

Constructing a Model of the Cochlea From OCT Images

Checkpoint Presentation

Students: Paul Wilkening and Emily Daggett (Group 2)

Mentors: Russell Taylor and Jin Kang



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Presentation Outline

- ❖ Overview
- ❖ Dependency Updates
- ❖ Progress Report
 - ❖ Bulk Scan Results
 - ❖ Side-view Probe Results
 - ❖ Virtual Fixtures
- ❖ Deliverable Updates
- ❖ Bibliography



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Overview

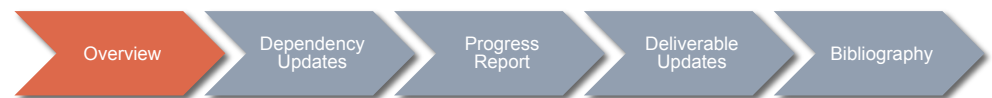
- Cochlear Implant: medical device used to restore hearing
 - External: Microphone, Speech Processor, Transmitter
 - Internal: Receiver/stimulator, Electrode Array
- Problem
 - Difficulty of inserting electrode array manually
- Project goals
 - Image the cochlea using 2 different types of OCT Imaging
 - Bulk Scan
 - Side-view Probe
 - Create Models from OCT images
 - Create Virtual Fixtures for use in inserting electrode array



