Kuan-Wei Tseng

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Education

National Taiwan University, Taipei, Taiwan (September 2016- June 2020)
Bachelor of Science in Engineering, Department of Mechanical Engineering

- Last 60-credits average GPA: 3.51/4.0
- 46 credits of Computer Science related courses
- Conducted undergraduate research at the Dept. of Computer Science and Information Engineering.

University of Oxford, Oxford, UK (July 2017- August 2017)
Advanced Humanity and English Language Program

- Comprehensive academic English program covering topics such as academic and creative writing, debating, British culture, job seeking skills, etc.

Research Experience

Research Associate (Feb. 2021 - Present)
Research Assistant (Aug. 2020 - Feb. 2021)
Undergraduate Research Assistant (Sep. 2019 - Jun. 2020)
Dept. of Computer Science and Information Engineering (CSIE), National Taiwan University

- **Deep Learning**: Developed video stabilization algorithms with deep learning, including an offline method, which is the first learning-based method that utilize 3D computer vision to model and smooth the camera motion, and an online method, whose speed surpasses state-of-the-art methods (54.6fps) with satisfying shape preservation.
- **Computer Vision for Robotics**: Implemented accurate and light-weight dynamic object-aware visual Simultaneous Localization And Mapping (SLAM) framework based on ORB-SLAM2 and Single Shot Object Detection, achieving comparable performance with DynaSLAM but at least 10 times faster than it.
- **Sensor Fusion**: Analyzed the performance of visual-inertial fusion methods and constructed a high accuracy (95%) and adaptive framerate (up to 120Hz) 3D object tracking system for mobile devices from the camera pose computed by local IMU propagation and remote server solution that performs 3D object pose estimation.
- **Augmented Reality:** Explored the applications of optical see-through head-mounted display and designed a mixed reality navigation (image-based localization based on structure from motion models) and guidance (3D animation manual) system for outdoor facility maintenance with Microsoft HoloLens 2.
- **Human Computer Interaction**: Investigated and conducted user experience study on multisensory experience in interactive system. Developed a precise and versatile olfactory display system that exhausts scented gases by subwoofers to enhance immersive VR experience.

Selected Publications

[1] 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", IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2021.
[2] 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", ACM International Conference on Multimedia (ACMMM), 2021. (accepted)
[3] 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", IEEE International Conference on Image Processing (ICIP), 2021. (accepted)
[4] Yao-Fu Juan, *Kuan-Wei Tseng*, Peng-Yuan Kao and Yi-Ping Hung, "Augmented Tai-Chi Chuan Practice Tool with Pose Evaluation", in IEEE International Conference on Multimedia Information Processing and Retrieval (MIPR), 2021. (accepted)
[5] 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", Pattern Recognition. ICPR International Workshops and Challenges, 2021.
[6] *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.

Teaching Experience

Teaching Assistant (Spring 2021)
Dept. of Computer Science and Information Engineering (CSIE), National Taiwan University

- **3D Computer Vision with Deep Learning Applications, Spring 2021.**
  - Graduate Level Course. [CSIE5429], Instructor: Dr. Chu-Song-Chen
  - Gave lectures on topics such as structure from motion, SLAM algorithms, and bundle adjustment.
  - Advised students on their homework and final projects such as camera relocalization and visual odometry.

- **Pattern Analysis and Classification, Spring 2021.**
  - Graduate Level Course. [CSIE5079], Instructor: Dr. Yi-Ping Hung
  - Surveyed state-of-the-art researches in pattern recognition and created a reading list for students' final project.
  - Held discussions and evaluated students' performance on homework, exams, and final projects.

Area of Knowledge & Skills

- **Domain Expertise**: 3D Computer Vision, Deep Learning, Robotics, Interaction Technologies
- **Programming Language**: C/C++, Python, MATLAB, SQL, HTML, LATEX, …
- **Software and Tool**: ROS, Gazebo, OpenCV, PyTorch, LATEX, Git, AutoCAD, Inventor, …
- **Language Proficiency**: Mandarin (Native), English (TOEFL 98), Japanese (JLPT N1)

Selected Coursework

- **Visible Light Communication via Frequency Shift Keying**
  - Term Project of Wireless Network: Fundamentals & Applications [CSIE5521]
  - Programming Language: C++, Python, Objective C, Arduino
  - Designed and implemented a visible light communication system based on LED frequency modulation. Utilized the rolling shutter effect to decode the message from the ultrahigh LED blinking frequency that human cannot perceive with naked eye. Demonstrated robust transmission within 50cm at the speed of 16bps.

- **Video Inpainting Using Temporal Information**
  - Term Project of Video Communication [CSIE7625]
  - Programming Language: Python
  - Designed and implemented a video inpainting that can remove arbitrary dynamic object selected by the users. Utilized motion segmentation to track the moving object, and filled the vacant area with background pixels obtained from adjacent frames. Achieved effective removal and satisfying visual quality with few artifacts.

- **Morphing Robot and Its Biomedical Application**
  - Term Project of Introduction to Biomedical Engineering [EE3009]
  - Programming Language: Arduino
  - Designed and fabricated a magnified model of a biomedically applicable morphing robot. Utilized airbags, solenoid valve, and air pump to make a locomotion layer, and deformable clay controlled by servo motor to make a transformation layer. Demonstrated strong mobility and ability to avoid obstacles on its way.

Honors

Awards
- **Best Paper Award**
  - 33rd IPPR Conference on Computer Vision, Graphics, and Image Processing (CVGIP), Taiwan, 2020.
  - Paper Title: Camera Relocalization Using Deep Learning Method
  - Exploited the geometric condition from multiple views to obtain scaled pose of a monocular images.

- **3rd place in Propeller-Powered Racing Vehicles Competition**
  - College of Engineering, National Taiwan University, Taiwan, 2019.
  - Designed line following robot cars powered merely by propeller and competed the speed with other groups.

Funding and Scholarships
- Kobe University Funds for Summer Program in Japanese Language and Culture at Kobe University, Kobe University, Japan, 2019.
- JASSO Scholarship for Short-Term Japanese Language Program (NUSTEP) at Nagoya University, Japan Student Services Organization (JASSO), Japan, 2018.