BME Design-Fall 2023 - Sam TAN
Complete Notebook

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Sam TAN

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Team contact Information

GRACE BOSWELL - Oct 10, 2023, 7:38 PM CDT

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Project description

GRACE BOSWELL - Sep 14, 2023, 9:24 AM CDT

Course Number: BME 200/300

Project Name: Dual Handheld and Video Otoscopy Unit

Short Name: Ears on Eyes

Project description/problem statement:

The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

About the client:

Dr. Lara Tomich is our client for the Dual Handheld and Video Otoscopy Unit for this semester. She works for the Department of Medical Sciences and Dermatology at the UW School of Veterinary Medicine. Our team will add more information in regards to our client after our first client meeting on 9/14/2023 at 4:30.

GRACE BOSWELL - Oct 10, 2023, 7:40 PM CDT

Current Problem Statement:

Current handheld otoscope designs in veterinary practice either lack the capability to stream live videos of examinations to remote devices or feature video functionality instead of the traditional lens view, which is essential for simulation training. We aim to develop a handheld otoscope that combines live video capabilities, enabling faculty members to assess student-performed examinations in real-time.

Updated Problem Statement: 12/10/2023

GRACE BOSWELL - Dec 10, 2023, 12:49 PM CST

Title: Updated Problem Statement

Date: 12/10/2023

Content by: Grace

Present: N/A

Goals: To document our final problem statement (may change slightly with editing of final report)

Content:

Current handheld otoscope designs in veterinary practice either cannot stream live videos of examinations to remote devices or feature video functionality instead of the traditional lens view, which is essential for simulation training. The team aims to develop a handheld otoscope that combines live video capabilities, enabling faculty members to assess student-performed examinations in real time.

Conclusions/action items:

The problem statement is supposed to be updated as the semester progresses and the team did not accomplish this as we should have. This a big mistake on our part and the team will be fixing this over the next few days before the final report and notebook are due. The team plans to meet 12/11 to discuss the final report and make the needed changes.

Final Problem Statement: 12/13/2023

GRACE BOSWELL - Dec 13, 2023, 1:02 AM CST

Title: Final Problem Statement

Date: 12/13/2023

Content by: Grace

Present: N/A

Goals: To add our finalized problem statement to our labarchive.

Content:

Current handheld otoscope designs in veterinary practice either cannot stream live videos of examinations to remote devices or feature video functionality instead of the traditional lens view, which is essential for simulation training. However, the veterinary faculty wishes to use traditional otoscope methods in teaching instead of focusing on practices with video otoscopes that are practiced differently. Thus the client proposed a device that features both handheld and video functions so the team aims to develop a handheld otoscope that is capable of live video relay to enable faculty members to assess student-performed examinations in real-time.

Conclusions/action items:

The problem statement shown above has improved greatly over the past few days. Various aspects needed to be added such as specific design features, cost, materials, testing, and more. A problem statement allows others to easily understand the problem the team needs to solve and some plans on how it will be done. Other work for this class includes finishing touches on the final report and future work research.

2023/9/14-Client Meeting 1

Sam TAN - Sep 14, 2023, 7:29 PM CDT

Title: Client Meeting 1

Date: 9/14

Content by: All

Present: All

Goals: Set basic agreement with the client and gain more insights into the project.

Content:

Budget of 5000

Handheld otoscope aval for alter but not the video otoscope

Student will be using a lens and instructor will be using monitor

Distance: in the same room

Video recording will be nice

Light source: external

Possible for us to come see the video and handheld otoscope in action

Environment: camera may fog up

Simulation: model

Subject: larger dogs

Not much request on camera specs.

Video software research.

Metal/plastic

Weight: okay with heavier but ideally the same weight as a handheld otoscope.

Ergonomics: Left handed right handed not specified.

Next week Meeting: Tuesday to Thursday

Conclusions/action items:

Individual Research

Meet with the client 1-2 times next week to visit the lab and get hands on experiences with otoscope to better design for the future.

Client Meeting 2: 09/21/2023

JOSE RAMIREZ - Sep 26, 2023, 6:07 PM CDT

Title: Client Meeting 2

Date: 09/21/2023

Content by: All

Present: All

Goals: To receive an otoscope to manipulate and to see the video otoscope function in real life.

Content:

Dimensions:

Conclusions/action items:

Seeing the otoscopes in person has helped the group with their plans for design. Now that we have an otoscope to manipulate it will help us toy with different ideas and see if the logistics of them will work out. The group will begin our design matrix and decide what parts we need to order.

10/19/2023: Client Meeting 3

GRACE BOSWELL - Oct 19, 2023, 6:08 PM CDT

Title: Client Meeting 3

Date: 10/19/2023

Content by: All

Present: All (except Declan)

Goals: To give a brief summary of our preliminary presentation to the client. To discuss future plans and to receive her input of materials and design.

Content:

- went over the preliminary presentation with the client

- showed new drawings/sketches of the updated designs

- introduced the recently purchased materials

- asked the client if a wired connection is okay- 2 meters in length

- asked her opinion on design 1 vs design 3- introduced design matrix

- told the client how we are splitting up work

- magnifying length is not too important -try to keep it fairly similar

- the possibility of adding a gripped handle

Meeting length: 30 minutes

Conclusions/action items:

After this meeting, the team has a better understanding of what the client expects from the team. We have split up the work to try to accomplish our various goals. These goals include completing design 1 and design 3

11/27/2023: Client Meeting 4

GRACE BOSWELL - Nov 27, 2023, 5:08 PM CST

Title: Client Meeting 4

Date: 11/27/2023

Content by: All

Present: All (except Zakki)

Goals: To present the prototype to the clients and receive feedback on what needs to be adjusted

Content:

Introduced final prototype

- showed the light source- clients thought it was bright enough

- explained how beam splitter works

- showed the camera image from the computer- the camera has a zoom ability

- semi-ridged wire is okay for practice- does not interfere with students' learning/examinations

- The camera needs to be glued into place to prevent the wrong orientation

- explained how to change the battery- back removes like a tv remote

- potential to have another group continue this next semester with Bluetooth imagining

- potential test - does it break

- Thursdays at 12- Sam and Grace (LT 845-475-5144) - meet in the same spot as last time in vet school- by giraffe skeleton

Conclusions/action items:

From this meeting, the team has realized that we have a lot of work to do over the next week and a half before poster presentations. The team needs to glue to camera into the track, solder the light source, test the materials, and finish the final report and poster. The poster has been started, all that is needed is pictures of the design, testing, discussion, and future work. The team will test the product on Thursday, November 30th with the clients and their colleges.

