Michael Andrés Lin

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Education

Stanford University	**Stanford, CA**
PhD candidate, Mechanical Engineering - Robotics	*2019 – Present*
Principal Investigator: Dr. Mark Cutkosky	
Stanford University	**Stanford, CA**
M.S. Mechanical Engineering, GPA: 3.87	*2015 – 2017*
Concentration: Embedded Systems, Robotics, Dynamics	
University of California, Berkeley	**Berkeley, CA**
B.S. Electrical Engineering and Computer Science, GPA: 3.79 with Honors	*2011 – 2015*
Concentration: Embedded Systems, Signal Processing and Controls	

Research Experience

Biomimetics and Dexterous Manipulation Lab	**Stanford, CA**
Graduate Researcher, Advisors: Mark Cutkosky, Ph.D.	*September 2019 – Present*

Project: Investigating methods to enable robots to use the sense of touch to explore and manipulate in cluttered and unstructured environments such as house-hold environments (in collaboration with Toyota Research Institute).

- Demonstrated that robot hands with light-weight fingers design afford to make contact with objects quickly and, thus, perform tasks faster under uncertainty.
- Implemented a particle filtering algorithm that allows a robot to use contact with objects to determine their location to sub-millimeter accuracy.
- Developed a robust pneumatic tactile skin and integrated it with an industrial robot arm to reach into constrained spaces.
- Developed a Potential Field based controller that uses tactile sensor feedback to react to contacts safely.

Graduate Researcher, Advisors: Mark Cutkosky, Ph.D., Bruce Daniel, M.D.   *September 2016 – January 2018*

Project: Develop augmented-reality guidance system for needle biopsy. Improved insertion accuracy by displaying in real-time a holographic view of biopsy needle as inserted in patient tissue.

- Developed a new method of using Mixed-reality (Microsoft HoloLens) to visualize a biopsy needle during insertion relative to internal patient anatomy in order to assist physicians during surgery. Integrated needle strain sensing to allow for real-time update of needle shape and tip location.
- Used world-anchored camera tracking system (OptiTrack) and implemented registration procedures to find the relative transform between reference frame of user eyes, needle and patient.
- Conducted user studies on needle insertion in phantom tissue to quantify the improvement in needle placement accuracy when using the AR system compared to traditional procedure.

CHARM Lab	**Stanford, CA**
Undergraduate Researcher, Advisor: Allison Okamura, Ph.D.	*May 2014 – August 2014*

- Designed a hand-held actuated haptic gripper for teleoperation of the Raven Surgical Robot system (open source surgical robot). The device is capable of rendering programmed grip stiffness and command gripper position to the surgical robot.
- Integrated gripper into the teleoperation controller using Robot Operating System (ROS).
- Conducted subject experiment to study effects of gripper stiffness on user performance during robotic surgery.

Work Experience

Flexiv Robotics Inc	**Santa Clara, CA**
Senior Robotics Systems Engineer	*January 2018 – August 2019*

Developed a torque-controlled 7 degrees-of-freedom robotic arm for industrial task automation. Responsible for designing the motor controller circuit and embedded software for robot joint control.

- Designed and implemented model-based Field Oriented control to perform current control on brushless motors that outperformed off-the-shelf motor controllers.
- Developed event-driven state machines and fast and robust inter-joint communication via EtherCAT to integrate a multi-joint system.
- Implemented and executed testing procedures to determine root causes for undesired robot joint torque ripple and friction. This led to design changes that improved control fidelity.
- Created automation and testing scripts/procedure for stream-lining robot fabrication and validating electrical and mechanical designs.

Skills

Software: C/C++, Python, Git, PyBullet, Robot Operating System (ROS), MATLAB, Javascript, Java, C#
Hardware: Circuit design, CAD (Solidworks/OnShape), Rapid Prototyping (3D printing, laser cutting)
Spoken Languages Spanish (native), Mandarin Chinese (fluent), Japanese (limited)

Publications

Journal Papers

1. (In Review) **M. A. Lin***, R. Thomasson, G. Uribe, H. Choi, M. R. Cutkosky, "Exploratory Hand: Leveraging Safe Contact to Facilitate Manipulation in Cluttered Spaces," Robotics and Automation Letters 2021
2. (In Review) A. M. Gruebele, **M. A. Lin**, D. Brouwer, S. Yuan, A. Zerbe, M. R. Cutkosky, "A Stretchable Tactile Sleeve for Reaching into Cluterred Spaces," Robotics and Automation Letters 2021
3. **M. A. Lin**, A. F. Siu, J-H Bae, M. R. Cutkosky and B. L. Daniel, "HoloNeedle: Augmented-reality Guidance System for Needle Placement Investigating the Advantages of 3D Needle Shape Reconstruction," Robotics and Automation Letters 2018

Conference Papers and Abstracts

1. **M. A. Lin**, J-H Bae, S.Srinivasan, S. L. Perkins, C. Leuze, B. Hargreaves, M. R. Cutkosky and B. L. Daniel "MRI-guided Needle Biopsy using Augmented Reality," Presented at Intl. Society for Magnetic Resonance in Medicine 25th Annual Meeting and Exhibition (ISMRM 2017)
2. S. L. Perkins, **M. A. Lin**, S.Srinivasan, A. J. Wheeler, B. A. Hargreaves and B. L. Daniel "A Mixed-Reality System for Breast Surgical Planning,"2017 IEEE Intl. Symposium on Mixed and Augmented Reality (ISMAR)"
3. J-H Bae, C. Ploch, **M. A. Lin**, B. L. Daniel and M. R. Cutkosky, "Display of Needle Tip Contact Forces for Steering Guidance," Presented at Haptics Symposium 2016
4. **M. A. Lin**, S. B. Schorr, I. Yan, A. M. Okamura, "The effect of manipulator gripper stiffness on teleoperated task performance," Presented at Haptics Symposium 2015

Teaching Experience

Introduction to Microelectronic Circuits   **Berkeley, CA**
Teaching Assistant   *Fall 2013 & Spring 2015*

- Taught fundamentals of circuits and their application in hands-on lab projects.
- Instructed students on differential amplifiers, AC/DC converters, active and passive filters. Laboratory assignments included hands-on circuit prototyping on breadboards and computer-aided analysis with SPICE.

Honors and Awards

Best Poster Award (of 113 posters) at Stanford Bio-X IIP Symposium   **2017**

National Science Foundation Graduate Research Fellowship (NSF GRFP)   **2015**

Stanford School of Engineering Fellowship   **2015**