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Bulk Scan Workflow

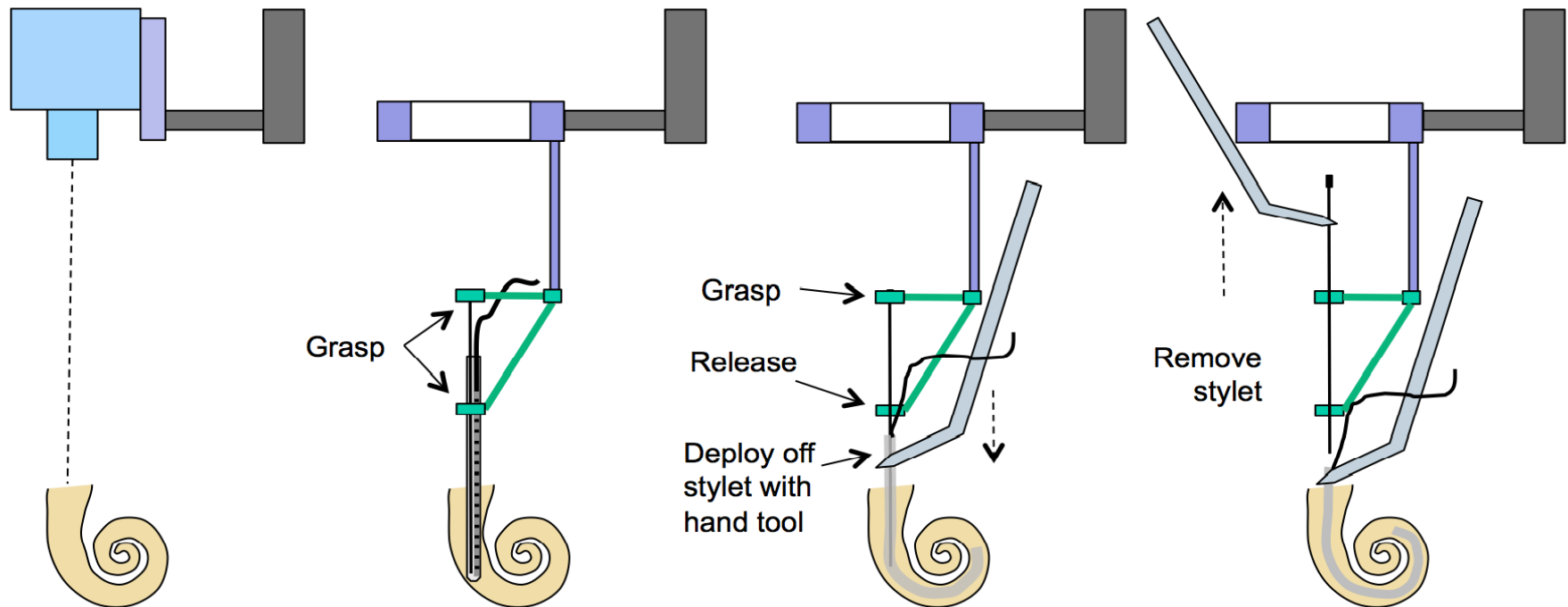


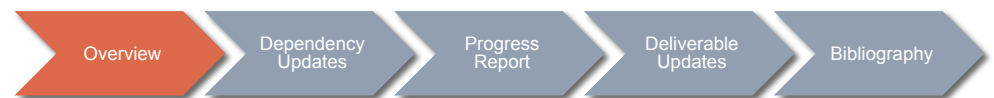
Image credit: R. Taylor



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Side-View Probe Workflow

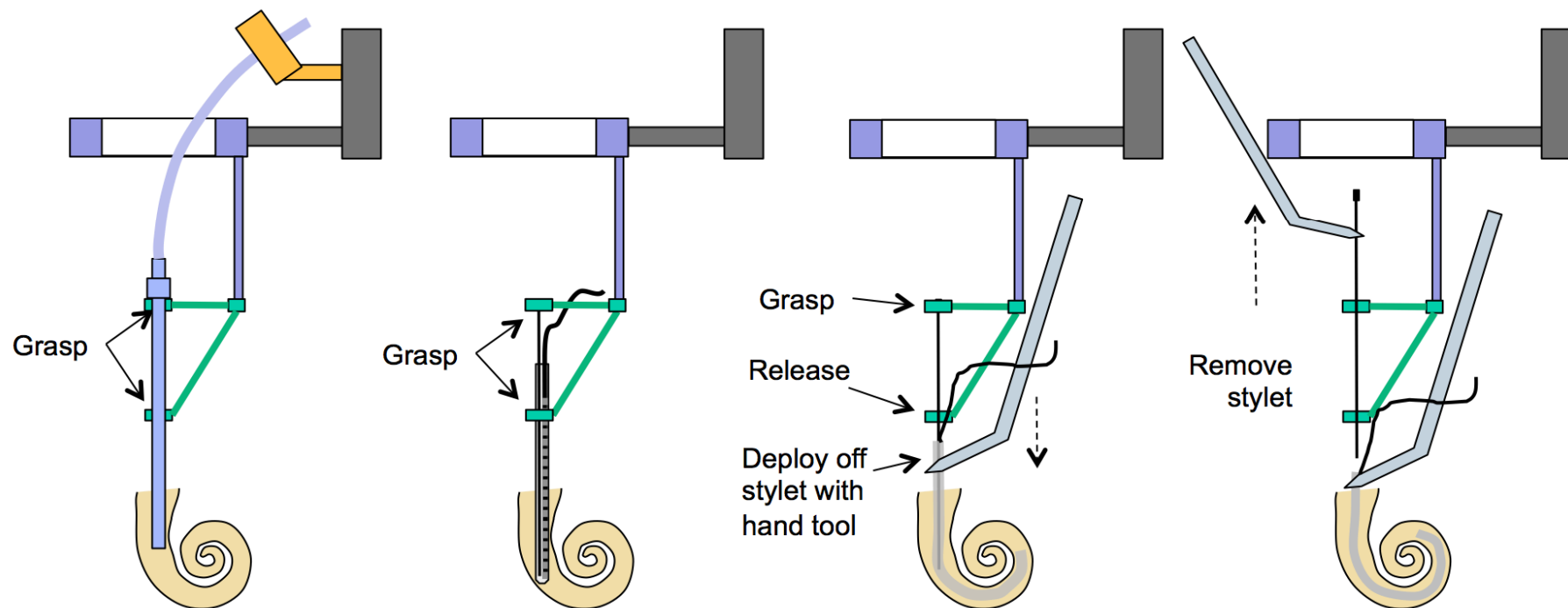


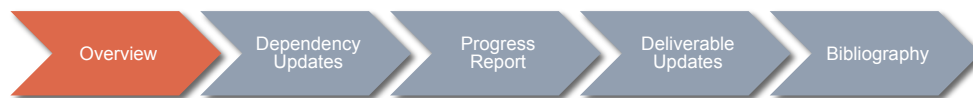
Image credit: R. Taylor



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Updated Dependencies

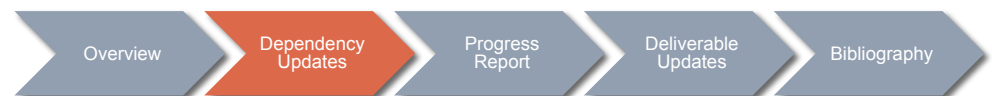
	Dependency	Plan/Source	Status/Comments
1	Bloodeborne Pathogen Training	Take online class	Done
2	Fire Safety and Hazard Communication Training	Take online class	Done
3	Engineering and Clinical Mentors	Schedule weekly team meeting	Scheduled
4	OCT Bulk Scan	Mingtao	Available
5	Side-View OCT Probe	Saumya	Available
6	EyeRobot2	LCSR	Available
7	CISST Libraries	Training	Available
8	Cochlear Phantom	LCSR	Available
9	Dry/Wet Temporal Bones	Iulian	Available
10	Detecting Contours in B-scans	Saumya	Available
11	Control Optimizer Library	Paul	Available
12	Bulk Scan Stitching	Mingtao	Available
13	Side-view Probe Calibration	Iulian	Calibration Object Available