11/30/2023: Client Meeting 5

JOSE RAMIREZ - Dec 01, 2023, 11:40 AM CST

Title: Client Meeting 5

Date: 11/30/2023

Content by: Grace, Sam, Jose

Present: Grace, Sam, Jose

Goals: To test our device with vets and vet students

Content:

The team took verbal feedback while the testers also filled out a survey.

(The following can also be found in **Testing and Results** Folder)

VERBAL FEEDBACK

- Very much like using a regular otoscope and does a good job in simulating experiencing of giving dog and examination.
- When teaching students how to use a lens otoscope a polished version of our prototype, would be preferred over their current lens otoscope.
- Very lightweight in comparison to regular lens otoscope.

GENERAL NOTES:

- Since light is not in the inside of the specula, sometimes debris can block the light but allow the lens view to see clearly.
- Need to reprint otoscope head because the specula currently use tape and is not secured very well. The specula falls off when navigating inside the ear if there is no tape attached.
- White light LED leads to some discoloration, could potentially use warm LED light instead.
- The slit in the otoscope head permits outside light to enter the camera view which causes disturbances in the video feed as well as not allowing the camera to focus.
- Some inconsistencies when it comes to camera quality specifically the camera going not being in focus. Once the camera became focused it was relatively consistent in staying in focus.
- There is a lot of Black Space on the video feed that could be cropped out or zoomed out of.

Conclusions/action items:

Overall this was an effective test session because the team was able to get 10 more responses from those who are familiar with the otoscope. Testing at the vet school also allowed the team to use their ear model to see if the testers could correctly identify the shape and color. This data will be used to correlate scores with each other and be put in the final report and poster

2023/10/03-Team Meeting (Coli)

Sam TAN - Oct 03, 2023, 9:14 PM CDT

Title: Team Discussion Meeting

Date: 10/1

Content by: All

Present: Sam, Bobby, Grace, Declan, Jose

Goals: Presentation Work and design re-evaluation

Content:

- Worked on the presentation
- Assigned Slides for each individual
- Group research and discussion on camera
- Design matrix re-evaluation
- Start on preliminary report

Conclusions/action items:

Presentation and report

2023/10/05- Team Meeting (Mechanical Engineering Building)

GRACE BOSWELL - Oct 10, 2023, 7:28 PM CDT

Title: Team Meeting (Mechanical Engineering Building)

Date: 10/05/2023

Content by: Sam, Grace, Bobby, Jose, and Zakki

Present: Sam, Grace, Bobby, Jose, and Zakki

Goals: To practice and refine our presentation before the preliminary presentations.

Content:

- the group went over slides
- made edits based on the rubric
- discussed major talking points
- timed ourselves to try and split time evenly
- wrote speaker notes on major speaking points
- discussed final report logistics more

Conclusions/action items:

This meeting was quick and helped the group understand our roles in the presentation better. We practiced timing ourselves to make sure the time was split evenly. We also checked over our sources and table/figure labels to make sure they were correct. Now the team must begin working on the proposed final design, work on the preliminary report, and buy materials.

2023/10/10-Team Meeting (Virtual)

Sam TAN - Oct 10, 2023, 7:20 PM CDT

Title: Team Meeting Virtual

Date: 10/10/23

Content by: All

Present: Sam, Bobby, Grace, Declan, Zakki

Goals: Go over report.

Content:

- Get together and finalize report

- Talk over about

Conclusions/action items:

2023/10/15- Team Meeting (Engineering Hall)

GRACE BOSWELL - Oct 15, 2023, 3:07 PM CDT

Title: Team Meeting (Engineering Hall)

Date: 10/15/2023

Content by: Sam/Declan/Grace/Bobby

Present: Sam/Declan/Grace/Bobby

Goals: To develop a rough prototype and to decide on an inexpensive micro camera.

Content:

-looked at film that was purchased

-looked at low-expense otoscope camera options

-emailed Aubrey about purchases of camera

-meeting length: 2 hours

Conclusions/action items:

After this meeting, we have concluded that the team each individually needs to construct some preliminary designs. This includes modeling on Solidworks/Cad, modeling with cardboard boxes, and creating a presentation to display at show and tell.

To do:

Bobby: Cardboard Example

Sam: 3D model of design 1

Declan: 3D model of design 3

Grace: Cardboard model of dog ear

2023/10/16- Team Meeting (Makerspace)

GRACE BOSWELL - Oct 18, 2023, 10:06 PM CDT

Title: Team Meeting (Maker Space)

Date: 10/16/2023

Content by: Sam/Grace

Present: Sam, Grace

Goals: Fabrication, research, 3D modeling, design brainstorming.

Content:

We discussed methods to make ear models for the show and tell aiming to make more realistic simulations for the audience.

A 3D model of an ear canal of a dog was done and ready to print with the maker space via a 3D printer.

Consultation about how to print the model was also discussed and resin was considered the best option for such a model with high curvatures.

A short session on SolidWorks.

Conclusions/action items:

After this meeting, we decided to 3D print our first prototype of a dog's ear canal. This will occur after the maker space payment account is approved and ready to be used. This printing process will include trial and error because of the high curvature and the hollow inside of the 3D model. This means one end may need to begin filled in to have a solid base for stabilization or we will need to print 2 halves of the design and attach them together.

2023/10/23- Team Meeting (Makerspace)

GRACE BOSWELL - Nov 01, 2023, 7:18 PM CDT

Title: Team Meeting (Makerspace)

Date: 10/23/2023

Content by: Sam and Grace

Present: Sam and Grace

Goals: To 3D model an otoscope head that will allow for the beam splitter to fit comfortably without movement.

Content:

- worked on 3D modeling of otoscope head and ear canal

Conclusions/action items:

Keep working to progress on the otoscope head and the ear canal. After this, we will print both the 3D models and see what needs to be fixed. Other materials are currently be ordered.

2023/10/31- MakerSpace Meeting

Sam TAN - Oct 31, 2023, 4:09 PM CDT

Title: MakerSpace Meeting

Date: 10/31/23

Content by: Sam

Present: Sam, Bobby

Goals: Material Testing, Method testing

Content:

- LED and battery testing

- Endoscope camera testing. Evaluation: the light coming to the camera might be too bright. Image is very small. Need a convex lens.

