. 7, no. 3, pp. 6479-6486, July 2022, doi: 10.1109/LRA.2022.3173733.
- **Song Jingwei**, Patel Mitesh and Ghaffari Maani. Fusing Convolutional Neural Network and Geometric Constraint for Image-Based Indoor Localization, in IEEE Robotics and Automation Letters, vol. 7, no. 2, pp. 1674-1681, April 2022, doi: 10.1109/LRA.2022.3140832.
- **Song Jingwei**, Patel Mitesh, Girgensohn Andreas and Kim Chelhwon. Combining deep learning with geometric features for image-based localization in the Gastrointestinal tract[J]. Expert Systems with Applications, 2021, 185: 115631.
- **Song Jingwei**, Bai Fang, Zhao Liang, Huang Shoudong and Xiong Rong. Efficient two step optimization for large embedded deformation graph based SLAM, 2020 IEEE International Conference on Robotics and Automation (ICRA), 2020, pp. 9419-9425, doi: 10.1109/ICRA40945.2020.9196930.
- **Song Jingwei**, Wang Jun, Zhao Liang , Huang Shoudong and Dissanayake Gamini. MIS-SLAM: Real-time Large Scale Dense Deformable SLAM System in Minimal Invasive Surgery Based on Heterogeneous Computing. IEEE/RSJ International Conference on Intelligent Robots and Systems, 2018 (RAL-IROS option)
- **Song Jingwei**, Wang Jun, Zhao Liang , Huang Shoudong and Dissanayake Gamini. Dynamic Reconstruction of Deformable Soft-tissue with Stereo Scope in Minimal Invasive Surgery. IEEE/RSJ International Conference on Intelligent Robots and Systems, 2017 (RAL-IROS option)
- **Song Jingwei**, Xia Shaobo, Wang Jun, Patel Mitesh and Chen Dong, Uncertainty Quantification of Hyperspectral Image Denoising Frameworks Based on Sliding-Window Low-Rank Matrix Approximation, in IEEE Transactions on Geoscience and Remote Sensing, vol. 60, pp. 1-12, 2022, Art no. 5504212, doi: 10.1109/TGRS.2021.3065570.
- **Song Jingwei**, Xia Shaobo, Wang Junand Chen Dong. Curved Buildings Reconstruction From Airborne LiDAR Data by Matching and Deforming Geometric Primitives, in IEEE Transactions on Geoscience and Remote Sensing, vol. 59, no. 2, pp. 1660-1674, Feb. 2021, doi: 10.1109/TGRS.2020.2995732.
- Chien Erh Lin, **Song Jingwei**, Ray Zhang, Minghan Zhu and Ghaffari Maani. Se (3)-equivariant point cloud-based place recognition. In Conference on Robot Learning (pp. 1520-1530). PMLR.
- Wang Jun, **Song Jingwei**, Zhao Liang and Huang Shoudong. A Submap Joining Based RGB-D SLAM Algorithm using Planes as Features. 11th Conference on Field and Service Robotics
- Wang Jun, **Song Jingwei**, Zhao Liang and Huang Shoudong. A submap joining algorithm for 3d reconstruction using an rgb-d camera based on point and plane features[J]. Robotics and Autonomous Systems, 2019, 118: 93-111.
- Zhang Teng, Wu Kanzhi, **Song Jingwei**, Huang Shoudong and Dissanayake Gamini. (2017). Convergence and consistency analysis for a 3-d invariant-ekf slam. IEEE Robotics and Automation Letters, 2(2), 733-740.
- **Song Jingwei**, Wu Jianwei, Jiang Yongyao. Extraction and reconstruction of Curved Surface Buildings By Contour Clustering using airborne LiDAR Data. OPTIK.

Other publications:

- **Song Jingwei**, Wang Jun, Zhao Liang , Huang Shoudong and Dissanayake Gamini. Robust Shape Recovery of Deformable Soft-tissue Based on Information from Stereo Scope for Minimal Invasive Surgery. Hamlyn Symposium on Medical Robotics 2017

