

Jiunnkai (Bruce) Huang

Robotics Institute
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Education

University of Michigan, Ann Arbor, MI

Master of Science, Robotics September 2016 to June 2018

- GPA: 3.8/4.0
- Subjects (2016 Fall to 2017 Fall): Advanced in Computer Vision, Self-Driving Cars in Perception and Control, Probability and Random Process, Mobile Robotics, CS 231n (taught by prof. Fei-Fei Li at Stanford from Youtube), Computer Vision, Math for Robotics, Robotic Systems Laboratory
- Subjects (2018 Winter): Machine Learning, Filtering and Estimation in Random Proc., Motion Planning

National Taiwan University(NTU), Taiwan

Bachelor of Science, Electrical Engineering September 2010 to July 2014

- Major GPA: 3.81/4.0
- Published three IEEE conference papers and submitted one IEEE journal paper

Research Experience

The DROP lab

Prof. Matthew Johnson-Roberson

Research Assistant

January 2017 to present

- Implemented pedestrians prediction deep network along with action recognition, 3D skeleton pose estimation and gaze angle of pedestrians to assist autonomous vehicles on to go or to stop at intersections
- Collected KITTI dataset 2.0 including verifying sensor setups, preprocessing and post-processing data such as reconstruction of 3D bounding boxes of vehicles, action classes and 3D skeletons of pedestrians
- Implemented neuron network of autoencoder, FCN and PixToPix and EKF for future usages
- Implemented Spatial Transform Network to improve accuracy of 3D skeleton estimation
- Used domain adaptation and generative adversarial networks to generate artificial images for autonomous vehicles to train neural network

The April robotics lab

Prof. Edwin Olson

Research Assistant

July 2016 to 2017 March

- Implemented Apriltag follower to control wheeled robots to follow multi-agents by using mono-camera and robots are also able to be guided to turn or to go by voice commands along with silence detection
- Implemented visual odometry with RGBD camera to correct errors from encoders on wheeled robots

NTU Antennas, Microwave and Millimeter-Wave Circuits Lab

Prof. Shih-Yuan Chen

Research Assistant

August 2013 to August 2015

- Bottomed up of pipeline to collect ambient energy and test the efficiency of wireless power charging
- Designed four kinds of rectennas and published three IEEE papers on wireless power transfer

Projects

Visual odometry using Intel RealSense in C++ from scratch

Team Leader

2016 Fall, Ann Arbor, MI

- Implemented feature detection by using Features from Accelerated Segment Test (FAST) algorithm
- Implemented feature matching using brute force and optical flow for a sparse feature set using the iterative Lucas-Kanade method with pyramids
- Implemented RANSAC to find the transformation between current frame and next frame

- Tracked the updates in real-time (9 fps) to generate the trajectory in the robot's local frame

Autonomous navigation and exploration using APRIL maebot along with encoders and LiDAR

Team Leader

2016 Fall, Ann Arbor, MI

- Implemented PID controller for differential wheeled robot to go straight and turn at consistent speed
- Implemented whole pipeline of simultaneous localization and mapping process including action model, motion model and particle filter to localize the robot and to update the map
- Implemented A-star algorithm to navigate to destination as well as to avoid collisions
- Explored and navigated the whole environment by cleaning up the outliers and check points

3D reconstruction of dense map using ICP and particle filter from scratch

One person team

2016 Winter, Ann Arbor, MI

- Assembled Arduino Yun with one beam LiDAR and two motors by 3D printing to collect point clouds
- Implemented 3D occupancy cell by using 3D Bresenham's line algorithm and log odds
- Implemented Euclidean nearest neighbor, kd-tree for Iterative Closest Point(ICP) from scratch
- Implemented ICP from scratch alone with multitasks, multithreads so as to speed up matching process
- Smoothed map with SAM by estimating covariance between each scan

Autonomous wireless charging, landing system and obstacle avoidance for hexacopter

Independent project

2015 Winter to 2016 Winter, Taiwan

- Assembled hexacopter and designed procedure to extend delivery distance
- Applied wireless charging and radar location system with antenna array and Arduino system
- Implemented real-time vision system to identify, track and localize target
- Implemented landing system with infrared beacon and wireless charging system
- Implemented autonomous obstacle avoidance by conducting feature extraction and matching

Autonomously searching target and manipulating with robot arm and camera

Team Leader

2016 Fall, Ann Arbor, MI

- Used Solidworks to design gripper for 3D printing so as to catch targets
- Implemented algorithm to map pixel coordinates from overhead camera to world coordinates
- Detected and localized the targets based on color blob detection from scratch
- Programmed forward and inverse kinematics to move robot arm to a certain location
- Designed planner to capture detected targets and state machine for all the processes

Segway

Team Leader

2016 Fall, Ann Arbor, MI

- Assembled a Segway with BeagleBones
- Implemented two PIDs to have the robot moving, turning and balanced
- Used keyboard with LCM to control the robot which is also able to follow certain color tags

Selected Publications

1. **Jiunn-Kai Huang**, Shih-Yuan Chen, "A Compact Size Slot Loop Rectenna for Dual-Band Operation at 2.4- and 5.8-GHz ISM Bands," *IEEE Antennas and Propagation Society International Symposium*, pp. 411-412, July 2016.
2. **Jiunn-Kai Huang**, Wan-Ting Hung, Tzu-Heng Cheng, Shih-Yuan Chen, "A 2.45-GHz High-Efficiency Loop-Shaped PIFA Rectenna for Portable Devices and Wireless Sensors," *IEEE Antennas and Propagation Society International Symposium*, pp.1284-1285, July 2015.

Skills

- **Programming:** C/C++, Python, Matlab, Verilog
- **Tools/Skills:** Solidworks, Inventor, Professional photographer, Photoshops, Final Cut Pro X, High Frequency Structural Simulator, Advanced Design System, HSpice, Cosmos scope