

# Shanhe (William) Wang

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## EDUCATION

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M.S., Robotics	Northwestern University, Evanston IL	GPA 3.87	Dec 2018
B.S., Mechanical Engineering	University of California Berkeley, Berkeley CA	GPA 3.57	May 2014

## SKILLS & KNOWLEDGE

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- Programming Languages: Python, C/C++, MATLAB, Bash, PHP
  - Software: ROS, Gazebo, V-REP, Git, Linux, LabView, SolidWorks, Altium Designer, L<sup>A</sup>T<sub>E</sub>X
  - Knowledge: Visual Servoing, Forward/Inverse Kinematics, Dynamics, Optimal Control, Computer Vision, Deep Learning, Data Structures, Mechatronics

## PROJECTS (Portfolio Website 🌐 willshw.me)

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**Visual Servoing for Objects without Prior Models**, Northwestern University, IL Sep 2018 - Current  
*Implementing visual servoing on a robotic arm for grasping an object without a prior geometric model*

- Applying position-based and image-based visual servoing control schemes to Kinova Mico robotic arm
- Tracking and keeping a dynamic object in the frame of the camera sensor
- Locating an object in the point cloud retrieved from RGBD sensor
- Estimating a pre-grasping pose for a dynamic object using point cloud alignment

**Robot Automated Proprietary Camera Rig Calibration**, Northwestern University, IL Apr 2018 - Jun 2018  
*Developed software to automate calibrations of camera rigs for Intelligent Flying Machines in Chicago*

- Programmed UR3 robot to automate extrinsic and intrinsic calibrations of camera rigs deployed in warehouses
- Developed and refined proprietary camera calibration pipeline to enhance usability and calibration accuracy
- Optimized image data processing to locate camera rotational center at subpixel accuracy
- Generated maps for calibrated cameras to improve localization and estimation
- Integrated the calibration software into a ROS package and documented the usage of the ROS package

**Autonomous Ball-in-a-maze Puzzle Solving Robot**, Northwestern University, IL Sep 2017 - Dec 2017  
*Collaborated with 4 teammates to program a Sawyer robot to solve a ball-in-a-maze puzzle quickly and reliably*

- Designed search algorithm for a global path plan and dynamic local path for the robot to roll a ball to a goal point
- Implemented joint velocity controllers to track a target pose of the maze attached to robot end-effector for controlling ball's rolling motion
- Responsible for integration of teammate's software capabilities into a single software pipeline enabled by ROS

## WORK EXPERIENCE

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**Research Engineer** Jul 2014 - Jul 2017  
*University of Southern California Institute for Creative Technologies, Los Angeles CA*

- Developed xCapture, a network-based camera software system that can control a large number of cameras and manage image data to provide centralized camera management and simplify capture sessions; the system was adopted by AR industry partner
- Programmed xCapture in C++ using multithreading, socket programming, OpenCV and FFmpeg to provide live-view of all cameras, acquire raw image data, process raw image data, data playback and focus peaking assistance
- Streamline tasks on the xCapture server, such as data management, camera control message broadcasting, system logging, etc. using Python, Bash, and PHP scripts
- Researched and prototyped the virtual head-mounted camera (VHC), and published the project in ACM SIGGRAPH 2015 Emerging Technologies, "Virtual Headcam: Pan/tilt Mirror-based Facial Performance Tracking"
- Implemented autofocus function and high precision motor controller on VHC to enable high-performance tracking and clear image data acquisition

## PUBLICATION

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X. Yu, **S. Wang**, J. Busch, T. Phan, T. McSheery, M. Bolas, P. Debevec, "Virtual Headcam: Pan/tilt Mirror-based Facial Performance Tracking" in *ACM SIGGRAPH 2015 Emerging Technologies*