- **Song Jingwei**, Wang Jun, Zhao Liang , Huang Shoudong and Dissanayake Gamini. Dynamic Reconstruction of Deformable Soft-tissue with Stereo Scope in Minimal Invasive Surgery. Computer Assisted Radiology and Surgery (CARS2017).
- **Song Jingwei**, Wang Jun, Zhao Liang , Huang Shoudong and Dissanayake Gamini. (2016). 3D Shape Recovery of Deformable Soft-tissue with Computed Tomography and Depth Scan. In Australasian Conference on Robotics and Automation (ACRA2016).
- **Song Jingwei**, Wang Xinyuan, Liao Ying, Zhen Jing, Ishwaran Natarajan, GuoHuadong, Yang Ruixia, Liu Chuansheng, Chang Chun and Zong Xin.An improved neural network for regional giant panda habitat suitability mapping A Case Study in Yaan prefecture. Sustainability.
- **Song Jingwei**, Liao Ying, He Jiaying, Yang Jia, Xiang Bo.Analyzing Complexity of Municipal Solid Waste Stations Using Approximate Entropy and Spatial Clustering. Journal of Applied Science and Engineering.
- **Song Jingwei**, Xiang Bo, Wang Xinyuan, Wu Li, Chang Chun. Application of dynamic data driven application system in environmental science. Environmental Reviews 22.999 (2014): 287-297.
- **Song Jingwei**, He Jiaying, Zhen Jing.Real-time Data Assimilation for Improving Linear Municipal Solid Waste Prediction Model A Case Study in Seattle. Journal of Energy Engineering-ASCE.
- **Song Jingwei**, HeJiaying.A Multi-Step Chaotic Model for Municipal Solid Waste Generation Prediction. Environmental Engineering Science
- **Song Jingwei**, He Jiaying, Zhu Menghua, Tan Debao, Zhang Yu, Ye Song, Shen Dingtao, Zou Pengfei. Simulated Annealing Based Hybrid Forecast for Improving Daily Municipal Solid Waste Generation Prediction. The Scientific World Journal.
- Jiang Yongyao, **Song Jingwei**, Lu Hao. Research on a Multi-Sources Remote Sensing Fusion Method Based on Least Square Model Combined with Color Space Transform. 2011 International Symposium on Image and Data Fusion, 327-334.

Patent:

- Mitesh Patel,**Song Jingwei**, et al. Fusing deep learning and geometric constraint for image-based localization: U.S. Patent 11,227,406[P]. 2022-1-18.

RESEARCH EXPERIENCE

United Imaging Research Institute of Intelligent Imaging, Beijing
SLAM,Navigation,Localization *July.2022 - Now*

- Nonrigid SLAM and visual navigation in endovascular robots.
- Nonrigid SLAM and visual navigation in minimally invasive surgery.
- Development of autonomous system on ROS.

Research associate at Robotic institute, University of Michigan, Ann Arbor, USA
3D reconstruction, SLAM *July.2020 - May.2022*

- Design the first GPU-level Bayesian-based stereo matching algorithm for minimally invasive surgery.
- SLAM with non-parametric visual odometry.
- Rotational equivariant neural network for point cloud based robot localization.

Research intern at FX Palo Alto Laboratory, Inc, Palo alto, US
Image based localization *Jun.2019 - June.2020*

- General indoor localization technique by combining deep learning and geometric technique.
- Image based localization in GI-tract.

Visiting student at Institut de Robtica i Informtica Industrial of Universitat Politcnica de Catalunya
Non-Rigid Structure from Motion (NRSfM) *Jan.2019 - Apr.2019*

- NRSfM algorithm design and formulation.
- Constraint optimization with Augmented Lagrange Multiplier.

Research assistant in Centre for Autonomous Systems, University of Technology, Sydney
Realtime localization and dense reconstruction of deforming Soft-tissue with Stereo Scope *Jan.2016 - Dec.2019*

- Playing a key role in system design, data acquirement, processing and software implementation.
- Independently accomplish Matlab prototype design and CUDA C programming.
- Jointly processing camera calibration, Handeye calibration

Research assistant in Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences *Dec.2012 - Jun. 2015*

Intern in Changjiang Scientific Institute *Sep. 2011 - Jun.2012*

Research assistant in Institute of Geodesy and Geophysics, Chinese Academy of Sciences *Jun.2011 - Sep.2011*

Team leader in School of Remote Sensing and Information Engineering, Wuhan university *May.2010 - Sep. 2011*

TECHNICAL STRENGTHS

- Programming Languages: Matlab, Python, C++, CUDA C, C#
- Major interests (Knowledge): SLAM, Optimization, GPU programming, Computer vision, deformation modelling, ROS, machine learning, Spatial data analysis/mining, time series analysis, PSO and Kalman filter, DDDAS, GIS application, remote sensing (RS) data processing.

ACHIEVEMENTS

- The Third Prize Scholarship, Wuhan University *2009*
- National Scholarship *2010*
- National Scholarship *2011*
- Outstanding graduate, Wuhan University *2012*
- Excellent student, University of Chinese Academy of Sciences *2014*
- National Scholarship *2014*
- Excellent student, University of Chinese Academy of Sciences *2015*
- Outstanding graduate, University of Chinese Academy of Sciences *2015*
- Deans scholarship of excellence, University of Chinese Academy of Science (top 240 in UCAS) *2015*
- International Postgraduate Research Scholarships and Australian Postgraduate Awards (awarded from Australian government, top 5 in UTS) *2016*
- Second prize of the showcase competition, FEIT, UTS *2017*
- First prize of the showcase competition, FEIT, UTS *2018*
- IRI-UPC Excellence Mara de Maeztu internship scholarship (IRI-MdM Internship) *2018*
- Research associate funding supported by Toyota research institute *2020*
- The 17th oversea talent of Beijing *2023*