DALHOUSIE UNIVERSITY
FACULTY OF ENGINEERING

Celeste MacNeil
Rebecca Sutton
Nathan Sherwood

Audioptics Medical

Department of . . .

Automatic Segmentation and Measurement of the middle ear

INTRODUCTION

- Scan patient middle ear in vivo
- Non-invasive
- No radiation or x-rays used
- Automatically evaluate middle ear disorders
- Developed using open-source software

DESIGN PROCESS

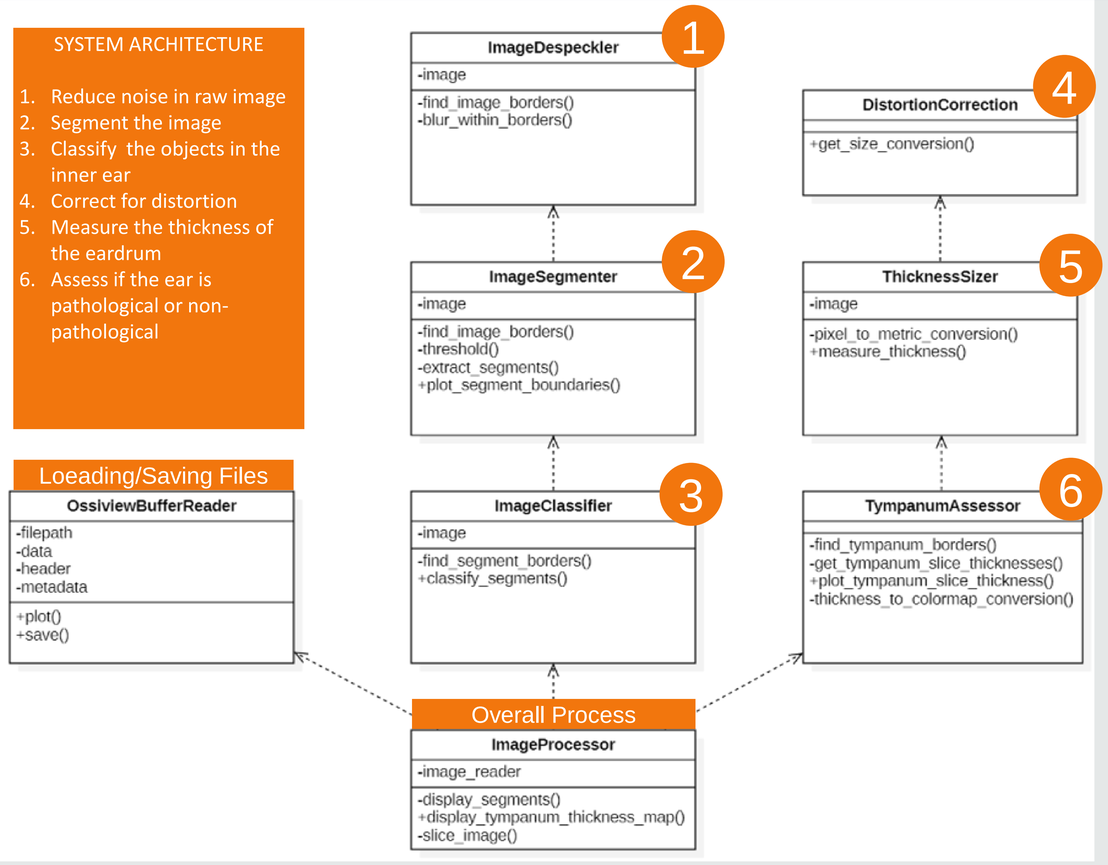
Initial Design

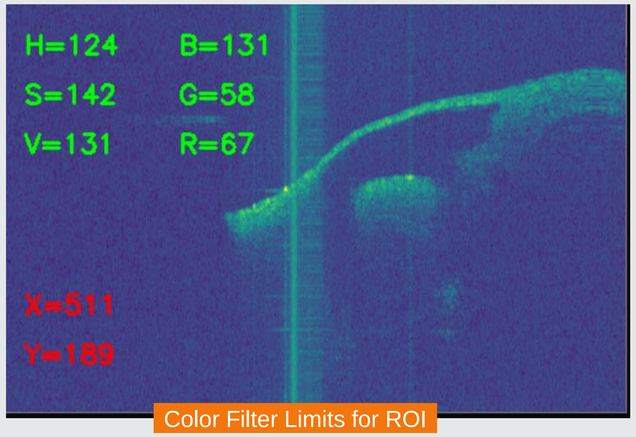
- Discuss design requirements and deliverables with our client
- Create a thorough system architecture (see center panel) broken into modules with necessary functions for the output for each deliverable
- Research existing methods and OpenCV algorithms to determine the best means by which to implement each function
- Test and validate the functions using the datasets provided by the client, Audioptics Medical

DETAILS OF DESIGN

SYSTEM ARCHITECTURE

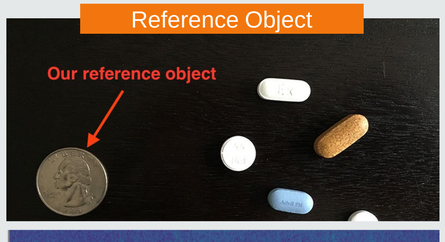
1. Reduce noise in raw image
2. Segment the image
3. Classify the objects in the inner ear
4. Correct for distortion
5. Measure the thickness of the eardrum
6. Assess if the ear is pathological or non-pathological

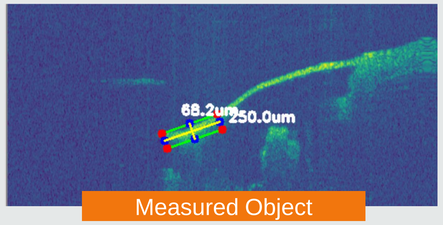




Color Filter Limits for ROI

Reference Object





Measured Object

CONCLUSION & RECOMMENDATIONS

Completed

- Made a color filter to remove noise and highlight ROI
- Used morphological operations to remove image speckle
- Used OpenCV watershed algorithm to segment ear structures

Future Work

I. Enumerate/Classify segments
II. Correct machine introduced distortion
III. Measure/Display eardrum thickness using color map

References

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