Kuan-Wei Tseng

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Research Interest

3D Computer Vision (view synthesis, visual odometry, structure from motion, object tracking), Image and Video Processing (style transfer, video stabilization), Augmented/Virtual Reality (guidance system, multisensory experience), Sensor Fusion (visual, inertial, UWB)

Education

M.S., Department of Computer Science, Tokyo Institute of Technology (Tokyo Tech) 2022/04 –
- Adviser: Prof. Ikuro Sato and Prof. Rei Kawakami.
- Lab: Recognition and Learning Algorithm Laboratory (a.k.a. Sato Lab)
- Courses: Advanced Topics in Computer Vision, Advanced Topics in Artificial Intelligence

B.S., Department of Mechanical Engineering, National Taiwan University (NTU) 2016–2020
- Advisor: Prof. Yi-Ping Hung (Department of Computer Science and Information Engineering)
- Lab: Image and Vision Lab (imLab)
- Courses: Digital Image Processing, Computer Vision, Advanced Computer Vision, Robotics, Video Communications, Wireless Networking–Fundamentals and Applications, Numerical Methods, Data Visualization with Modern Data Science

Selected Publications

[1] **Kuan-Wei Tseng***, Jing-Yuan Huang*, Yang-Shen Chen, Chu-Song Chen, Yi-Ping Hung, "Pseudo-3D Scene Modeling for Virtual Reality Using Stylized Novel View Synthesis", in *ACM SIGGRAPH Posters*, 2022. (*Co-first authors)

[2] Jing-Yuan Huang, Grace Theodore, You-Shin Tsai, Jerry Chin-Han Goh, Mu-Hang Lin, **Kuan-Wei Tseng**, Yi-Ping Hung, "Exploring Multisensory Feedback for Virtual Reality Relaxation", in Proceedings of the *IEEE International Conference on Multimedia and Expo Workshops (ICMEW)*, 2022. (Best Demo Paper)

[3] **Kuan-Wei Tseng**, Yao-Chih Lee, Chu-Song Chen, "Artistic Style Novel View Synthesis Based on A Single Image", in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops*, 2022.

[4] You-Yang Hu, Yao-Fu Jan, **Kuan-Wei Tseng**, You-Shin Tsai, Hung-Ming Sung, Jin-Yao Lin, Yi-Ping Hung, "aBio: Active Bi-Olfactory Display Using Subwoofers for Virtual Reality", in *Proceedings of the 29th ACM International Conference on Multimedia (MM)*, 2021. (Oral Paper; Best Student Paper)

[5] Yao-Chih Lee, **Kuan-Wei Tseng**, Yu-Ta Chen, Chien-Cheng Chen, Chu-Song Chen, Yi-Ping Hung, "3D Video Stabilization with Depth Estimation by CNN-based Optimization", in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.

[6] Yu-Ta Chen, **Kuan-Wei Tseng**, Yao-Chih Lee, Chun-Yu Chen, Yi-Ping Hung, "PixStabNet: Fast Multi-Scale Deep Online Video Stabilization with Pixel-Based Warping", in *Proceedings of the IEEE International Conference on Image Processing (ICIP)*, 2021.

[7] Yao-Fu Juan, **Kuan-Wei Tseng**, Peng-Yuan Kao and Yi-Ping Hung, "Augmented Tai-Chi Chuan Practice Tool with Pose Evaluation", in *Proceedings of the IEEE International Conference on Multimedia Information Processing and Retrieval (MIPR)*, 2021. (Oral Paper)

[8] Peng-Yuan Kao, **Kuan-Wei Tseng**, Tian-Yi Shen, Yan-Bin Song, Kuan-Wen Chen, Shih-Wei Hu, Sheng-Wen Shih, and Yi-Ping Hung, "Camera Ego-Positioning Using Sensor Fusion and Complementary Method", in *Pattern Recognition. ICPR International Workshops and Challenges*, 2021.