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	Rotation virtual fixture														
	Model-based virtual fixture														
Final Presentation															

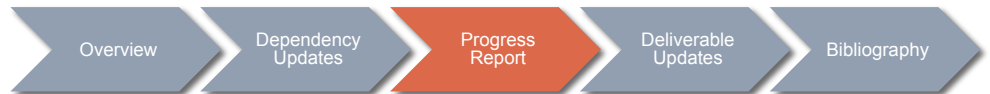
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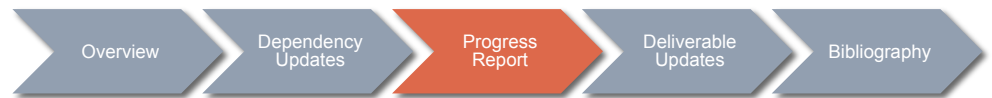
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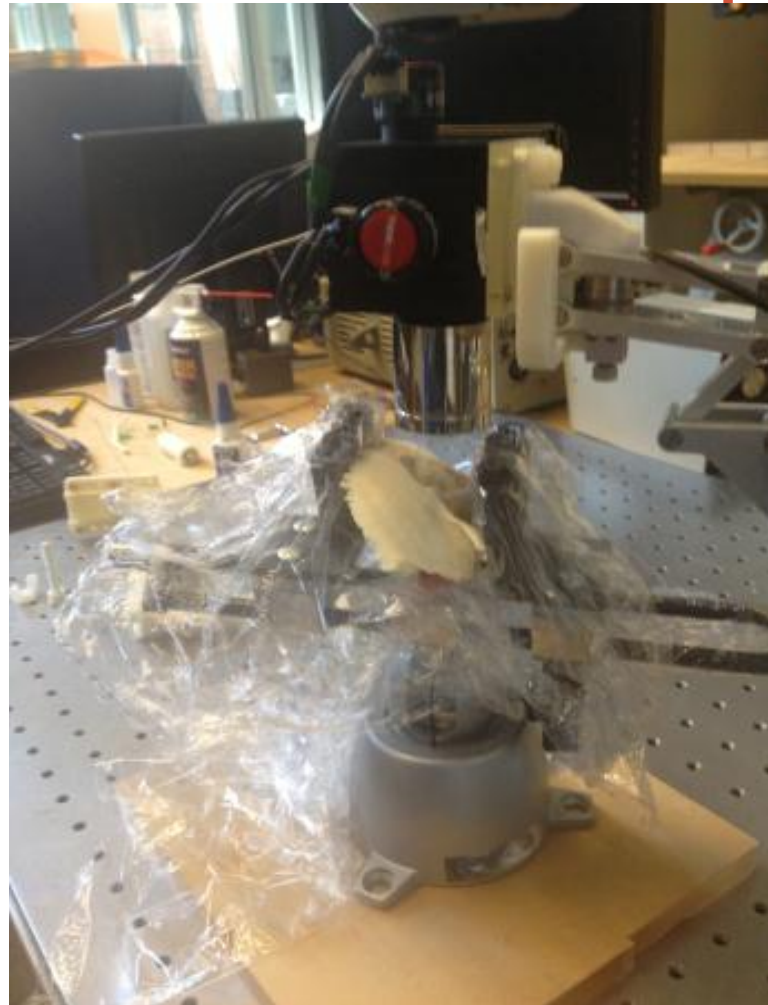
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Bulk Scan Setup