- Sent convex lens order information to Aubrey. Lens spec: diam-25mm, FL 100mm, center length- 4.3mm

Measurements:

Camera diameter- 5.3mm

Effective 57mm

Battery holder length: 31mm

Width: 24mm

LED width: 2mm

Speculum diameter (end): 24mm

Conclusions/action items:

Material Order, 3d modeling, 3d printing, material testing, method testing.

2023/11/01- Zoom Meeting

GRACE BOSWELL - Nov 01, 2023, 7:41 PM CDT

Title: Team Meeting- Zoom

Date: 11/01/2023

Content by: Sam, Grace, Jose, and Zakki

Present: Sam, Grace, Jose, and Zakki

Goals: To gain a greater understanding of the different portions of the project before show and tell.

Content:

- members went over the parts of the projects that they have worked on over the past weeks

- Sam has made progress by printing the head of the otoscope and placing the cube inside

- Grace is having difficulties with 3D modeling the ear canal and may switch from solid works to modeling of different form

- Zakki planned a time to meet with Sam and Bobby to work on modeling and led light source

- Jose received the camera but needs specula to compare camera size to nossil

meeting length: 45 minutes

Conclusions/action items:

This meeting has helped the team understand what we will discuss during the show and tell. We have ideas of difficulties that we will share with other teams and hopefully, they can give us advice. The team will continue to meet and 3D model until our other materials have arrived.

2023/11/10- Makerspace Meeting

Zakki Mirza - Dec 07, 2023, 5:22 PM CST

Title: Makerspace Team Meeting- Sawdering

Date: 11/10/2023

Content by: Grace

Present: Sam, Grace, Zakki, and Bobby

Goals: To practice sawdering our light source to the battery.

Content:

All team members present practiced their sawdering skills

- Zakki and Bobby soldered the light source to a battery with the switch for the light

- the first run was successful

- need to see how it fits within the otoscope and if more space needs to be made for it

- Grace and Sam looked at potential materials to print the design with

- pla is cheap but does not look at good as other materials

- since the otoscope handle is long it may cause issues printing in some 3D printers

meeting length: approx 2 hours

Conclusions/action items:

This meeting was successful and has helped the team make progress on the light source. The next steps are to see if the sawdering holds and if it fits in our current otoscope model. Another item that needs to be completed is a funnel shape around the light. This is to direct the light to the specula and ear instead of the viewers eye.

2023/11/27- Makerspace Meeting

GRACE BOSWELL - Nov 27, 2023, 5:21 PM CST

Title: Makerspace Meeting

Date: 11/27/2023

Content by: All

Present: All (except Zakki)

Goals: To finish our prototype so we can test with vet's, vet students, and those with no experience.

Content:

- hot glued light source
- made survey into google form
- worked on 3D modeling of ear canal
- updated expense sheet
- added figures to the poster
- decided how to test the device

Meeting length:

Conclusions/action items:

The team made a lot of progress during this meeting and has finished the prototype that will be used for testing. On Wednesday Grace will test the device with freshmen in an interEGR 170 class. Then on Thursday Sam and Grace will go to the vet school to test the device with our client and other vets/vet students.

2023/12/06- Zoom Meeting

GRACE BOSWELL - Dec 10, 2023, 12:05 PM CST

Title: Zoom Meeting

Date: 12/06/2023

Content by: Grace

Present: All (except Declan)

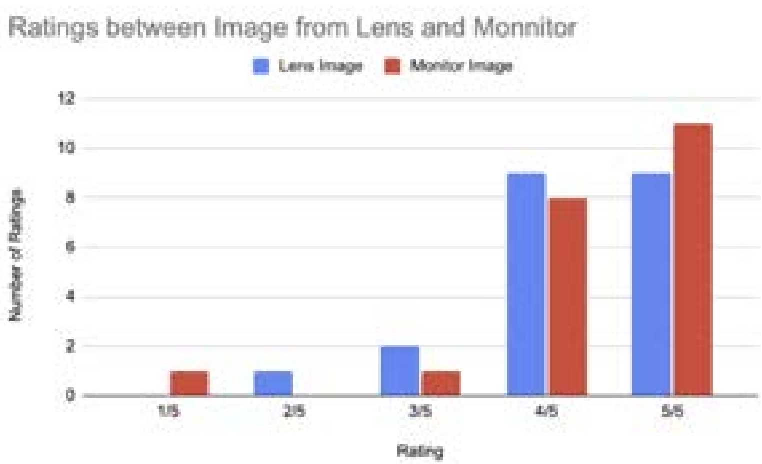
Goals: To make the finishing touches to the poster before reprinting.

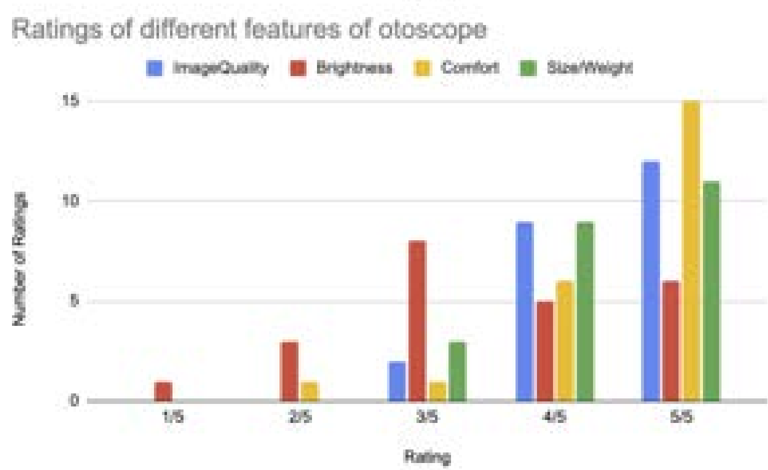
Content:

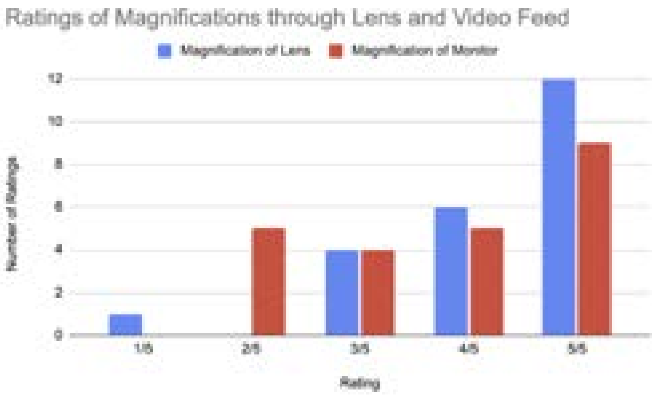
During this meeting, the team had a few disagreements regarding the poster. The first one was deciding if we should reprint our poster or not. The first poster printed very blurry which made the graphs and ear diagram unreadable. This cost the team personal money, $20 per person because Sam paid for the notebook. After discussing for a while the team decided it would be best the reprint with a higher-quality file, because what would be the point in having an unreadable poster?

