**Chi-Yao (Ed) HUANG**

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**Research Interests \_\_\_\_**

Semantic Map, Dynamic SLAM, Robotics, Machine Learning, Object Recognition, Sensor Fusion, Self-driving Vehicle

**Education \_\_\_\_**

**National Taiwan University (NTU)**, Taipei, Taiwan 09/2015-09/2017

M.S. in Mechanical Engineering

**National Sun Yat-San University (NSYSU)**, Kaohsiung, Taiwan 09/2015-09/2017

B.S. in Mechanical and Electro-Mechanical Engineering

**Work Experience \_\_\_\_\_\_\_\_\_\_\_\_\_**

**Senior Software Engineer in HTC VIVE**, New Taipei, Taiwan 02/2018-present

*Projects: SER*

* SER is an AR project that expects to remove complicated devices on consumers. Consumers are able to use a glasses device and gestures to interact with AR. And SER is the first AR project in VIVE. (SER was planned to display in the MWC2020, but it was canceled because of the pandemic.)
* The launcher and the core engineer in SER algorithm depart.
* Manage and lead 3 colleagues to integrate software part.
* Develop 3-Camera and IMU fusion tracking algorithm.
* Build up prototype of AR system for real world interaction(i.e. gesture tracking).
* Evaluate sensors, including camera and IMU.
* Evaluate and manage CPU computation with the hardware and firmware team.
* Track thermal problems with the mechanic team.

*Projects: OUN*

* OUN is the next masterpiece in HTC VIVE, which combines all VR, AR, and Gaming.
* The launcher and the core engineer in OUN algorithm depart.
* Develop Tightly-Coupled visual-inertial SLAM for VR tracking
* Research IMU pre-integration.
* Build up prototype of OUN
* Evaluate sensors, including camera and IMU.
* Parallelize SLAM algorithm with Hexagon

*Projects:* CR SLAM

* Low computing cost SLAM algorithm, operating on embedded device(RK1108).
* Parallelize SLAM algorithm with CEVA.
* Evaluation pipeline, SPU and VPU on RK.

*Projects:* CAR COSMOS

* Develop object tracking algorithm, operating on embedded device(RK1108).
* Parallelize object tracking algorithm with CEVA.
* Evaluation pipeline, SPU and VPU on RK.

**Software Engineer in HTC VIVE**, New Taipei, Taiwan 09/2017-02/2018

*Projects:* HTC VIVE COSMOS. <https://www.youtube.com/watch?v=5vkqM1hhs3A>

* The algorithm depart of COSMOS is called “LAMBDA”, which is eleventh in Greek and implies that there are eleven members in this algorithm depart. I am one of them.
* Develop Loosely-Coupled visual-inertial SLAM algorithm.
* Develop multi-cameras state estimation and optimization.
* Develop multi-cameras calibration.

**Vice System manager in NTU Robotics Lab,** Taipei, Taiwan 09/2016-05/2018

* Design the bridge courses for junior graduate students or new members of the robotics lab. These courses include Robotics, Linear Control System, Digital Control System, Programming(C/C++, MATLAB), and the introduction to our lab.
* Hold the gathering regularly for the professor, the member of the lab, and alumni.
* Manage and maintain the equipment in the lab, including several arm robots, two-wheel robots (BUNNY and GREEN), and a humanoid robot (NINO).

**Company of Air defense Artillery** **Battalion, R.O.C Army**, Taiwan 09/2014-09/2015

* Battalion dispatcher, managing and organizing hundreds of cars, trucks and anti-air tanks.
* Participate in all crucial military activities in R.O.C (Taiwan), including Han-Guang and Liang-Yong.

**Research Experience \_\_\_\_\_\_\_\_\_\_\_**

**SLAM, National Taiwan University** 02/2016-09/2017

Advisor: Prof. Han-Pang Huang

*Projects: Visual-Inertia SLAM* [*https://youtu.be/1SMAWB4Ojlo*](https://youtu.be/1SMAWB4Ojlo)

* Improve ORB-SLAM with optical flow method.
* Develop the fused algorithm of optical-flow and feature-based method for SLAM’s front-end.
* Develop Bundle Adjustment optimizer operated in Lie group and Quaternion.
* Develop Loosely-coupled visual-inertial SLAM on biped robot.
* Research several VO, VIO and SLAM-related algorithms such as ORB-SLAM, DSO and VINS.

*Projects: RGBD SLAM* [*https://youtu.be/eWdKrk1S-Fg*](https://youtu.be/eWdKrk1S-Fg)

* Implement ICP(Iterative Closest Point) for state estimation and point cloud mapping.
* Manage point cloud with hash-table.
* Render the point cloud world into the 3D voxel world with TSDF.
* Use the 3D voxel world for robot path planning.

**Humanoid Robotics, National Taiwan University**  09/2015-02/2016

Advisor: Prof. Han-Pang Huang

*Projects: ZMP (Zero Moment Point) Research*

* Model biped robot into inverted pendulum system.
* Plan ZMP trajectory for biped robot walking.
* Research robust control for biped robot walking on uneven terrain.

**Electro-mechanical Integration, National Sun Yat-Sen University**  02/2014-07/2014

Advisor: Prof. Yaw-Terng Su

*Projects: Commercial Speed Controller of Vehicles.*

* Design PID control for vehicles’ speed controller with speed input and actuator’s angle output.
* Design suitable actuators and sensor.

**Automatic Control, National Sun Yat-Sen University** 09/2013-02/2014

Advisor: Prof. Yaw-Terng Su

*Projects: Stair Climber for Elders*

* Use PLC control to design the stair climber for elders.
* Design mechanical system which focuses on
* Design sensors and actuators
* Draw out the ladder diagram of PLC control.

**Master’s thesis**

3D Reconstruction and Path Planning with Signed Distance Function

Advisor: Prof. Han-Pang Huang

* The research developed a Dense SLAM algorithm for robot planning. We used Kinect as our sensor

to acquire the RGB-D information from the environment and to apply the information to construct a 3D map. The process includes RANSAC point cloud filtering, down-sampling, and ICP pose estimation. The highlight in this research is to use TSDF (Truncated Signed Distance Function) update voxel map information and obtain a smoothy mapping result, and the mapping result will be optimized by bundle adjustment in order to conquer ICP drifting problem. Finally, the mapping research is used for robot path planning. A special path planning method, DDAO\*, is also discussed in my research.

**Term Projects \_**

**Simulate Vehicles Run in the NTU campus**, course: Design and Practice of Intelligent Vehicles

* Autonomous driving with LiDAR with particle filter.

**Skills \_\_\_**

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| Programming Languages | C/C++, Python, MATLAB, Javascripts |
| Programming Library | OpenCV, Eigen, g2o, Ceres, PyTorch, Tensorflow, Keras, OpenGL |
| Parallel Computing | SIMD, CEVA, Hexagon |
| Languages | English (fluent), Mandarin Chinese (native) |
| GRE | 312(updating) |
| TOEFL iBT | 91(updating) |