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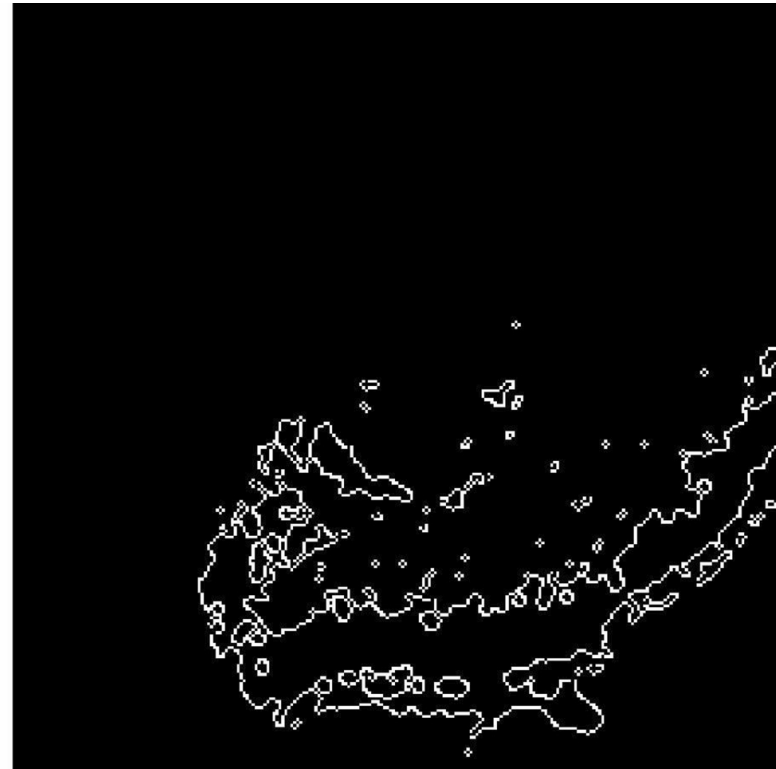
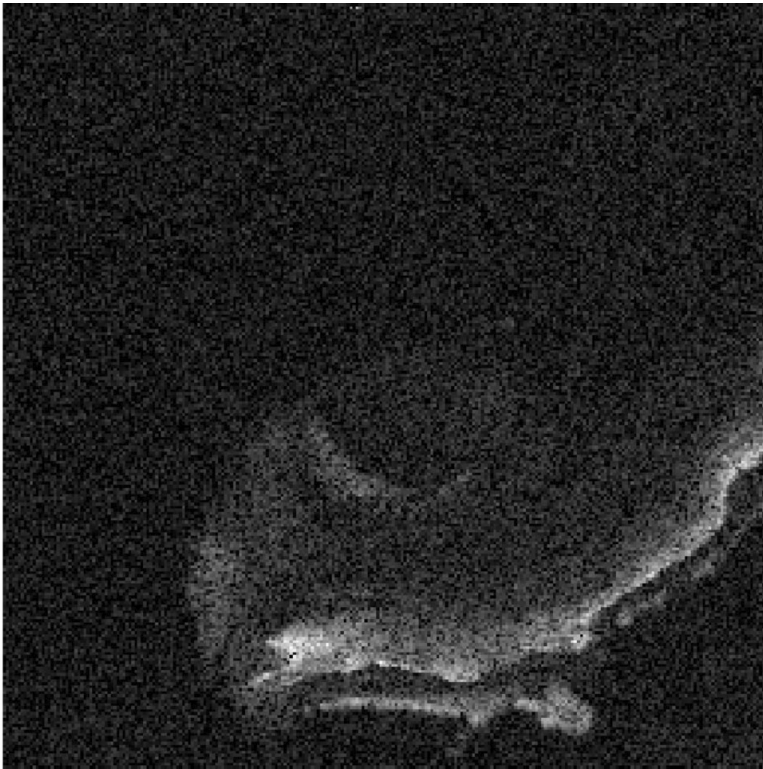
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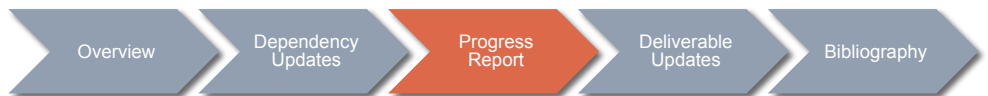
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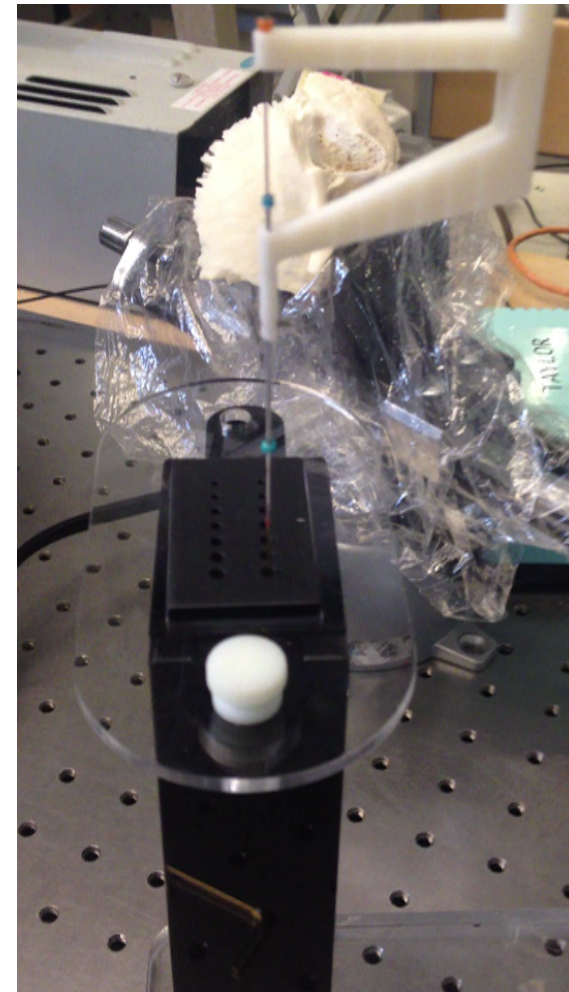
