Introduction

• Capsulorhexis is a part of the cataract surgery procedure. The technique does not require special skill, but occasionally, run away tears occur which require high skill to fix.
• We aim to use visual feedback to facilitate skill development among novice surgeons for capsulorhexis procedure.
• We visually overlay force data on the tool motion video.

The Problem

• Currently, feedback to support technical skill acquisition among trainees in ophthalmology is through qualitative verbal instruction and demonstration.
• Most of the simulations used are either software or do not provide proper visual cues to evaluate the procedure.
• Directed feedback can facilitate deliberate practice and effective skill acquisition.

The Solution

• We propose using visual overlays for assisting surgeons to perform and evaluate tasks.
• We perform the procedure on a phantom using the Da Vinci Research Kit and record tool motion data and force sensor data.
• We overlay the force sensor data with the tool video to provide visual cues to the person operating on the phantom.
• The phantom used was wax paper attached with Velcro. This was opted after considering several factors namely, repeatability, sensitivity to force sensor readings, realisticness towards the operation.

Outcomes and Results

• Developed phantom to simulate capsulorhexis task.
• Overlayed force sensor data in the tool video to provide visual cues to the surgeon.
• Developed code and setup to collect tool motion data and force sensor data.

Future Work

• Collect tool motion data and force sensor data for many procedures.
• Estimate forces during any point of the procedure and overlay this force to guide the novice surgeon to perform the task.
• Compare tool force data between experts and novices.

Lessons Learned

• Any mechanical system developed has to be repeatable and realistic with good results.
• Synchronization of sensor data is vital during data collection.

References


Support by and Acknowledgements

• Cis II Mentors – Swaroop Vedulla and Austin Reiter.
• I extend my thanks to Preetham for helping me out with the force sensor.
• I extend my thanks to Dr. Shameema Sikder for letting me use the rexis simulator and for providing valuable feedback.