The next issue discussed was whether the team should change the graphs from rata data to the averages of the different categories. 3 group members voted for the averages and 2 voted for the raw data. The majority wanted the average data because the raw data was too much information to have on 3 bar graphs. The members who wanted the raw data wanted to show the wide variety in scores from the survey.

Original graphs:

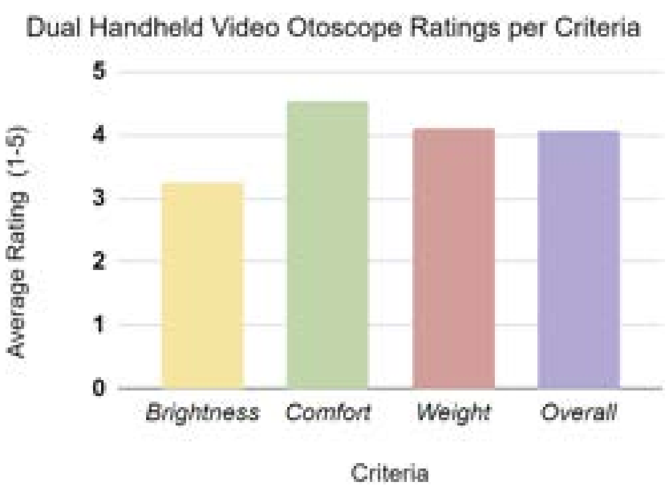


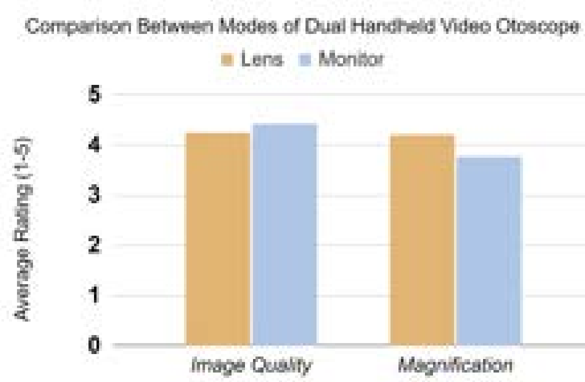




Changes made: The 2 graphs on the left were condensed into 1 to save space on the poster. All the categories were changed into averages so there was less clutter from a lot of bars on multiple graphs. The average of the overall otoscope rating was added to the graph on the right. There was disagreement on whether it belonged there or not, but it did not make sense to just write the score in the testing section.

New graphs:





meeting length: 2 hours

Conclusions/action items:

Overall this meeting helped the team work through some difficult situations. The teams had not been in a disagreement before this and it was a good learning experience for everyone. Compromise is difficult in situations like this because there was not time to ask our advisor for advice. The team decided to go with advice from fellow BME 200/300 students and 2 BME graduate students.

2023/12/07- Mechanical Engineering Meeting

GRACE BOSWELL - Dec 10, 2023, 12:15 PM CST

Title: Mechanical Engineering Team Meeting

Date: 12/07/2023

Content by: Grace

Present: All (except Declan)

Goals: To practice our talking points and time ourselves before our poster presentation on 12/08

Content:

- unfortunately, Declan could not attend the meeting because he had physics lab, and the time worked for everyone else

- we updated him on certain points he should highlight while talking and the time length of his portion

- at the beginning of the week the team split up the talking points to the best of our ability

- the decision was made by looking at what the team was most comfortable discussing and what they had worked on mainly throughout the semester.

- the team saw their final poster printed

- everyone went in order and the team timed themselves- our goal was for each person to talk between 1-2 minutes

- sam, jose, and grace's parts may go longer so it was okay if declan, zakki, and bobby went a little shorter

- the team discussed the dress code and time to arrive

meeting length: 1.5 hours

Conclusions/action items:

This team meeting was essential for preparing for the poster presentation because the team needed to practice transitions from one group member to another. The group needed to practice speaking loudly due to the commotion in ecb during poster presentations. The team will continue to practice on their own after this meeting.

2023/12/11- Team Meeting (Zoom)

GRACE BOSWELL - Dec 13, 2023, 10:32 AM CST

Title: Team Meeting - Zoom

Date: 12/11/2023

Content by: Grace

Present: All (except Declan)

Goals: To review the final report as a team and discuss the needed last-minute changes.

Content:

- team went over about half of the report

- ran out of time so the team agreed to look into it on our own time

- while reviewing we started at the beginning and worked our way down based on the guidelines

- in sections that needed major changes we left a comment and someone agreed to edit it later

- small grammar changes were made along the way

- after all figures/images/sources were added, a team member went through and added the numbers in the order they appear

- The abstract and conclusion still need to be updated

meeting length: 2 hours

Conclusions/action items:

This will most likely be the team's last meeting. We will finish the report before the deadline and submit it along with our final notebooks. A client eval will be sent to our advisor. Everyone will complete their feedback fruits to accurately rate the other teammates and reflect on these results.

2023/9/15-Advisor Meeting 1

Sam TAN - Sep 16, 2023, 7:25 PM CDT

Title: Advisor Meeting

Date: 9/15/23

Content by: All

Present: All

Goals: Meet with advisor to discuss further plans

Content:

Things to ask during the next client meeting:

Add-on modules vs. complete teaching unit?

How does payment works? Would it be a reimbursement or out of pocket or through some sort of UW Funding account?

Got insight on course logistics:

Design notebook will be check every week.

Things can be done:

Since we have a generous budget, we're hoping to purchase a current video otoscope on the market and disassemble to alter on the handheld otoscope to achieve goals. Current video otoscope arranges from 20-100 dollars which is considered do-able.

Conclusions/action items:

Client meeting next week at the Vet School to discuss more about the project. Have hands on experiences with handheld otoscope, take measurements and observe the functions of video otoscop.e

09/22/23-Advisor Meeting 2

GRACE BOSWELL - Sep 27, 2023, 7:42 PM CDT

Title: Advisor Meeting 2

Date: 09/22

Content by: All

Present: All

Goals: To gain a better understanding of our advisor's expectations and to talk over some preliminary designs.

Content:

Discussed expectations for lab archives and progress reports in the future.

