Yunchu Zhang

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EDUCATION

Sept.2017 — June 2019 **University of California, Los Angeles (UCLA)**
Department of Mechanical & Aerospace Engineering
Major:Control&Robotic(AI) Cumulative GPA: 3.84/4.0
Degree:Master of Science

Sept.2013 — June 2017 **Dalian University of Technology (DUT)**
Degree:Master of Science

✦ *Sept.2014 — June 2017* **School of Electrical Engineering, Dalian University of Technology (DUT)**
Major:Automation Cumulative GPA: 3.81/4.0

✦ *Sept.2013 — June 2014* **School of Software Technology, Dalian University of Technology (DUT)**
Major:Software Cumulative GPA: 3.71/4.0

RESEARCH EXPERIENCE

July 2019 — Present **Long path algorithm for manipulation based on perception and planning**

Prepared to be published in RSS in January

Advisor: Katerina Fragkiadaki, Assistant Professor, Department of Machine Learning, and Chris Atkeson, Professor , Robotics Institute,Carnegie Mellon University

Details:
- Based on RGBD image information to construct a 3D symbolic tensor that represent the whole scene include robot and objects.
- Utilize deep reinforcement learning algorithm (DDPG+HER) to train basic arm-object contact and short range manipulation policy for multiple different objects separately in relative frame.
- Utilize behavior cloning(Dagger) learning with 3d tensor information and object pose position to train single policy that could manipulate different objects for random goals in short distance.
- Utilize motion planner (model-based thought)based on 3D representation to get long path manipulation subgoals and achieve them one by one.

October 2018 — Mar 2019

Intelligent Aerial manipulator HCI system: Using arm-drone to collaborate with human

Research team leader

Advisor: Xiang Anthony Chen, Assistant Professor, Department of Electrical and Computer Engineering, University of California, Los Angeles.

Details:
- Based on robot-arm and drone to build aerial manipulator system and make it stable with impedance control and motion planning algorithms in ROS.
- Utilize deep neural network to train an offline grasps network for grasp position predict.
- Fused human demonstration to dataset for stable grasping.

June 2018 — Sept.2018 **Robotics research Intern at DMAI** **Graduate Researcher**

Advisor: Yixin Zhu , Research Director and VP, DMAI

Details: · Build red-ball tracking system with several motors, 3D-printed links, Raspberry Pi and Pi camera.

· Utilized Zeromq to build communicate pipeline with CV group to attain object's dynamic information.

· Solved inverse kinematic problem for self-designed humanoid robot's neck in ROS and achieve real-time neck tracking with human's gaze info.

· Based on Monocular-ORB-Slam algorithm to scan current environment scene and build surrounding environment map for robots.

Apr.2018 — June 2018 **Control for Robotics system: Solving Rubik's Cube with robot arm and motor**

Team leader

Advisor: Veronica Santos, Associate Professor, Department of Mechanical Engineering , Director of Biomechatronics Lab in UCLA

Details: · Based on web-camera to detect randomly shuffled Rubik's cube and sent motion command's solution to robot arm.

· Utilize inverse kinematic to make trajectory and position planning for robot arm.

· Utilized PID position control to rotate Rubik's Cube and realized real-time Gripper's force control to grasp Rubik's Cube.

Jan.2018 — Mar.2018

Artificial Intelligence Course Project: Reinforcement Learning method for locomotion

Team leader

Advisor: Demetri Terzopoulos, Distinguished Professor and Chancellor's Professor of Computer Science , Director of Computer Graphics and Vision Lab in UCLA

Details: · **http://tinyurl.com/275project**

· Developed a reinforcement learning approach and an evolution strategy for physics-based character locomotion skills training on the BipedalWalker-v2 physical environment provided by OpenAI Gym.

· Implemented Asynchronous Advantage Actor-Critic (A3C) algorithm and evolution strategy in complex environment (a sequence of challenging terrain with rough ground, stumps, pitfalls, and stairs)with good results and satisfying accumulated rewards.

· Comparing these two algorithms and add LSTM to A3C algorithm to gain stable natural behavior in more complex environment where a sequence of terrain are random generated.

Feb.2018 — Mar.2018 **Image based Object Detection System for Self-driving Cars Application**

Advisor: Shi Ruan , Deep learning and computer vision Researcher, Google

Details: · Base on Deep learning (Mxnet) to implement object detection and tracking system on self-driving car system.

· Utilize Yolo algorithm to construct special neural network model(utilize Resnet to extract basic image information and then with new designed network frame) update a new loss function, train the network on GPU and tune parameters to converge and optimize the result.

· Optimize feedforward inference network and realize object detection and tracking in real time on Raspberry with its Pi camera.

