

Harry Zhe Su

CONTACT INFORMATION

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RESEARCH INTEREST

My research interests lie in integrating sensory signals to different levels of planning and control for autonomous manipulation tasks by leveraging machine learning techniques. I investigated tactile servoing where robots directly adapt actions at the rate of perception while gaining better perceptual information. I also worked on learning reactive policies using deep learning techniques, which map erroneous sensory inputs and corrective actions to cope with unconstructed environment. More recently, I have been investigating learning predictive models which update feedforward models based on current sensory inputs. I have evaluated these work on a bimanual manipulation platforms equipped with various sensors. In addition to software development, I also lead in maintaining, debugging, fixing, and upgrading the electrical and mechanical aspects of the robot platform.

EDUCATION

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| 01.2011-Present | Ph.D. in Biomedical Engineering, University of Southern California , Los Angeles, USA
Computation Learning and Motor Control Lab, Adviser: Prof. Stefan Schaal |
| 08.2008-05.2011 | M.S. in Biomedical Engineering, University of Southern California , Los Angeles, USA
Medical Device Development Facility Lab, Adviser: Prof. Gerald E. Loeb |
| 09.2003-07.2008 | B. S. in Biomedical/Electrical Engineering, Shenyang University of Technology , Shenyang, China
Medical Image Processing Lab, Adviser: Prof. Li Ke |

RESEARCH EXPERIENCE

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| 01.2015-Present | Robotics Researcher, Autonomous Manipulation Department ,
Max Planck Institute for Intelligent Systems , Tuebingen, Germany
Research Assistant, Computational Learning and Motor Control Lab ,
University of Southern California , Los Angeles, USA <ul style="list-style-type: none">Developed a hierarchical manipulation framework for autonomous manipulation, which integrates sensory feedback at different levels of planning and control inside perception-action loops. |
| 09.2009-12.2014 | Research Assistant, Medical Device Development Facility ,
University of Southern California , Los Angeles, USA <ul style="list-style-type: none">Developed a haptic-enabled robotics system with state-of-the-art manipulators and sensors.Developed perceptual models and control algorithms for this system to characterize system properties and various material properties of external objects, such as contact forces, shapes, and compliance. |
| 01.2007-06.2008 | Undergraduate Researcher, Medical Image Processing Lab ,
Shenyang University of Technology , Shenyang, China <ul style="list-style-type: none">Developed a EEG classification method for a Brain Computer Interface system using Principal Component Analysis and Nearest Neighbor Classifier.Developed a noise reduction method for optical coherence tomography images and coauthored a journal paper. |

TEACHING EXPERIENCE

- 08.2012 – 12.2017 Teaching Assistant, Department of Biomedical Engineering,
University of Southern California, Los Angeles, USA
BME 620 Applied Electrophysiology,
- 01.2012 – 05.2018 Teaching Assistant, Department of Computer Science,
University of Southern California, Los Angeles, USA
CSCI 545 Introduction to Robotics

PUBLICATIONS

- Z. Su**, O. Kroemer, G. E. Loeb, G. S. Sukhatme, and S. Schaal, **Learning Manipulation Graphs from Demonstrations Using Multimodal Sensory Signals**, in *IEEE International Conference on Robotics and Automation (ICRA)*, 2018.
- G. Sutanto, **Z. Su**, S. Schaal, and F. Meier, **Learning Sensor Feedback Models from Demonstrations via Phase-Modulated Neural Networks**, in *IEEE International Conference on Robotics and Automation (ICRA)*, 2018.
- Z. Su**, S. Schaal, and G. E. Loeb, **Surface Tilt Perception with a Biomimetic Tactile Sensor**, in *IEEE International Conference on Biomedical Robotics and Biomechatronics*, 2016.
- Y. Chebotar, K. Hausman, **Z. Su**, G.S. Sukhatme, and S. Schaal, **Self-supervised Regrasping Using Spatio-temporal Tactile Features and Reinforcement Learning**, in *IEEE International Conference on Intelligent Robots and Systems (IROS)*, 2016.
- Molchanov, O. Kroemer, **Z. Su**, and G. S. Sukhatme, **Contact Localization on Grasped Objects Using Tactile Sensing**, in *IEEE International Conference on Intelligent Robots and Systems (IROS)*, 2016.
- Z. Su**, O. Kroemer, G. E. Loeb, G. S. Sukhatme, and S. Schaal, **Learning to Switch Between Sensorimotor Primitives Using Multimodal Haptic Signals**, in *International Conference Simulation of Adaptive Behavior (SAB)*, 2016.
- Z. Su**, K. Hausman, Y. Chebotar, A. Molchanov, G. E. Loeb, G. S. Sukhatme, and S. Schaal, **Force Estimation and Slip Detection/Classification for Grip Control Using a Biomimetic Tactile Sensor**, in *IEEE International Conference on Humanoid Robotics (Humanoids)*, 2015.
- Z. Su**, J. A. Fishel, T. Yamamoto and G. E. Loeb, **Use of Tactile Feedback to Control Exploratory Movements to Characterize Object Compliance**, in *Frontiers in Neurorobotics*, 2012.
- Z. Su**, Y. Li and G.E. Loeb, **Estimation of Curvature Feature Using a Biomimetic Tactile Sensor**, in *35th Annual Meeting of the American Society of Biomechanics*, 2011.
- N. Wettels, J.A. Fishel, **Z. Su**, C.H. Lin, G.E. Loeb, **Multi-modal Synergistic Tactile Sensing**, in *IEEE International Conference on Humanoid Robotics (Humanoids)*, 2009.
- L. Ke, Q. Du, **Z. Su**, **An OCT Image De-noising Method Based on Multi-scale Wiener Filtering**, in *Optics and Precision Engineering*, 2008.
- L. Ke, Q. Du, **Z. Su**, **The Correlation between the Wavelet Base Properties and Image Compression**, in *International Conference on Computational Intelligence and Security*, 2007.

