



# Dual Handheld and Video Otoscope

**Team: Eyes on Ears**

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**Client: Dr. Lara Tomich**

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# Presentation Overview

- Problem Statement
- Background Material
- Product Design Specifications
- Competing Designs
- Preliminary Designs
- Design Matrix
- Future Work
- Acknowledgements
- References

# Client - UW School of Veterinary Medicine



Figure 1: Photo of Dr. Lara Tomich [Tomich, 2023]

Dr. Lara Tomich

Department of Medical Sciences, Dermatology

- Teaches dermatology to preclinical students
- Educates fourth year students, interns, and residents



Figure 2: Photo of Dr. Amy Nichelason [Nichelason, 2023]

Dr. Amy Nichelason

Department of Medical Sciences, Primary Care

- Research goals are to help create tools that enhance clinical decision making
- Clinical assistant professor heavily involved in clinical teaching.

# Problem Statement

- Handheld otoscopes either do not allow for live video of the examination to be viewed from a remote device
- Or they have video capabilities instead of a traditional lens view which is practiced differently in simulations
- Design a handheld otoscope with live video capabilities

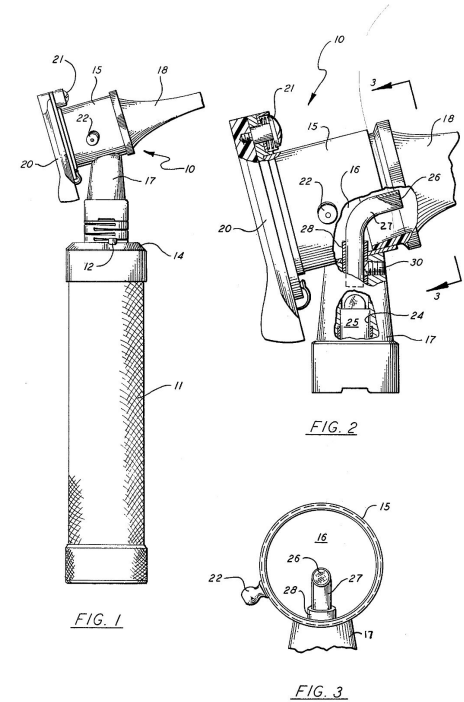


Figure 3: US Patent US4006738A [Moore, 1977]

# Background Material



Figure 4: Welch Allyn Pneumatic Otoscope [4]



Figure 5: Welch Allyn Pneumatic 3.5V Otoscope Handle [5]



Figure 6: Endo World Video Otoscope [6]

## Handheld Otoscope

- Utilize lenses to display inside of ear optically
- Portable, does not need external display, easy to use

## Video Otoscope

- Require external monitors and power source
- Clear display of inside of ears
- Have video recording capacity for later review

# Product Design Specifications

- **Client Requirements:**
  - The otoscope resembles features of a traditional handheld otoscope (lenses), providing a effortless transition between them
  - The otoscope has video relay ability
  - External light source
  - Maintain expenses below the budget
  - Reasonable design weight/size
  - Easy to work with for new veterinary students

# Competing Designs



Figure 7: Wispr Digital Otoscope [7]

## Wispr Digital Otoscope[7]:

- Adjustable Specula
- Same handle design
- No optical lens



Figure 8: Welch Allyn Veterinary Otoscope [8]

## Welch Allyn MacroView Veterinary Otoscope[8]:

- large, sharp, nearly full view of the tympanic membrane
- Adjustable focus
- Does not have video capacity for assessment

