

# Mo Shan (Sean)

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## EDUCATION

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<b>University of California, San Diego</b> <i>PhD in Electrical and Computer Engineering, GPA 3.74/4</i>	La Jolla, CA, USA <i>Expected Jun. 2022</i>
<b>University of California, San Diego</b> <i>Master of Science in Electrical and Computer Engineering, GPA 3.74/4</i>	La Jolla, CA, USA <i>Sept. 2016 – Feb. 2020</i>
<b>National University of Singapore</b> <i>Bachelor of Science in Electrical and Computer Engineering, GPA 4.84/5</i>	Singapore <i>Sept. 2010 – Jun. 2014</i>
<b>University of Southampton</b> <i>Student Exchange Program in School of Electronics and Computer Science</i>	Southampton, United Kingdom <i>Dec. 2012 – Jul. 2013</i>

## RESEARCH INTERESTS

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- Rich models of tightly coupled localization and environmental representation that unify multiple characteristics, such as the geometric landmarks, semantic object-level map, object surfaces, and yet scale to large environments in real-time on embedded platforms such as quadrotors
- Simultaneous localization and mapping; visual-inertial odometry
- Relevant fields: computer vision, machine learning, optimization

## EXPERIENCE

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<b>Graduate Student Researcher</b> ECE, UCSD	Jun. 2018 – Current USA
<ul style="list-style-type: none"><li>• Designed and developed a tightly coupled, filtering based semantic VIO (OrcVIO) that produces an object-level map, with C++, Python, OpenCV, Sophus, Eigen, PyTorch</li><li>• OrcVIO is 4.8% better in object mapping accuracy compared with a single view object mapping approach, and 23.4% better in localization accuracy compared with an object SLAM approach, on the KITTI dataset</li></ul>	
<b>Associate Scientist</b> TEMASEK LABORATORIES	Jun. 2014 – Sept. 2016 Singapore
<ul style="list-style-type: none"><li>• Developed a Google Map aided visual odometry with C++, OpenCV, Dlib, which increases the localization accuracy by 96.0% compared with the baseline</li><li>• Implemented an UAV navigation approach based on a laser-stereo sensor suite with C++, OpenCV</li></ul>	
<b>Summer Intern</b> INFINEON	Jun. 2012 – Sept. 2012 Singapore
<ul style="list-style-type: none"><li>• Evaluated the performance of the AC-HMI-OLED prototype card</li><li>• Performed quality test of the Class D amplifier, Infrared Receiver and the Boost Converter</li><li>• Tested features such as a-law compression, volume control, Manchester decoding and voltage conversion</li><li>• Developed a Simulink model for touch sensing, and performed real time noise filtering</li></ul>	
<b>Summer Intern</b> INTERACTIVE DIGITAL MEDIA INSTITUTE	Jun. 2011 – Sept. 2011 Singapore
<ul style="list-style-type: none"><li>• Implemented a foreground detection algorithm based on RPCA using MATLAB reaching more than 70% precision at recall higher than 90%, which outperforms state-of-the-art</li><li>• Designed and developed a painting classification algorithm using sparse coding with MATLAB, achieving 2.3 times better authentication accuracy than the baseline</li></ul>	

## TECHNICAL SKILLS

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**Languages:** Python, C++, MATLAB

**Frameworks:** ROS

**Developer Tools:** Git, Docker, VS Code, PyCharm

**Libraries:** OpenCV, Dlib, scikit-image — Eigen, Sophus — PyTorch, Tensorflow, Keras

## AWARDS

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### Multi-Year Dean's Fellowship and Jacobs Fellowship

Sept. 2016 – Sept. 2017

UCSD

*La Jolla, CA, USA*

- Most prestigious fellowship offered by the ECE Department

### The 3rd International UAV Innovation Grand Prix

Nov. 2015

AVIC

*Zhejiang, China*

- Championship of rotary wing competition with a monetary prize of 100,000 RMB
- Designed and implemented a bucket detection algorithm to guide bucket transfer for the firefighting task using a UAV, with C++, OpenCV and Dlib

## PROFESSIONAL ACTIVITIES

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### Talks

- "OrcVIO: Object residual constrained Visual-Inertial Odometry", IROS Oral Presentation, Oct. 25, 2020.
- "Geo-referenced UAV Localization", PaoPao Robot Open-course, April 21, 2018.

### Reviewer

- Journals: IEEE Transactions on Robotics (T-RO), IEEE Robotics and Automation Letters (RA-L)
- Conferences: IEEE International Conference on Robotics and Automation (ICRA), IEEE International Conference on Intelligent Robots and Systems (IROS), IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)

## PUBLICATIONS

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### Journal Articles

- Z. Gao, **M. Shan**, Q. Li. (2015). Adaptive Sparse Representation for Analyzing Artistic Style of Paintings. ACM Journal on Computing and Cultural Heritage
- Z. Gao, Q. Li., R. Zhai, **M. Shan**, F. Lin. (2015). Adaptive and Robust Sparse Coding for Laser Range Data Denoising and inpainting. IEEE Transactions on Circuits and Systems for Video Technology

### Conference Proceedings

- **M. Shan**, Q. Feng, N. Atanasov. (2020). OrcVIO: Object residual constrained Visual-Inertial Odometry. In IEEE International Conference on Intelligent Robots and Systems (IROS). Las Vegas, USA.
- Q. Feng, Y. Meng, **M. Shan**, N. Atanasov. (2019). Localization and Mapping using Instance-specific Mesh Models. In IEEE International Conference on Intelligent Robots and Systems (IROS). Macao, China.
- **M. Shan**, Y. Bi, H. Qin, J. Li, Z. Gao, F. Lin and B. M. Chen. (2016). A brief survey of visual odometry for micro aerial vehicles, Proceedings of the 42nd Annual Industrial Electronics Conference (IECON), Florence, Italy.
- **M. Shan**, Fei Wang, Feng Lin, Zhi Gao, Ya Z. Tang, Ben M. Chen. (2015). Google Map Aided Visual Navigation for UAVs in GPS-denied Environment. In IEEE International Conference on Robotics and Biomimetics (ROBIO). Zhuhai, China.
- Z. Gao, **M. Shan**, L. Cheong, Q. Li. (2014). Adaptive Sparse Coding for Painting Style Analysis. In Computer Vision-ACCV 2014. Springer Berlin Heidelberg.
- Z. Gao, L. Cheong, **M. Shan**. (2012). Block-sparse rpca for consistent foreground detection. In Computer Vision-ECCV 2012 (pp. 690-703). Springer Berlin Heidelberg.

### Workshop Papers

- **M. Shan**. (2019). Weakly supervised keypoint detection. Southern California Robotics Symposium (SCR), Pasadena, USA.
- **M. Shan**, N. Atanasov. (2017). A spatiotemporal model with visual attention for video classification. In Robotics: Science and Systems (RSS) Workshop on Articulated Model Tracking, Cambridge, USA.
- **M. Shan**, A. Charan. (2015). Google Map Referenced UAV Navigation via Simultaneous Feature Detection and Description. Poster paper. In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). Hamburg, Germany.