Some group members showed their designs and we received feedback on how realistic these ideas are and how we may improve them.

Talked about our client meeting and how we will access funds for materials we may need.

Conclusions/action items:

Overall this meeting was helpful in understanding the expectations for lab archives and for the progress reports. Our advisor helped us understand that this design process is important and we should take it seriously. We are taking this advice into consideration while working on our design matrix. Another thing the group needs to work on is beginning to pick out the materials we may need and seeing if we need to buy a new otoscope all together.

2023/10/13-Advisor Meeting 10/13

Sam TAN - Oct 13, 2023, 2:01 PM CDT

Title:

Date:

Content by:

Present:

Goals:

Content:

Show and tell coming up.

No meeting in two weeks.

Use preliminary feedback to improve on the final poster presentation.

Improve by showing what should you be looking at on the design drawings, make more clear and flow better.

Future work: be more concise and last longer, talk more about plans, method and testing plans.

Buy something off amazon that we can tear apart and make use any parts and integrate them to our design.

Make bigger prototype and learn sooner and eventually scale them down.

Conclusions/action items:

2023/10/20-Advisor Meeting

GRACE BOSWELL - Oct 20, 2023, 1:54 PM CDT

Title: Advisor Meeting

Date: 10/20/2023

Content by: All

Present: All (except Zakki)

Goals: To understand what to improve on in the preliminary report and discuss plans for show and tell.

Content:

What to improve on the report:

- engineering(modeling and math) that's guiding our progress
- figures are unreadable - fix the figure captions to be larger
- figures should be able to stand alone
- look at significant figures

Show and tell:

- bring something that is working well and something that needs help from others (to get different perspectives and ideas)
- how it works: 1st hour half goes to look at other projects other half stays, then the second half the groups switch
- present ideas quickly so there is time for feedback
- bigger model of the otoscope then size it down for the final model

Ear Canal:

- look at CT scans for different diseases

Camera:

- focal length range - potentially a lens
- 2 separate systems of connection and potentially change to wireless camera

Conclusions/action items:

This meeting has helped the team determine what changes need to be made within our preliminary report to make sure it is improved for the final report. The team also discussed how the work has been split between 3 groups. This will hopefully help the team to have many models to show others at show and tell. We also need to work on our elevator pitch and make sure everyone has it memorized. We will also have a list of difficulties that we will present to the other students and potentially get their assistance.

2023/11/10- Advisor Meeting

GRACE BOSWELL - Nov 10, 2023, 2:12 PM CST

Title: Advisor Meeting

Date: 11/10/2023

Content by: All

Present: All

Goals: To discuss future plans and difficulties.

Content:

- reminded that the poster presentation is in a month

- solidify testing plans

- finish survey- find people to test with (potentially ask the client if she can introduce us to people we can test with)

Current design

- camera 1 did not work- document this somehow

- design 3 difficulties printing- Declan is going to maker space later to work on this

- focal length is causing difficulties

- The back of the otoscope can pop off to allow the user to adjust the battery/camera

- looking at the light source and how it will sit within the otoscope, going to create a "funnel" design to direct light forward

- using watch like battery (coin)

- waiting on the new camera, have to adjust camera track diameter to fit the new camera cord

Survey

- talk to the client

- use all different levels of expertise- pre-med/pre-vet/vet/med/no knowledge of anatomy

Ask client:

-what year do students first learn to use an otoscope?

-have her use our otoscope to see similarities and differences- what we should change

Conclusions/action items:

The next steps are to begin working on final deliverables that we already have information for. The testing is very important for the next step. This includes finishing the survey and finding lots of people to test it with. Once the team receives the new camera we will modify the next prototype and think about refining the material used print.

2023/11/17- Advisor Meeting

GRACE BOSWELL - Nov 17, 2023, 1:49 PM CST

Title: Advisor Meeting

Date: 11/17/2023

Content by: All

Present: All

Goals: To receive feedback from our advisor on the next steps for the project.

Content:

rest of schedule:

-poster presentation 3 weeks from today: We present at 1:05- number 34- down a hallway- potentially bring an extension cord

-no progress report needed for Thanksgiving week- potentially email advisor if there are questions

-look into printing reservations at college library for poster

Notebooks:

- use appropriately and make sure to document

Testing:

-Meet with the team to discuss questions

-email the client to see if she has pre-vet or vet students we can test with

Final prototype:

-A new camera has come

-The light source has been soldered to the battery source

Conclusions/action items:

Overall the team has realized that we are almost finished with our prototype which is good. The next step is to begin working on our poster and final report. We must get an early start on this because we do not want to wait until the last minute when everyone has finals. Another thing the team needs to accomplish is testing. The team will meet again to discuss these questions and email the client to see if she can connect us with people to test with.

2023/12/01- Advisor Meeting

GRACE BOSWELL - Dec 01, 2023, 2:05 PM CST

Title: Advisor Meeting

Date: 12/01/2023

Content by: Grace

Present: All

Goals: To discuss the project's past and future aspects and prepare for the poster presentation.

Content:

Rest of semester:

- poster presentation: December 8
- print on December 5/6- college library
- final report, feedback fruits, final notebook - December 13
- do a class review

Project advice:

- hose clamp on top to keep head together

Survey:

- look over data- causation vs correlation

Conclusions/action items:

GRACE BOSWELL - Dec 03, 2023, 5:32 PM CST

Conclusion/action items:

Unless we decide to meet after poster presentations, this is the team's final advisor meeting. That means the poster, final report, and final notebooks are due soon. The team has made a lot of progress through out the semester and needs to document this in our work.

09/27/23-Design Matrix

GRACE BOSWELL - Sep 28, 2023, 12:20 PM CDT

Title: Design Matrix

Date: 09/27

Content by: All

Present: All

Goals: To reflect on three different designs and rank them based on varying criteria.