# Design 1: One Way Mirror

- 45° Angle One Way Mirror
- Camera Below
- Two magnifying glasses

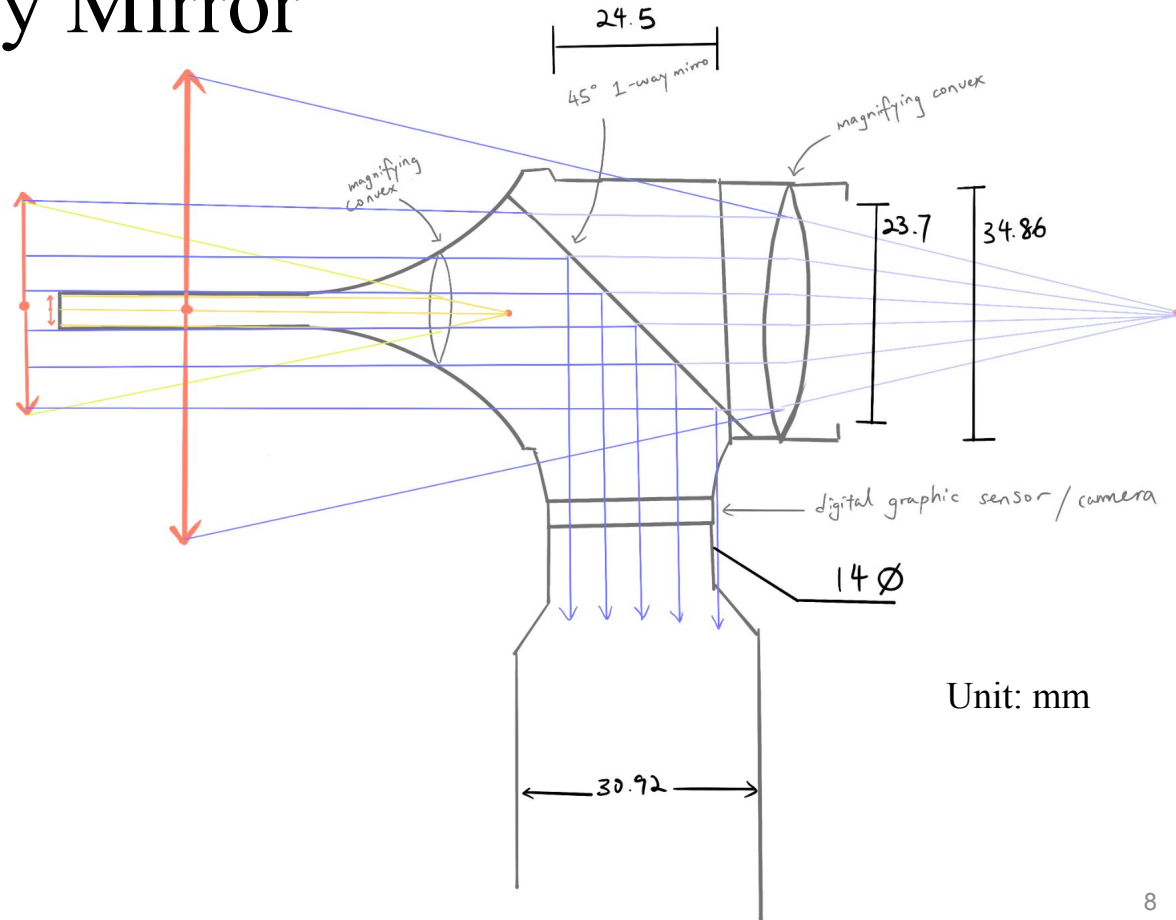


Figure 9: Design Drawing of One way mirror [9]



# Design 2:

- Also utilized a 50 percent reflecting mirror
- Part of the light(image) will pass through the mirror to the image sensor, connected to the monitor
- The rest will pass through a pentaprism to eventually redirect the light to an optic lens

