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AUDIOPTICS MEDICAL

Department of Electrical Engineering

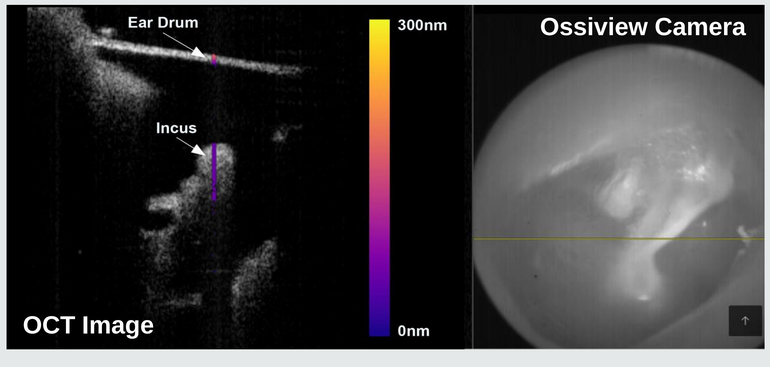
Test Station for Optical Coherence Tomography Imaging Verification Testing

Introduction

- Project is to design a test station to characterize the Ossiview camera and the OCT laser
- The test station will only be used by Audioptics to confirm the accuracy of OCT and camera results to ensure proper diagnosis when the system is used in the clinic
- Deliverables to client are:
  - 3D printed alignment cradle to keep the hand piece stationary during testing and the 3D model files
  - Develop test protocol to allow for straightforward test replication by future users
  - Develop any software needed to perform the test

What is OCT?

- Optical Coherence Tomography (OCT) is the method used in the Ossiview to obtain images of the middle ear through the ear drum
- Distances are calculated by comparing the time the infrared (IR) light reflection off a middle ear structure takes to return to the Ossiview transceiver with the time IR light takes to travel a predefined distance inside the Ossiview hand-piece. Due to the speed of light being different in different tissues, the time of flight of the IR pulse can measure both distance to a structure and thickness of different tissues

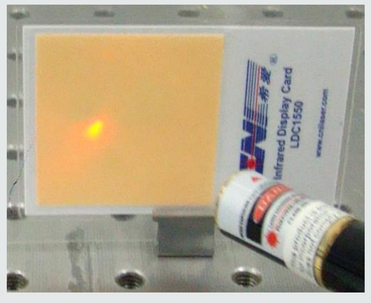


Design Process

- For the Ossiview to interface with the test station, the hand-piece is placed in the cradle to aim the OCT laser. When aligned, the OCT laser is to be pointed at the translation stages via a hole in the underside of the cradle
- Depending on which test is being performed, the translation stages will hold either an IR detection card or a test target. The light reemitted by the detection card when excited by the laser is recorded by a standard photographic camera
- Once test images are transferred to a computer, the image-processing software ImageJ can be used for analysis
- Tests will be performed to characterize both the Ossiview camera as well as the laser for the OCT system

Infrared (IR) Light Detection

- IR light is outside of the visible spectrum, meaning it cannot be seen by the naked eye
- To see the IR laser beam, phosphor-containing detection cards are used, which emit visible light when hit by IR light

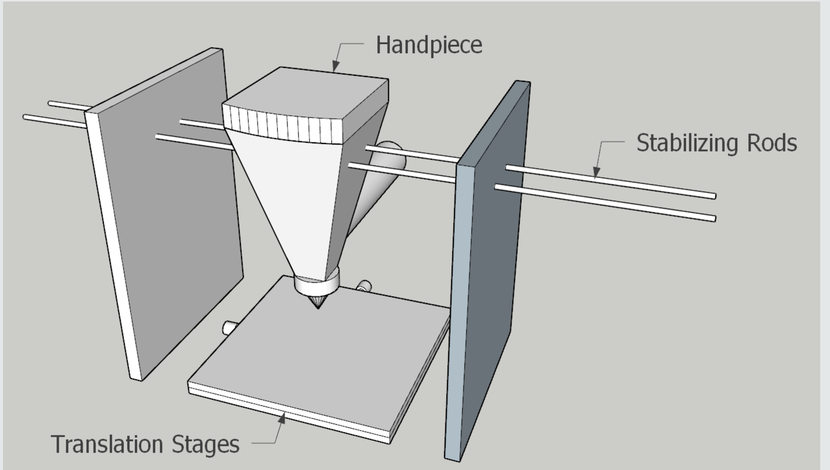


ImageJ

- ImageJ is a Java-based, open-source software that can be used to analyze images
- It will be used for:
  - Measuring between 2 points
  - Plotting measured values
  - Creating macros of actions performed on images for easy repetition
  - Pixel Intensity
- These analyses will be completed to determine the characterization of the Ossiview camera and OCT system

Model

- The test target or detection card will be placed on the translation stage
- The translation stage moves in the XYZ planes to allow the target to be mapped out with Ossiview



Tests To Perform

- Ossiview Camera Tests:
  - Field of View
  - Depth of Field
  - Resolution
- OCT Tests:
  - Axial Resolution
  - Lateral Resolution
  - Depth of Field
  - Geometric Accuracy
  - Contrast
  - Volume of Interest
  - Laser Intensity
  - Laser Widths

Next Steps

- Write protocol for tests to be performed
- Purchase IR detection cards and translation stages
- Verify that previously obtained camera has proper specifications for capturing test images

References

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