Dec.2016 — June.2017 **Graduation Design: Target Tacking for UAV Based on Vision**

Advisor: Yan Zhuang, Professor, Department of EE, DUT

Details: ·Processed the UAV's images with opencv and ROS in Linux system and tracked object with L-K pyramid optical flow and nearest neighbor classifiers.
· Adding cluster analysis to increase robustness in L-K tracking part.
· Utilized online learning P-N teacher method to correct and update model.
· Utilize Kalman filter to estimate relatively accurate object location from tracking and detection parts' input when object was obscured
· Achieving real time tracking in UAV's processor platform

Sept.2015 — May.2016 **Unmanned Aerial Vehicle (UAV) Project** **Team member**

Advisor: Yan Zhuang, Professor, Department of EE, DUT

Details: · Collected road image from UAV's camera and marked walkable road in the image with SVM method.
· Sent real-time road info to instruct the wheeled robots and plan the walkable path with obstacles avoidance.

Mar.2015 — June 2016 **National College Student Innovation Project** **Team leader**

Advisor: Qiuhui Pan, Professor, Department of Math, DUT

Details: · Research Project: Ecological System Evolution Model Based on the Influence of Water Resource.
· Based on the cellular automaton method, build ecological system evolution model with Monte Carlo.

Jan.2016 — Feb.2016 **Intern At Chinese Academy of Sciences, Research on the Robot and UAV**

Advisor: Zhiqiang Pu, Associate Professor

Details: · Utilized Matlab/Simulink and S-Function to construct dynamic control system (based on PID) for a quadcopter.
· Designed swarm optimization algorithm to solve the optimization problem for nonlinear functions.

HONORS AND SCHOLARSHIPS

- Academic Scholarship in EE Department *Sep.2014 & Sep.2015*
- Merit Student in Dalian University of Technology *Sep.2015*
- E+H Scholarship, by Endress + Hauser *Sep.2015*
- First prize Technology Innovation Scholarship with ranking of No. 1(in 695) *Sep.2015*
- Fifth place in school Top 10 singer contest *Mar.2015*

COMPETITIONS AND AWARDS

✦ **Freescale Smartcar Competition**
Regional Second Prize *Sep.2014 — June 2015*

❍ Wrote the algorithms for different stages to identify the racing track from environment information, based on PID algorithm to control speed.
❍ Was responsible for hardware building, PCB design, welding and debugging.
❍ Equipped the smart car with sensors such as accelerometer to avoid obstacles and pass over the ramp.

✦ **Electronic Design Competition (Research on blind pendulum) DUT**
Nationwide Second Prize *July 2015 — Aug.2015*

❍ Research on blind pendulum, building model, and spatial 3-D analysis.
❍ Built a model of nonlinear dispersion, composition and resolution of motion, and automatic control principle.
❍ Collected the attitude of wind pendulum, processed the data with SCM, and regulated wind force by position from PID closed-loop.
❍ Made the wind pendulum swing up, perform setting-out and stay still under the control of DC blower.

✦ **Mathematical Contest of Modeling**
Meritorious Winner for twice top5% *Feb.2016*

❍ Topic: The Commercial Opportunity Analysis of Addressing the Space Debris Problem.
❍ Created model to update debris info and identified optimal solution by employing CMPSO model multiple times.

✦ **Mathematical Contest of Modeling**
Meritorious Winner for twice top5% *Feb.2015*

❍ Topic: Topic: Find the Lost Spacecraft.
❍ Made efficient searching plan by taking Bayesian method and probability distribution of each searching range.

Extracurricular ACTIVITIES

✦ Deputy Director , Department of Culture and Art, Student Union, DUT Sep.2013—Aug.2015
Supervised the department and assigned tasks to the members

✦ Member, School Choir, DUT Sep.2014—Aug.2015
Participated in the performance and some contests

✦ Member, School Folk Art Club, DUT Sep.2014—Aug.2015
Participated in Chinese folk art performances, including singing, clapper talk, cross talks

COURSES AND SKILLS

✦ Courses:C/C++ Language; Data Structure;Automotive Control; Single Chip Microcomputer; Humanoid Robot; Kinematics of Robotic Systems;Pattern Recognition and Machine Learning; Deep Learning; linear algebra and probability; Convex optimization; Computer Vision course in PyImageSearch with Adrian.
✦ Language&Software: C/C++,Python, ROS, Matlab, Labview, Embedded programming.
✦ Software Skills:Machine Learning and Deep learning algorithm, Computer vision, Dynamic system control, Extended Kalman Filter , Motion Planning,ORB-SLAM, Reinforcement learning, Mxnet, Tensorflow, Pytorch, OpenCV, Zeromq.
✦ Hardware Skills: welding, PCB hardware design, embedded system designing.