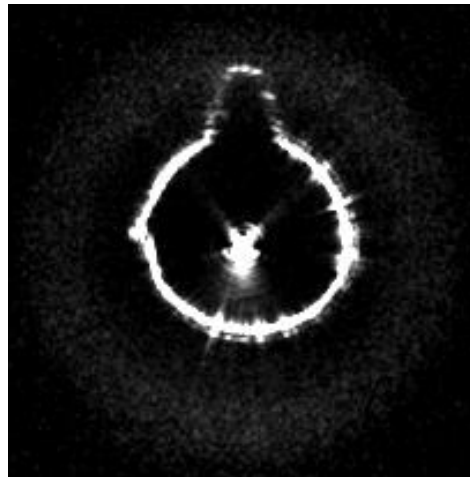
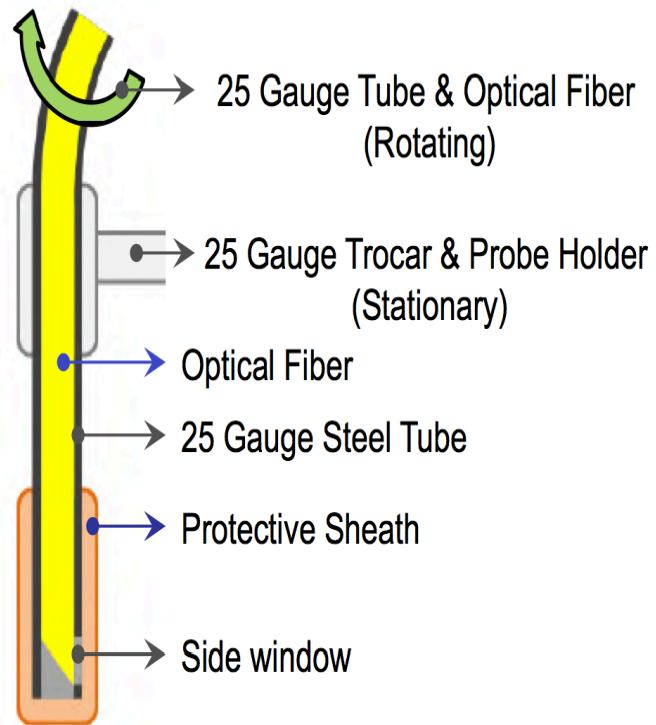
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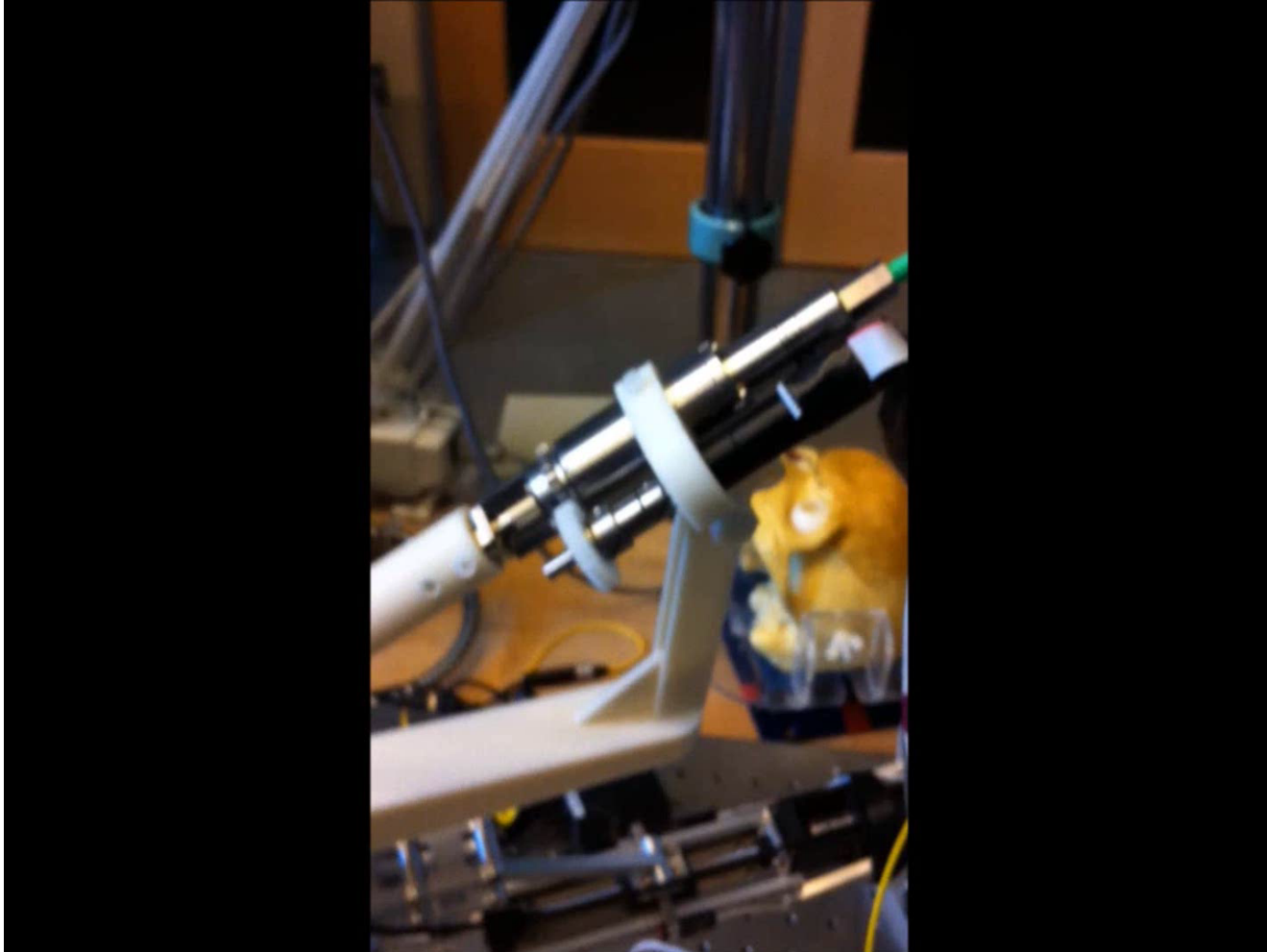
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Side-View Probe Setup