Content:

Dual Handheld and Video Otoscope - BME 200/300 Section 310

Preliminary Design Matrix

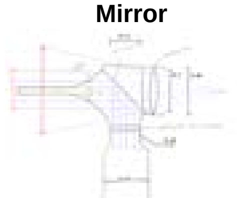
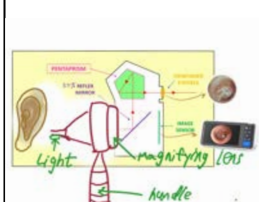
September 23, 2023

Client: Dr. Lara Tomich

Advisor: Professor Justin Williams

Team:	Sam Tan	stan68@wisc.edu	BSAC/Team Leader
	Grace Boswell	gboswell@wisc.edu	Communicator
	Haoming Fang	hfang45@wisc.edu	Team Leader
	Jose Ramirez	jsramirez3@wisc.edu	BWIG
	Declan McHugh	dvmchugh@wisc.edu	BWIG
	Zakki Mirza	zkmirza@wisc.edu	BPAG

Design Matrix:

Criteria (Weight %)	Design1: 1-way Mirror 	Design 2: Add on Module 	Design 3: Hidden Camera 
Effectiveness (25)	4.5/5	4.5/5	3.5/5
Ease of Fabrication (20)	2/5	2/5	3/5

Ease of Usage (15)	4/5	2.5/5	4/5
Adjustability (10)	2.5/5	4/5	2/5
Safety (10)	4/5	4/5	3/5
Size/weight (10)	4/5	2.5/5	4/5
Cost (10)	3/5	3/5	4.5/5
Total = 100	**61.5**	**57**	**68.5**

Design Matrix Criteria:

- Effectiveness
    - Designs in this criteria will be evaluated based on their ability to seamlessly integrate the capabilities of both a video otoscope and a traditional handheld otoscope. The accuracy and precision of the designs will be assessed to determine if the device will give a similar user experience compared to the regular handheld otoscope while minimizing the perceptive difference between video output and visual output from the lens. This criterion was given a weighting of 25% because it's the main goal of the project.

- Ease of Fabrication
    - The general complexity of the design includes removable parts, internal structure, software adaptabilities, and electrical circuit components. Designs will be evaluated based on estimated time to fabricate, and how each design minimizes the efforts required future teams can remake the design from our design sketches. This criterion was given a weighting of 20% because considering time, deadline, and future replication of the design, a good balance must be made between innovation and efficiency.

- Ease of Usage
    - The device should offer clients the same level of ease and familiarity as a conventional otoscope, ensuring a smooth transition to this upgraded tool. The user interface, ergonomics, and functionality of a basic otoscope should be intuitive and require minimal training. This criterion was given a weighting of 15% because the device should have similar usability to the original otoscopes to ensure an easy transition between the two devices.

- Adjustability
    - Otoscopes come with different sizes of speculum that fit different sizes of test subjects. This criterion will be evaluated based on the number of sizes of speculum to fit and how well they fit. Adjustability is also evaluated on the different types of lenses suitable for the otoscope design. This criterion was given a weighting of 10% because, although not specifically requested by the client, being able to adapt to changes and making different users comfortable is also crucial.

- Cost
    - Designs will be evaluated based on how much materials will be required, if any if not using the given otoscope from the client. This can be 3D printing costs or other add-on costs. Other components, such as Arduino circuits, camera will not be included since every design will be using the same camera and circuits presumably. This criterion was given a weighting of 10% because although the budget is plentiful, keeping the manufacturing costs low can still be beneficial if the design ever moves beyond the prototype stage.

- Safety
    - This includes the evaluation of overall aesthetics and how each component minimizes harm on any patients and users. This criterion was given a weighting of 10 percent because the safety of the dogs is important to the final design. It is weighted lower in comparison to some of the other criteria because the safety of the dog is mainly based on user error and the size of the specula used.

- Size/Weight
    - This category is based on the design's dimensions and the otoscope's weight. This device needs to be lightweight and able to be held comfortably in the hands of a veterinary student. The specula needs to fit comfortably in a larger dog's ear as well as a smaller dog's ear. This criterion was given a weighting of 10 percent because the weight and size of the device may impact its functionality.

Design 1: One Way Mirror

- This design utilizes two convex lenses to achieve a magnifying goal. The real image goes through the tip of the specula into the first lens positioned just at the beginning of the otoscope body that projects a larger virtual image (image 1) to the back. Image 1 then goes through a 45-degree arranged 1-way mirror that reflects only 70% of light. The rest is through another convex lens to enlarge the image for the local viewer. This view must keep close contact with the otoscope thus providing a dark environment for the 30% remainder light to be viewable. The 70% reflected light is captured by a camera below which is transferred to a distant viewer. This design scores second for its complexity which causes harder fabrication methods and requires more materials thus bringing costs up. However, this design is very effective and requires less space thus giving users the same experiences as if they were using the original handheld otoscope.

Design 2: Add on Module

- This design is for an external module to be added to regular handheld otoscopes to integrate video output capacity while maintaining the original optical output, with the goal of keeping the perceptive difference minimal between the digital and optical output, and also ensuring that users can effortlessly transition between these modes. As shown in image 2, the otoscope should fit on the regular otoscope's magnifying lens side. The optical output would first be reflected by a 50 percent polarizing mirror, with part of the image going through the mirror directly to the image sensor, and the rest of the image reflected upward into a pentaprism, to eventually flip the image back up-right and to the visual lens. This design scores the lowest mainly due to the add-on module being bulky and interfering with the user and might affect user experience. However, this design also outperformed the other two designs because of how easily this can be adjusted and very affected.

Design 3: Hidden Camera

- This design uses a camera inside the nozzle attachment that would be affixed around the specula cone. The total diameter of the attachment would be a maximum of 5mm. The camera would have a wired connection to either a video output device (e.g.: laptop, phone, etc.) or a wireless wifi-box that an external device would connect to. Ideally, the camera and wire would not be obtrusive to any form of functionality because the nozzle would essentially act as a second larger specula cone. The wire would be secured onto the otoscope so as to not be a disturbance to the user. This design scored the highest mainly because of the size and cost. However, this design might not be as effective and adjustable as the other two designs.

Conclusion:

Design 3 won based on the seven categories each design was evaluated on. Within the seven categories under evaluation, design 3 scored the highest for ease of fabrication, ease of usage, size/weight, and cost. These criteria focused on the overall expectation for delivery. Since design 3 makes the least amount of alteration to the original handheld otoscope, the team believes that this can be a better option for students getting familiar with the new design compared to the other two designs.

Conclusions/action items:

Through this process, we have concluded that the third design will most likely be the best route for our team to take. This design will most likely be the most cost-effective and will not be as difficult to build as the others. The team's goal now is to discuss these plans with our advisor and client. Then we will decide which materials to order.