REVIEWED WORKSHOP PAPERS AND ABSTRACTS

- Z. Su**, O. Kroemer, G.E. Loeb, G. S. Sukhatme, and S. Schaal, **Learning to Switch between Sensorimotor Primitives using Multimodal Haptic Signals**, in *Robotics Science and Systems (RSS) Workshop on Bootstrapping Manipulation Skills*, 2016.
- Y. Chebotar, K. Hausman, **Z. Su**, A. Molchanov, O. Kroemer, G.S. Sukhatme, and S. Schaal, **Bigs: Biotac grasp stability dataset**, in *IEEE International Conference on Robotics and Automation (ICRA) Workshop on Grasping and Manipulation Datasets*, Stockholm, Sweden, 2016.

Z. Su, K. Hausman, Y. Chebotar, A. Molchanov, G. Loeb, G. Sukhatme, S. Schaal, Slip Classification Using Tangential and Torsional Skin Distortions on a Biomimetic Tactile Sensor, in *The British Machine Vision Association (BMVA) Workshop on Visual, Tactile and Force Sensing for Robot Manipulation*, 2015

Z. Su, K. Hausman, Y. Chebotar, A. Molchanov, G. Loeb, G. Sukhatme, S. Schaal, Slip Detection and Classification for Grip Control using Multiple Sensory Modalities on a Biomimetic Tactile Sensor, in *IROS Workshop on Multimodal Sensor-Based Robot Control for HRI and Soft Manipulation*, 2015.

Z. Su, and G. E. Loeb. Haptic robot and human psychophysical studies: A complementary framework to decode haptic perception, in *Biomedical Engineering Society Annual Meeting*, 2014

Z. Su, J. A. Fishel, T. Yamamoto and G. E. Loeb, Use of Tactile Feedback to Control Robotic Palpation to Characterize Object Hardness, in *Biomedical Engineering Society Annual Meeting*, 2012

Z. Su, C. H. Lin, Y. Li and G. E. Loeb, Spatial Feature Extraction for a Biomimetic Tactile Sensor, in *Biomedical Engineering Society Annual Meeting*, 2011.

SCHOLARSHIPS AND AWARDS

2015-2018 Max Planck Institute Fellowship (Germany)

2014-2015 NSF Body Engineering Fellowship

2011-2014 Best Poster Award in USC Fred S. Grodins Research Symposium

09.2007 1st place, Liaoning Province, 7th Chinese National Undergraduate Electronic-Design Contest

2004-2007 Shenyang University of Technology Annual Scholarship

2004-2007 Outstanding Academic Achievements Award, Shenyang University of Technology

07.2004 Honor for Social Work, Shenyang University of Technology

PROFESSIONAL ACTIVITIES

Reviewer:

ICRA 2017-2018, IROS 2016-2017, CoRL 2018, RSS 2017, Robotics and Autonomous Systems, IEEE Transactions on Haptics, IEEE Transactions on Robotics

Organizer:

IROS 2018 Workshop: RoboTac: New Progress in Tactile Perception and Learning in Robotics, submitted

Humanoids 2016 Workshop: Tactile sensing for manipulation: new progress and challenges

ENTREPRENEURIAL ACTIVITIES

2014-2015 Our Medical, Inc., Chief Executive Officer and Chief Technology Officer

Responsible for team building, product development of an inflatable hip protector

HARDWARE AND SOFTWARE SKILLS

Programming Languages: C/C++, MATLAB, Python, Assembly, ROS, LaTeX

Operating Systems and Tools: Linux and Xenomai (real-time), Git, programming embedded systems (microprocessors)

Machine Learning: Supervised, unsupervised, reinforcement learning, deep learning (Tensorflow)

Design: Solidworks, Mastercam