Constructing a Model of the Cochlea from OCT Images

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Project Work Flow

Introduction

• Cochlear implants are used to restore hearing in deaf and hard-of-hearing patients by augmenting cochlear functionality.
• We propose a system for robot-assisted insertion of cochlear implants.
• We created models of the cochlea based on Bulk Scan Volumes and Side-View Probe B-scans.
• We combined these separate models to create a single, more accurate cochlear model.
• Combined model was used to enact virtual fixtures which constrain motion of the robot to the axis of the cochlea for cochlear implant insertion.
• This will improve upon standard practice in cochlear implant insertion surgery.

Outcomes

• Performed calibration between robot and bulk scanner, side-view probe.
• Individual and combined models created.
• Hand-tremor reduced with assistance of Steady-Hand Robot.
• Virtual fixtures enacted.

Future Work

• Improve process for creating side-view probe for stronger signal in wet bone and higher durability.
• Improve combined comprehensive model.
• Streamline system for clinical use.
• Paul will continue on this project in Fall 2013.

Lessons Learned

• Familiarity with OCT imaging and virtual fixture constrained optimization algorithms.
• Communication among members of the research team and owners of project dependencies is vital for success.
• It is important to be flexible with any project timeline as difficulties are bound to arise.

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Publications


Credits

• Paul Wilkening – Side-View/Combined Models and Virtual Fixtures
• Emily Daggett – Bulk/Combined Models

Acknowledgements

• Saumya Gurbani for side-view probe imaging software and B-scan image.
• Mingtao Zhao for bulk scan imaging software.
• Prof. Jin Kang for OCT system.
• Prof. Russell Taylor for support and advisement, and for virtual fixture image.
• Berk Gonenc for equipment setup images.
• Support by Cochlear Ltd. and Core NSF CISST/ERC.