Tzu-Yuan (Justin) Lin

tzuyuan@umich.edu
<https://tzuyuan.github.io/>

Education

University of Michigan	Robotics	M.S.	4.00/4.00	2018-Present
National Taiwan University	Mechanical Engineering	B.S.	3.87/4.00	2013-2017

Research Experience

Biped Robotics Lab, *Prof. Jessy Grizzle & Dr. Maani Ghaffari* — Jan. 2019 – Present
Perceptual Robotics Lab, *Prof. Ryan Eustice & Dr. Maani Ghaffari*
Continuous Visual Odometry (CVO):
- Developed CVO in C++ and improved code efficiency to run at real time.
- Developed an adaptive online hyper parameter learning version of CVO and improved the accuracy.
- Developing CVO with deep learning semantic labels for outdoor environment.

Simulation of Bipedal Robot with Camera and Lidar Sensor:
- Built up simulation environment in Gazebo and Mujoco for bipedal robot Cassie Blue with camera and lidar sensors.

HaptiX Lab, *Prof. Brent Gillespie* — Jan. 2019 – May 2019
Digital Hydraulic Body-Powered Exoskeletons for Stroke Rehabilitation
- Manufactured and assembled a digital hydraulic body-powered exoskeleton for stroke rehabilitation.

Advanced Medical Device Lab, *Prof. Hao-Ming Hsiao* — Aug. 2014 – Jul. 2017
Automated Colonoscopy Assistance
- Used the video feed from the colonoscopy device and implemented a computer vision algorithm to track the center of the colon in real-time.
- Implemented an PID controller to prevent the tip of the colonoscope from contacting with the intestinal wall to prevent perforation.

Publications

Preprint
- Xi Lin, Dingyi Sun, **Tzu-Yuan Lin**, Ryan M. Eustice, and Maani Ghaffari. "A Keyframe-based Continuous Visual SLAM for RGB-D Cameras via Nonparametric Joint Geometric and Appearance Representation." Submitted to *2020 Conference on Computer Vision and Pattern Recognition (CVPR)*. Seattle, USA, 2020. (<https://arxiv.org/abs/1912.01064>)

- **Tzu-Yuan Lin**, William Clark, Ryan M. Eustice, Jessy W. Grizzle, Anthony Bloch, and Maani Ghaffari. "Adaptive Continuous Visual Odometry from RGB-D Images." Submitted to *2020 International Conference on Robotics and Automation (ICRA)*. IEEE, Paris, France, 2020.
(<https://arxiv.org/abs/1910.00713>)

Journal Papers
- Hao-Ming Hsiao, **Tzu-Yuan Lin**, Chien-Erh Lin, Han-Yu Lee, and Yi-Ping Wang. "Innovation of New Occlusion Devices for Cancers." *Applied Sciences* 7, no. 5 (2017): 530.

- Hao-Ming Hsiao, Yi-Ping Wang, Yu-Han Cheng, **Tzu-Yuan Lin**, and Chien-Erh Lin. "A Novel Spherical Stent Concept for Intracranial Aneurysm." *Sensors and Materials* 28, no. 9 (2016): 947-955.

Conference Papers
- Han-Yu Lee, Chien-Erh Lin, **Tzu-Yuan Lin**, Shu-Wei Hsu, Chih-Han Yang, and Hao-Ming Hsiao. "Innovation of New Occlusion Devices for Cancers." In *International Conference on Inventions 2016 (ICI)*, Kenting, Taiwan, September 30 - October 3, 2016.

- Yen-Ting Wang, Yi-Ping Wang, **Tzu-Yuan Lin**, Chien-Erh Lin, and Hao-Ming Hsiao. "Drug-eluting stent with rhombic-shape reservoirs for drug delivery." In *2016 International Conference on Applied System Innovation (ICASI)*, pp. 1-4. IEEE, Okinawa, Japan, May 28 - June 1, 2016.