[9] **Kuan-Wei Tseng**, Meng-Wei Hsu, Peng-Yuan Kao and Yi-Ping Hung, "Influence of IMU Quality on Optimization-Based Visual Inertial Odometry", in *IPPR Conference on Computer Vision, Graphics, and Image Processing (CVGIP)*, 2020. (Presentation)

Preprints & Projects

Globally Consistent Video Depth and Pose Estimation with Efficient Test-Time Training. Extended Deep3D (CVPR'21) with keyframe-based strategies to achieve globally consistent inference of scene depth and camera pose from offline videos.

A Flexible-Frame-Rate Vision-Aided Inertial Object Tracking System for Mobile Devices. Constructed a fast and reliable 3D object pose tracking system for mobile devices by fusing local IMU pose propagation with learning-based object pose estimation on remote servers.

Research Experience

Research Intern, Denso IT Laboratory 2022/11 – Present
Working on object detection and segmentation tasks with transformer.

Research Assistant, Tokyo Institute of Technology 2022/10 – Present
Working on human motion generation projects with Prof. Ikuro Sato and Prof. Rei Kawakami.

Graduate Research Assistant, National Taiwan University 2022/02–2022/09
Research Associate (Full Time), National Taiwan University 2021/02–2022/01
Research Assistant (Full Time), National Taiwan University 2020/08–2021/01
Undergraduate Research Assistant , National Taiwan University 2019/09–2020/07
Advised by Prof. Chu-Song Chen and Prof. Yi-Ping Hung.

- **Sensor Fusion**. Contributed to indoor UAV localization projects using deep selective fusion of vision, IMU, and UWB sensors. Refined loss functions to increase global localization accuracy. Recruited and trained a team to collect data with visual-inertial sensor and motion capture system.
- **Image Processing**. Designed and implemented ArtNV, a stylized novel view synthesis pipeline that generate spatially consistent novel views for 3D displays. Integrated ArtNV into VR as an alternative to modeling or 360 images for the unreachable areas in the virtual environment.
- **Computer Vision**. Contributed to GCVD, a globally consistent video depth and pose estimator that improves state-of-the-art methods by 19% , and Deep3D, an learning-based video stabilizer that first leveraged self-supervised learning of depth and pose to smooth camera motion.
- **Virtual Reality**. Developed an olfactory display system that exhausts scented gases by subwoofers to enhance immersive VR experience. Analyzed user experience on multisensory feedback and integrated multisensory experience into VR for relaxation.
- **Augmented Reality**. Explored practical applications of optical see-through head-mounted display and designed a mixed reality navigation (image-based localization) and guidance (3D animation manual) system for outdoor facility maintenance with Microsoft HoloLens 2.

Teaching Experience

Teaching Assistant, Tokyo Institute of Technology Fall 2022
- LAS.I121 Computer Science I
- LAS.I122 Computer Science II

Teaching Assistant, National Taiwan University
- CSIE 4004 Computer Science and Information Technology (II) Spring 2022
- CSIE 5079 Pattern Classification and Analysis Spring 2021
- CSIE 5429 3D Computer Vision with Deep Learning Applications Spring 2021, 2022

Services & Honors

Reviewer of WACV 2023, IEEE Signal Process. Lett. 2022

Best Demo Paper Award, IEEE International Conference on Multimedia & Expo (ICME) 2022
Best Student Paper Award, ACM International Conference on Multimedia (MM) 2021
Best Paper Award, IPPR Conference on Computer Vision, Graphics, and Image Processing 2020
Kobe University Funds, Summer Program in Japanese Language and Culture 2019
JASSO Scholarship, Nagoya University Short-Term Japanese Language Program 2018

Competences

Languages. Mandarin Chinese (*native*), English (*fluent*, TOEFL 104), Japanese (*fluent*, JLPT N1)
Programming Languages. Python, C++, MATLAB, SQL, HTML
Library, Software, and Tools. PyTorch, OpenCV, ROS, Git, Latex, Unity, AutoCAD, Inventor