

Cao Yuchen (Joshua)

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Education Background

- **University of Chinese Academy of Sciences** **Shanghai, China**
M.Sc. in Computer Science (Prof. Laurent Kneip, MPL lab) *Sep, 2016-Now*
- **China University of Petroleum** **Qingdao, China**
B.Eng. in Automation (GPA:3.62/4 Ranking: 5/135) *Sep, 2012-July, 2016*
- **Konkuk University** **Seoul, Korea**
Exchange Student for UAV Research (Project Score: 95/100) *Feb, 2016-July, 2016*

Working Experience

- **UAV-LAB, ShanghaiTech University** **Shanghai, China**
Research Assistant *Oct, 2016-May, 2017*
 - Develop the ground station for path planning with DJI SDK.
 - Configure a system with Raspberry Pi and TX1 to intercept data from LightBridge with processing and output to drone flight controller.
 - Package the DJI SDK and code written by Pro. Xiaopei Liu into one API unit.
- **TA, ShanghaiTech University** **Shanghai, China**
Teaching Assistant *Sep, 2017-June, 2018*
 - Assist Linear Algebra course from Sep, 2017 to Jan, 2018
 - Assist Simultaneous Localization and Mapping course from Mar, 2018 to June, 2018

Research Experience

- **SLAM Projects**
 - * ***A Self-Designed Simplified SLAM Framework***
 - Design a basic SLAM system with tracking, mapping and pose optimization function from scratch in Matlab.
 - It includes SIFT and Harris feature extraction, brute-force and SSD matching, 7 points/8 points and homography for camera matrix calculation, and LevenBerg-Marquardt average error for pose optimization.
 - <https://github.com/CaoYuchen/SLAM-basicframe>*
 - * ***Segmentation Based Object Tracking System***
 - Develop Polyview (Lab inner C++ SLAM repo), add segmentation function to it.
 - Segment ground-plane and chair object, Calculate normal vector of ground-plane and center point of chair projected to the ground, set an intermediate frame to reduce DoF to 3(yaw, x, y), and track camera pose by calculating pose of chair.
 - * ***Development of Kinect SDK***
 - Develop Kinect SDK to record RGB/Depth images of chairs from Kinect2 as dataset in Windows.
 - Modify KinectFusion to run .xef file save from Kinect, reconstruct 3D model and record camera poses in Windows.
 - <https://github.com/CaoYuchen/KinectCapture>*

★ **Tracking Rendered Images with Monocular ORB-SLAM**

- Use Unreal Engine4 to render virtual environment and capture monocular RGB image as dataset.
- Develop ORB-SLAM to track camera pose and reconstruct sparse point cloud from virtual images.

○ **Deep Learning Projects**

★ **Retinal Vessel Edge Detection with FCN and HED**

- Modify FCN and HED to fit retinal vessel edge detection problem, train network with Aria/DRIVE/CHASED81 dataset.
- Compared with existing traditional machine learning and computer vision work, we get 97% of accuracy.

★ **Stanford CS231 2016 Assignments**

- Finish all the assignments of CS231 Stanford Deep Learning course 2016.
- Code forward and backward propagation function and implement classic neural network in MXNet and PyTorch.

★ **Instance Segmentation Based on Mask RCNN**

- 3D print a fixing-board for 3 GS3 cameras configured on Jackal robot, capture outdoor dataset and calibrate camera.
- Develop Mask RCNN to get instance segmentation of large scale outdoor environment images as captured.

○ **Robot Projects**

★ **2D Incision with Schunk Arm Robot**

- Build model and define the occlusion region of arm in urdf and xacro, use PyCAM to generate coordinate of path, check the function by ROS RVIZ.
- Use ROS Moveit! to define 6 axis motion rules of joints and links for the arm, and implement 2D Incision.
<https://robotics.shanghaitech.edu.cn/node/114>

★ **Path Planning with DJI SDK**

- Set up DJI M600 with TX1 and Raspberry Pi3 as intermediate system to process signal from Remoter.
- Develop DJI API to make drone fly automatically in planned path.

Honor & Awards

○ **National Award for Inspirational Students**

Oct, 2014 China University of Petroleum

National Scholarship

Top 1%

○ **Shandong Province Electrical and Electronic Competition for the First Prize**

Aug, 2014 Shandong Province

Competition Prize

Top 1%

○ **Lotus Lantern Festival Best Volunteer in Korea**

Mar, 2016 Seoul, Korea

International Volunteer

Great Contribution

Software & Language

○ **Software Ability**

Programming: C++ == Matlab > Python == (HTML+CSS+JS)

Tools: Linux, ROS, OpenCV, OpenGL, Unreal, Eigen, SolidWorks, Adobe Illustrator/Premiere, Ps, Mesh-lab, Office.

○ **Language Skills**

Chinese (Native), English (Proficient, EILTS: 7.0/9.0), Japanese (N4)