Xianyi Cheng

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Education

Aug 2019 - Present	PhD in Mechanical Engineering **Carnegie Mellon University** Advisor: Matthew T. Mason and Howie Choset
Aug 2017 - Aug 2019	Master of Science in Robotics **Carnegie Mellon University** Advisor: Matthew T. Mason
Aug 2013 - Jun 2017	Bachelor of Science in Aerospace Engineering **Harbin Institute of Technology**

Publication

- **Cheng, Xianyi**; Jia, Zhenzhong; Bhatia, Ankit; Aronson, Reuben M.; and Mason, Matthew T. (2018) *Sensor Selection and Stage and Result Classifications for Automated Miniature Screwdriving.* International Conference on Intelligent Robots (IROS). PDF
- **Cheng, Xianyi**; Jia, Zhenzhong; and Mason, Matthew T. (2019) *Data-Efficient Process Monitoring and Failure Detectionfor Robust Robotic Screwdriving.* International Conference on Automation Science and Engineering (CASE) ,(To appear).
- **Cheng, Xianyi**; Hou, Yifan; and Mason, Matthew T. (2019) *Manipulation with Suction Cups using External Contacts.* International Symposium on Robotics Research (ISRR), (To appear). PDF

Research Experience

Current Research Assistant, **the Manipulation Lab**, Carnegie Mellon University

Oct 2017

Dexterous Manipulation with Vacuum Grippers (ongoing project)

- Developing contact models and physical models for vacuum suction cups
- Modeling suction cups as elastic joints to perform dexterous manipulation tasks
- Planning vacuum gripper actions using hybrid force-velocity control

Automation of Screwdriving Assembly

Data-efficient Fault Detection and Process Monitoring System

- Developed realtime stage classification and result prediction system for mininature screwdriving assembly
- Developed sensor reduction algorithms to select for minimal sensor set while achieving high prediction accuracy
- Incorporated process models into hidden markov model for process monitoring to achieve data-efficiency

Parallel Force Position Control of the Assembly Plane

- Built hardware and control system for xy compliance stage
- Implemented parallel force position control to reduce the rate of screwdriving failure caused by alignment errors

Jun 2017 – Jan 2017 | Research Assistant, Spacecraft System Research Center, Harbin Institute of Technology
Indoor SLAM and 3D Object Segmentation

- Implemented RGB-D SLAM and 3D point cloud reconstruction using Kinect V2 camera
- Designed Object Segmentation algorithms on 3D point cloud using region growing method

Sept 2016 – May 2016 | Research Assistant, Pattern Recognition Lab, Harbin Institute of Technology
Interactive Segmentation of Objects in Cluttered Environment

- Selected and tracked features using KLT feature tracking method.
- Segregated features into different clusters by their trajectories.
- Segmented object contours and identify objects given multiple fixations.

Project Experience

Dec 2018 – Sept 2018 | **Reasoning and Learning for Robot Construction**

- Developed a relational graph representation as the state representation for the robot construction problem
- Designed symbolic planning based on the relational graph representation
- Trained a visual learning system for pre- and post- condition prediction

Dec 2018 – Sept 2018 | **Stable Motion Planning under Multiple Contacts**

- Implemented RRT planning for object manipulation under multiple contacts
- Implemented kinematic analysis for finger contact selection and stability analysis

May 2018 – Feb 2018 | **Deep Learning for Video Game Music Generation**

- Combined recurrent neural network with convolutional restricted Boltzmann machine for music generation (on tensorflow)
- Built a video game music dataset where all songs only composed of a main track and a drum track

Aug 2016 – Dec 2015 | **Handheld Detergent-free Ultrasonic Washer**

- First Prize of the 9th National University Student Contest on Energy Saving and Emission Reduction
- Developed a series of prototypes for handheld ultrasonic washers
- Verified the effectiveness of ultrasound with mechanical vibration cleaning oil stains on the clothes without detergent

Honors and Awards

Nov 2016 | The First Place in the 4th Start-up Competition in Harbin Institute of Technology
Oct 2016 | Excellent Student Award in School of Astronautics
Aug 2016 | First Prize of the 9th National University Student Social Practice and Science Contest on Energy Saving and Emission Reduction
Jan 2016 | Selected in Outstanding Engineering Leader Program in Harbin Institute of Technology
Apr 2015 | People's Scholarship (awarded to top 5% students)

Technical Skills

Programming Languages: Python, C/C++, MATLAB
Tools: ROS, PyBullet, Vrep, Mujoco, Tensorflow, OpenCV, Point Cloud Library, SolidWorks, AutoCAD, Multisim, Satellite Tool Kit