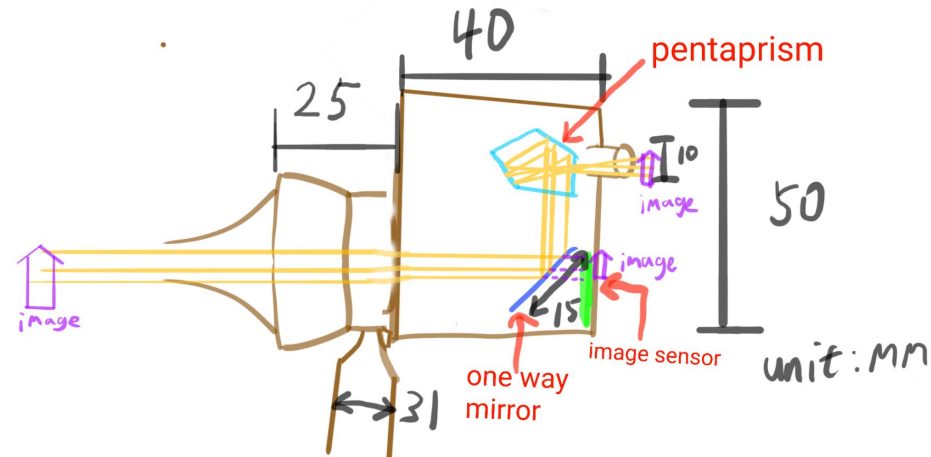


Figure 10: Design Drawing of Add on module [10]

# Design 3: Hidden Camera

- Custom-made larger nozzle affixed over specula
- 8 mm effective diameter camera on the inside of custom-made nozzle
- A wired connection to either a video output device or a wireless wifi-box that an external device can connect to

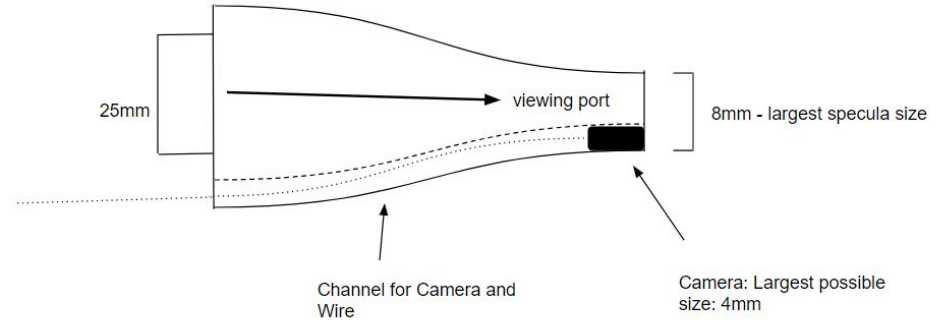


Figure 11: Design Drawing of Hidden Camera Design [11]

# Design Matrix

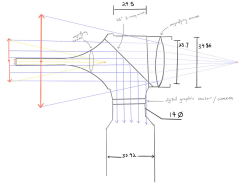
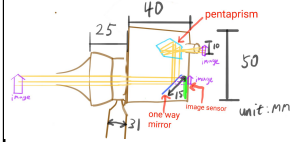
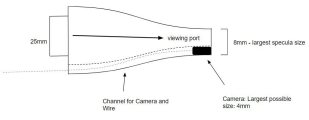
	Design 1: 1-way Mirror	Design 2: Add on Module	Design 3: Hidden Camera
<b>Criteria (Weight %)</b>			
<b>Effectiveness (25)</b>	4.5/5	4.5/5	3.5/5
<b>Ease of Fabrication (20)</b>	2/5	2/5	3/5
<b>Ease of Usage (15)</b>	4/5	2.5/5	4/5
<b>Adjustability (10)</b>	2.5/5	4/5	2/5
<b>Safety (10)</b>	4/5	4/5	3/5
<b>Size/weight (10)</b>	4/5	2.5/5	4/5
<b>Cost (10)</b>	3/5	3/5	4.5/5
<b>Total = 100</b>	<b>69.5</b>	<b>65</b>	<b>68.5</b>

Table 1: Design Matrix (Dual Handheld and Video Otoscope, 2023)

# Conclusion & Future Work

- Design 3 and 1 were chosen to move on with.
  - Potentially combine to make one design
  - 2 do-able prototypes
  - Refine and learn from both then choose preferred design to finalize
- Start development of Design 3
  - Narrow down best materials to use
  - Buy materials for fabrication
  - Buy camera
  - Work on user interface of video
  - Test accuracy

# Acknowledgements

- To our advisor
- To our client
- To our peers

# References

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