Side-View Probe Setup



Video credit: Berk Gonenc



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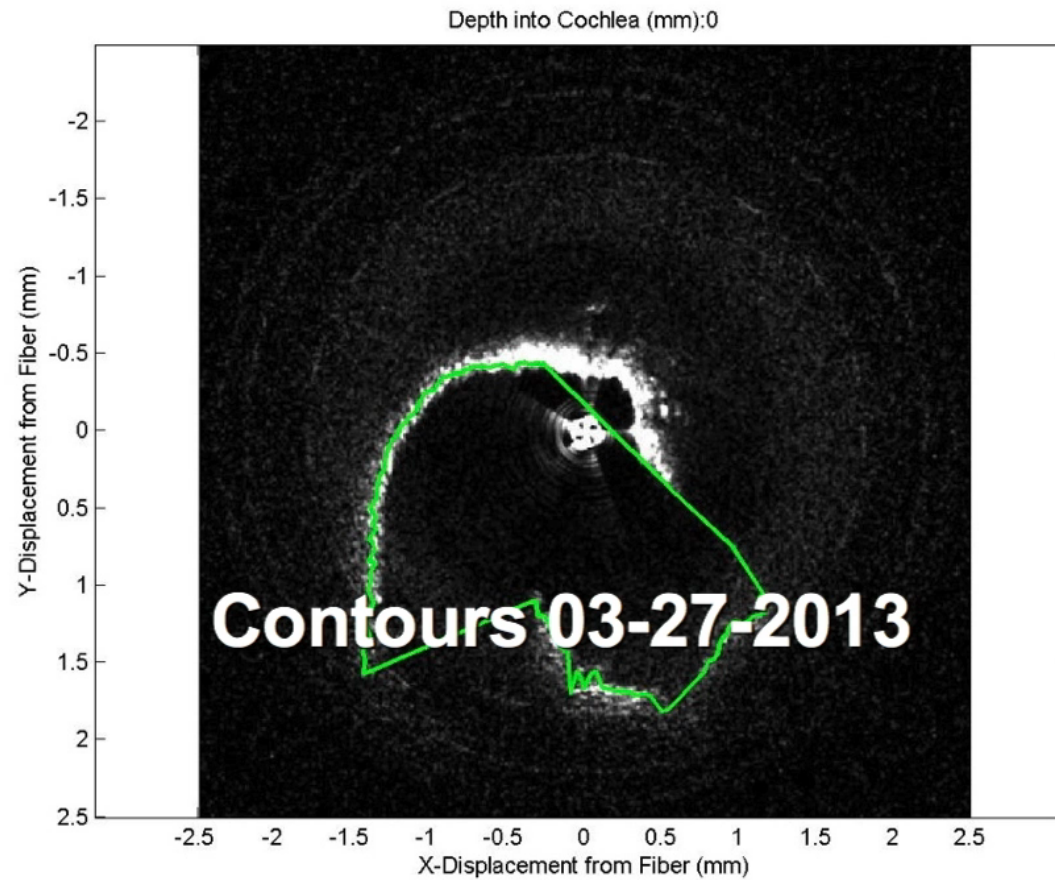
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Side-View Probe B-scans with Contours