2023/10/22- Design 1 V1 Head Piece Solidworks

Sam TAN - Oct 22, 2023, 5:14 PM CDT

Title: Design 1 3D model

Date: 10/22

Content by: Sam

Present: N/A

Goals: Solidworks modeling

Content:

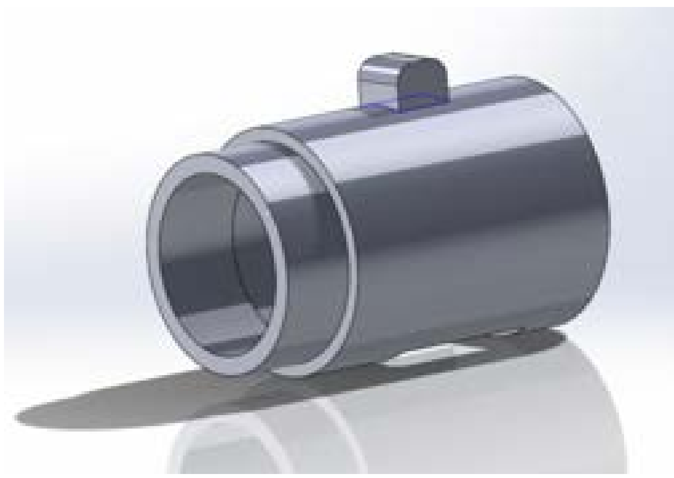
Attached.

Two designs were made. One looks better than the other.

Conclusions/action items:

More work on print.

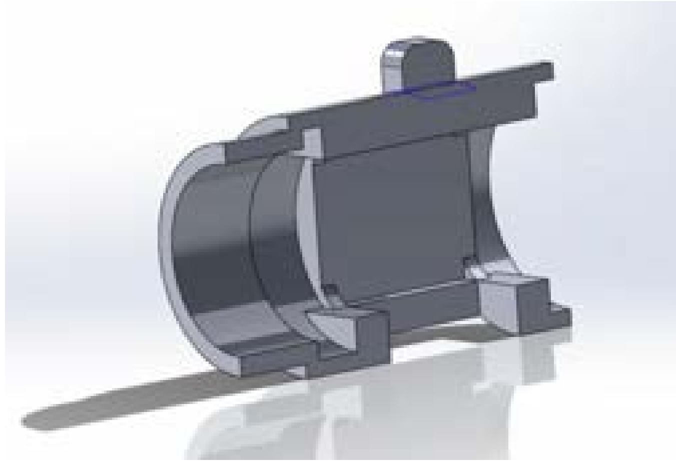
Sam TAN - Oct 22, 2023, 5:14 PM CDT



Download

Screen_Shot_2023-10-22_at_5.04.14_PM.png (444 kB)

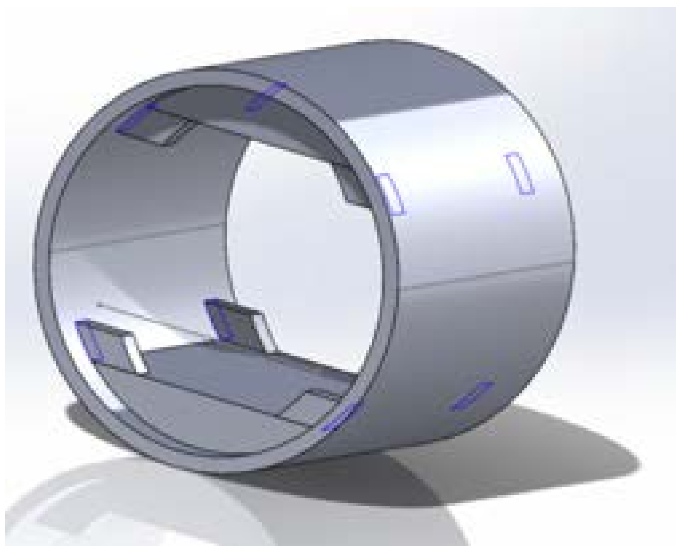
Sam TAN - Oct 22, 2023, 5:14 PM CDT



Download

Screen_Shot_2023-10-22_at_5.04.38_PM.png (311 kB)

Sam TAN - Oct 22, 2023, 5:14 PM CDT



Download

Screen_Shot_2023-10-22_at_5.05.19_PM.png (317 kB)

2023/10/23-Design 1 V1 Head Piece Solidworks Completed

Sam TAN - Oct 23, 2023, 9:14 PM CDT

Title: Design1 Otoscope Head

Date: 10/23/23

Content by: Sam

Present: Grace, Sam

Goals: N/A

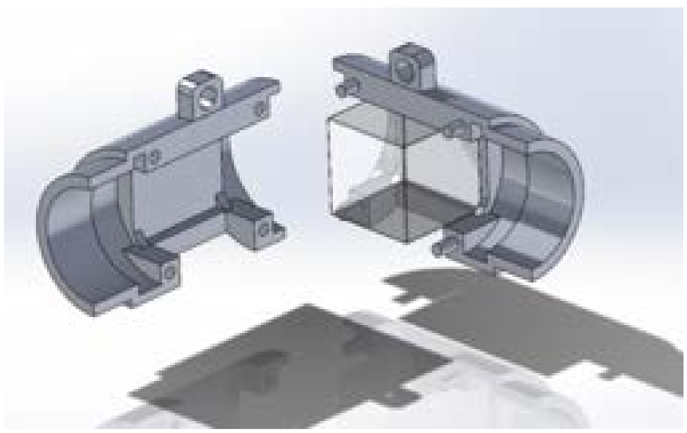
Content:

Attached

Conclusions/action items:

N/A

Sam TAN - Oct 23, 2023, 9:14 PM CDT



Download

Screen_Shot_2023-10-23_at_6.00.20_PM.png (541 kB)

2023/10/25- Design 1 Update Note

Sam TAN - Oct 25, 2023, 5:25 PM CDT

Title: Update

Date: 10/25/23

Content by: Sam

Present: Sam

Goals: Quick update note on design 1

Content:

As of today, 10/25, design one has gone through 3 minor modifications on dimensions and printed 3 times due to tolerance error.

-Combining rods on the prototype doesn't fit well into the other side

-Beam Splitter cube does not fit well into the prototype

-Specula does not fit into the prototype.

The problem mentioned above are being addressed and refined on the third print job.

Conclusions/action items:

Continue working on the handle and make adjustment necessary.