Work Experience

University of Michigan, Ann Arbor, Michigan, USA
Graduate Student Instructor, ROB 530: Mobile Robotics	Jan. 2020 – Present
Grader, ROB 501: Math for Robotics	Sep. 2019 – Dec. 2019
Graduate Student Research Assistant	May 2019 – Aug. 2019
Graduate Student Research Assistant	Jan. 2019 – May 2019

National Taiwan University, Taipei, Taiwan
Teaching Assistant (Full Time)	Aug. 2017 – Jul. 2018

Industrial Technology Research Institute, Hsinchu, Taiwan
Intern	July 2016 – Aug. 2016

Abbott Vascular, Taipei, Taiwan
Software Engineer Intern	July 2015 – Oct. 2015

Projects

- **Direct Visual Odometry with Pose Graph Optimization**   Jan. 2019 – May. 2019
  Implemented an offline direct visual odometry algorithm with pose-graph optimization to track a robot's position using monocular camera image as input.
- **Image Caption Generator (LSTM and CNN)**   Jan. 2019 – May. 2019
  Implemented a Long-Short Term Memory network (LSTM) and Convolutional Neural Network (CNN) to automatically generate captions for inputted images.
- **Semantic Segmentation of Wizarding Facade Dataset**   Feb. 2019 – Mar. 2019
  Constructed a U-Net structure in PyTorch to classify building facade into balcony, window, pillar, facade and other structures.
- **Vehicle Classification and 3D Localization**   Nov. 2018 – Dec. 2018
  Implemented DenseNet in TensorFlow and trained on synthetic data to classify 22 different types of vehicle and generate 3D bounding boxes using RGB image and point cloud data as the input.
- **Simultaneous Localization and Mapping (SLAM) Robot with Particle Filter and Path Planning** Nov. 2018 – Dec. 2018
  Created a particle filter for a simultaneous localization and mapping (SLAM) system using 2D LiDAR to explore and escape an arbitrarily-configured maze.
- **Self-navigated Two-wheel Balancebot**   Oct. 2018 – Nov. 2018
  Implemented cascaded PID controllers and the A* planning algorithm to balance and control a robot which acts as an inverted pendulum. The robot completed a series of tasks which test its ability to move and navigate through an environment while remaining balanced.
- **6 DOF Robot Arm with a 3D Block Detector and Color Segmentation**   Sep. 2018 – Oct. 2018
  Implemented a vision system for a robot arm, including camera calibration, object detection in 3D coordinates, and color segmentation. Computed the forward kinematics and inverse kinematics of the robotic system and scripted in Python.
- **Automated Parking System**   Feb. 2017 – Jun. 2017
  Integrated ultrasonic sensors, infrared sensors and encoders to construct the status of the system. Implemented the algorithm for the elevator using C++ and designed circuit to control the automated system. Developed GUI for the parking system using Qt.

Awards

- Presidential Award, National Taiwan University   2015-2017
- Altruism Award, National Taiwan University   Spring 2016
- International Design Awards (IDA), USA, Gold Winner   June 2016
- STAM Student Thesis Competition, Taiwan, Second Prize   Nov. 2016
- CGMH Medical Robot Competition, Taiwan, Honorable mention   Dec. 2016

Professional Service

- **UM Robotics Mentorship Program – Mentor**   May 2019 – Present
  Mentoring a first year graduate student in the Robotics Institute at University of Michigan.

- **UM Discover Engineering – Workshop Organizer and Volunteer**   July 2019 – Aug. 2019
  Designed and led an introductory workshop to robotics for local high school students. Taught students basics of path planning, as well as utilizing a depth sensor on the vehicle.

- **Ann Arbor Summer Festival – KidZone Volunteer**   July 2019
  Explained the concept and the usage of Lidar to local children, while leading a demo.

- **ASME NTU Student Section, Taiwan – Public Relations**   Aug. 2016 – June 2017
  Held a series of lectures, co-organized Taiwan Student Professional Development Conference.

- **NTUME Student Association – Director of Academic Division**   July 2015 – June 2016
  Held academic activities including a three-day corporate visit, and an honored alumnus speech.

- **NTU ME Summer Camp – Deputy Convener**   Feb. 2015 – July 2015
  Organized 3 speeches, 4 institution visits, and DIY activity for 100 participants.

- **NTU International Affairs – Student Volunteer**   Sep. 2014 – June 2016
  Helped international students from Sweden, Singapore and Panama with their problems at NTU and provide cultural guides.

Professional Memebership

- Student Member, Institute of Electrical and Electronics Engineers   2019-present
- IEEE Robotics and Automation Society (RAS)   2019-present
- IEEE Young Professionals   2019-present

Skills

Programming Tool	C/C++, python, TBB, Qt, Linux, Git, MATLAB
Computer Vision	OpenCV, SLAM, PyTorch, TensorFlow, PCL
Robotics Tool	ROS, Gazebo, Raspberry Pi
Mechanical Tool	SolidWorks, AutoCAD, Basic Machining
Language Skills	Chinese (native), Taiwanese(fluent), English (fluent)