Video credit: Saumya Gurbani



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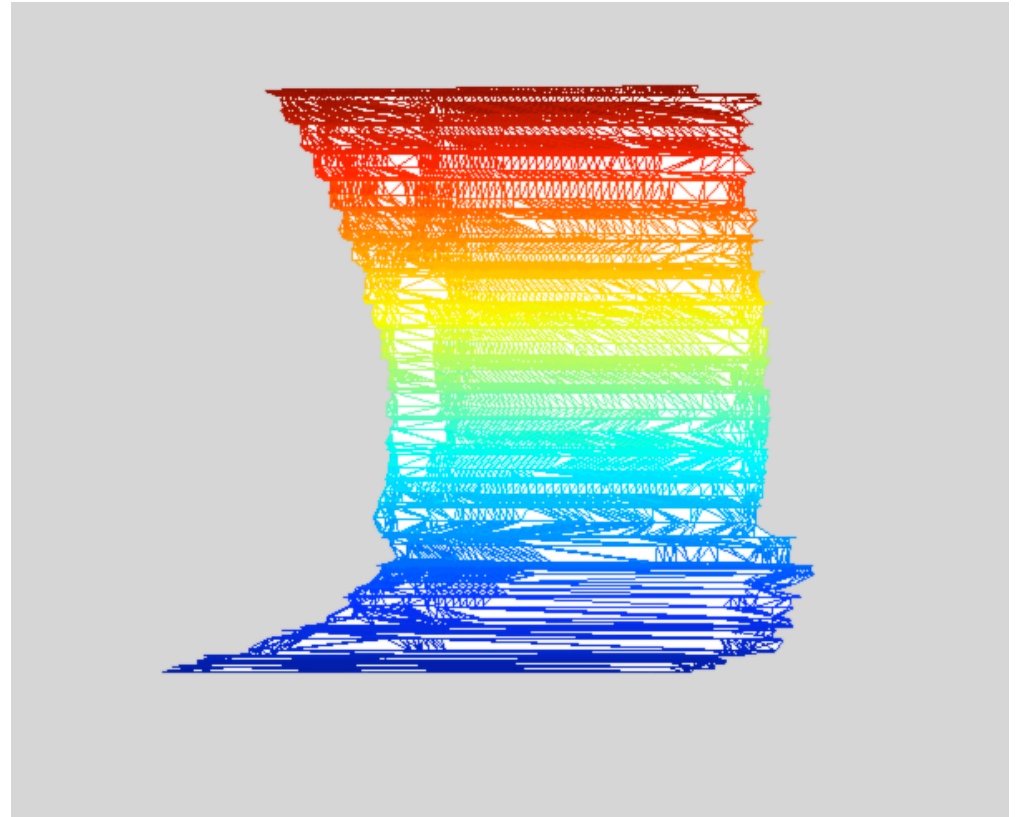
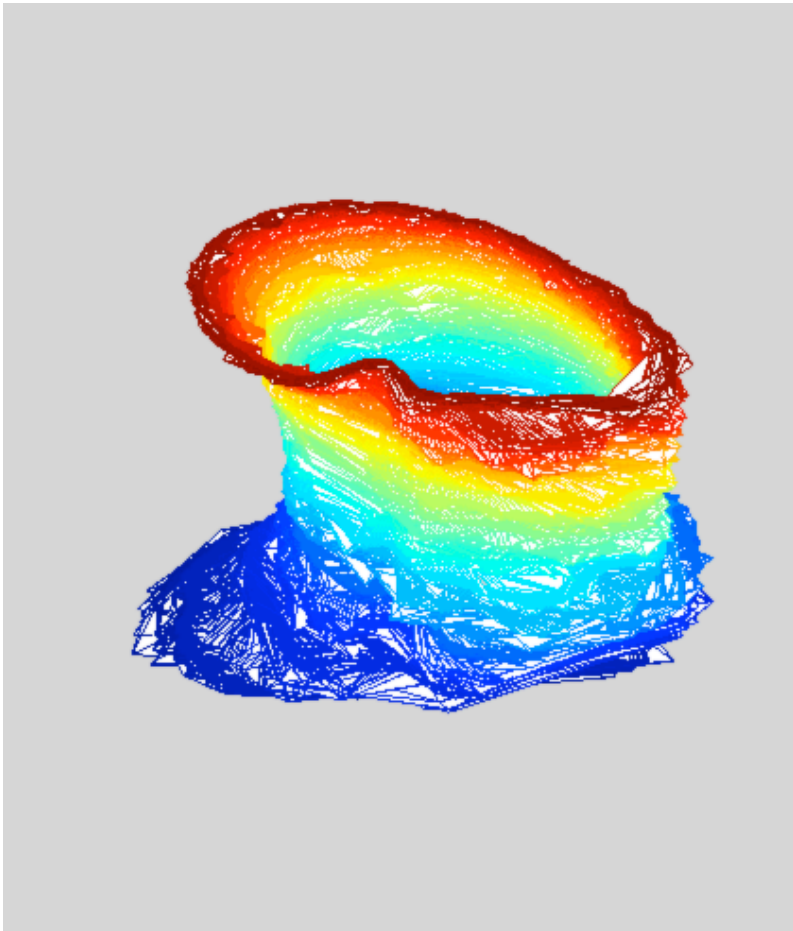


Image credit: Paul Wilkening



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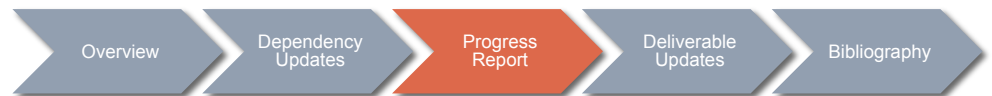
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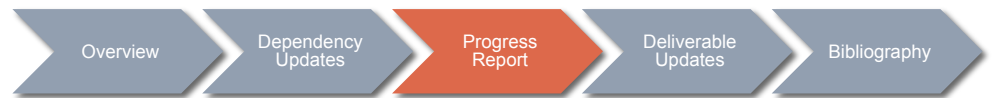
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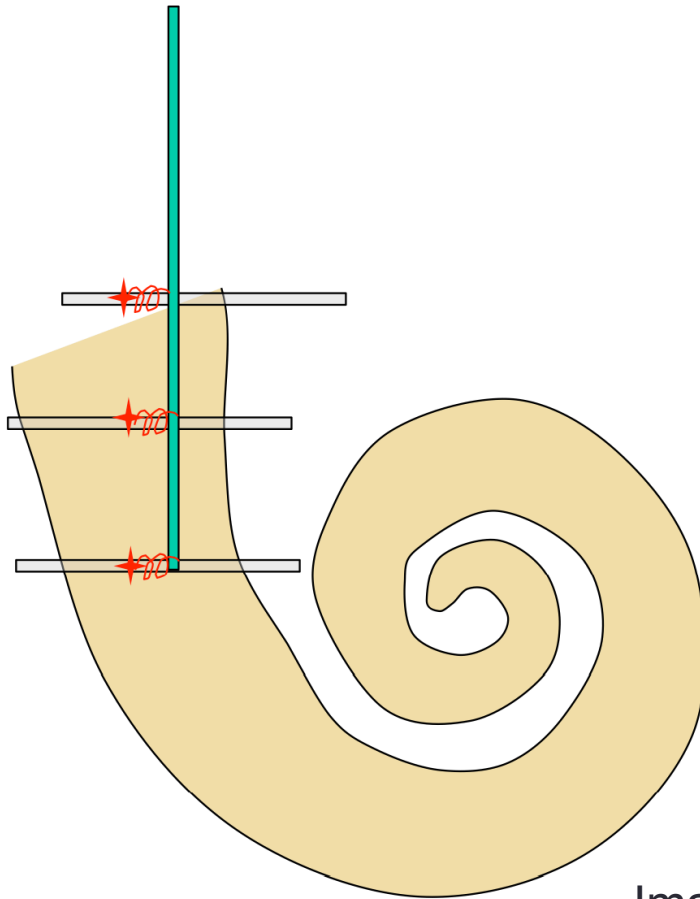
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Virtual Fixture



- Identify 2 points in each Side-view Probe B-scan
 - Center of Cochlea
 - Position of Probe
- Find vector from current position to desired position at depth of each B-scan
- Set-up virtual fixture to minimize vectors

Image credit: R. Taylor



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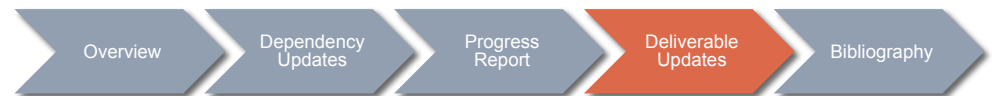
Minimal	1. Separate OCT bulk scan and side-view probe models	Done, needs improvement
	2. Working side-view virtual fixture	Done, needs improvement
Expected	1. Registration overlay of OCT bulk scan and side-view probe models	In progress
	2. Working bulk scan and rotation virtual fixtures	In progress
Maximal	1. Fine-tuned combined model presentation for intraoperative use	Planned
	2. Complete, working, user-friendly system	Planned



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