2023/11/24- Wire Orientation

Sam TAN - Dec 07, 2023, 4:39 PM CST

Title: Wire orientation

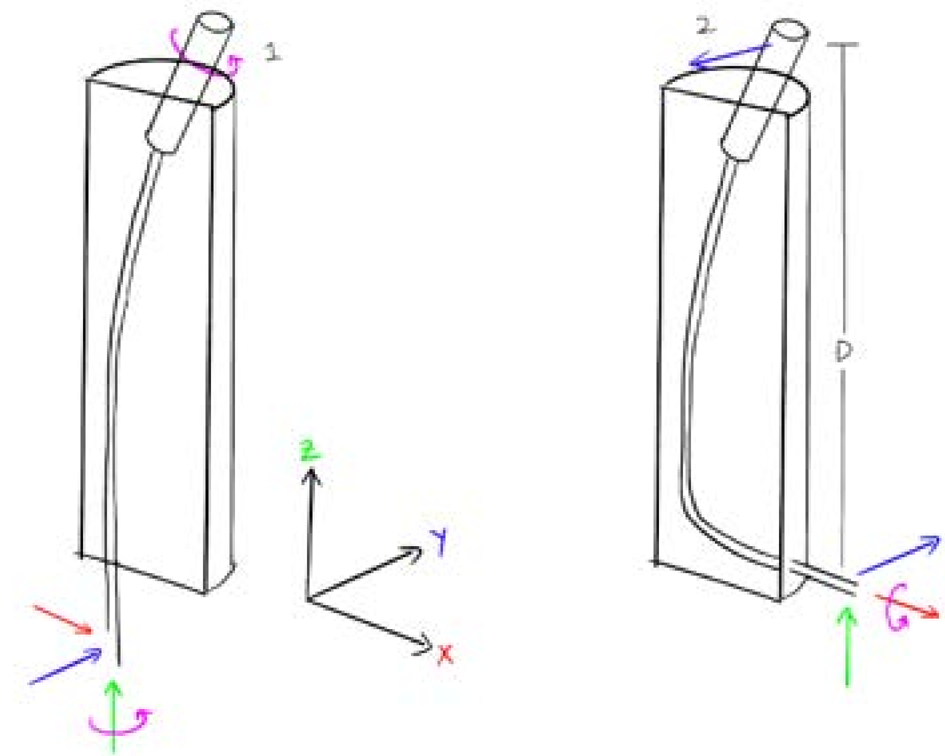
Date: 11/24/23

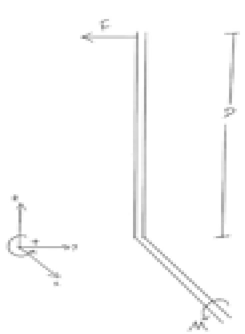
Content by: Sam

Present: Sam

Goals: Orientation of camera wire

Content:





$\Sigma M_x = 0$

$M + FD = 0$

$F = -\frac{M}{D}$

Two orientations of camera wire were considered during the design process. One, as the illustration of the left of picture 1, has the wire coming straight down and out from the bottom of the otoscope handle. Two, as the illustration of the right of picture 1, has the wire coming out through a ~90 degree turn to the side of the handle. This was considered because of the internal spin of the camera that results in a wrong orientation of the camera that provides a tilted view to the observer.

Design 1: As we can see from the axis, the forces that is generated by the user can be turn into 4 main directions, forces acting in x, y and z and moment in the z axis. There's no moment in the y or x axis because the wire is reinforced by the handle in those directions. Forces in the x y and z direction can all be accommodated and compensated by an opposite reaction force provided by the handle itself as support thus these forces don't create any motion or rotation to the camera. (Note, force in z direction is reacted directly to the beam splitter which is not illustrated on this drawing). All these reactive forces keeps the camera from heavy movements that results in the wrong orientation. However, the moment in z direction, noted in pink arrow has no reaction force on the camera, thus will create a moment (labeled as 1) identical in direction and magnitude on the camera. This transferred moment is what creates a spin on the camera thus tilting the orientation on the screen.

Design 2: As we can see from the axis, the forces that is generated by the user is similar to design 1, into 4 main directions, forces acting in x, y and z and moment in the x axis. There's no moment in the y or z axis because the wire is reinforced by the handle in those directions. Forces in the x y and z direction are all compensated by an opposite reaction force provided by the handle itself as support thus these forces don't create any motion or rotation to the camera. (Note, force in x direction is reacted by the internal structure of the 90 degree turn of the wire that is not illustrated on the drawing). All these reactive forces keeps the camera from heavy movements that results in the wrong orientation. There's also the moment in the x direction (pink), through the laws of moments, F=MD (M=moment observed, D=distance from the axis of rotation to the point force), will create a force that is proportional to the moment observed and the distant from the axis of rotation to the point of the force (camera). As we can see in picture 2. Such moment will need a reaction force of -M/D to compensate for any changes in order to reach static equilibrium. However, unlike design 1, design 2 transform the observed moment into an point force (labeled as 2) that can be resolved by the internal structure of the otoscope handle. This reaction force is labeled F and can be written as -M/D. Thus no external force can act on the orientation of the camera. This resolved the problem of the spin of the camera that creates a tilt on the screen.

pros and cons:

Design 1 need extra support on the camera such as glue to keep camera from spinning due to the external moments. Design 2 solves the problem with mechanical structures. However, design 1 is ergonomically efficient for use since the wire exits the handle at the bottom. Design 2 will create obstructive interference to the user because of the poor ergonomics.

Conclusions/action items:

After consideration, we decide to go with design one and use glue to keep camera in place, a very simple but yet effective way to compensate for the ergonomics.

2023/12/10- Final Design

GRACE BOSWELL - Dec 10, 2023, 12:33 PM CST

Title: Final Design

Date: 12/10/2023

Content by: Grace

Present: N/A

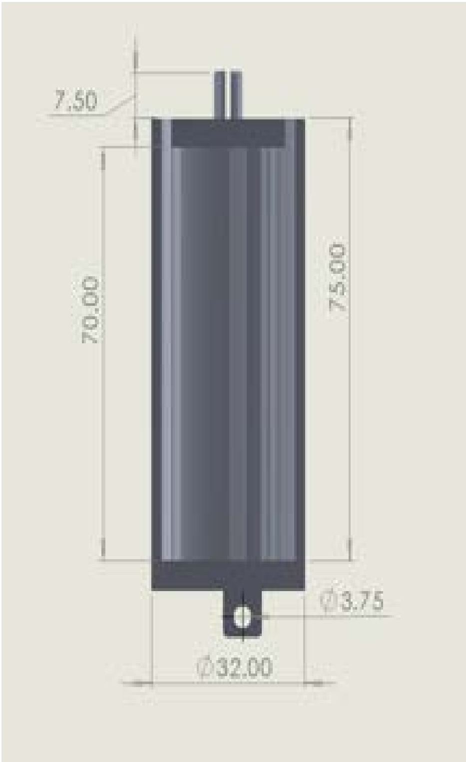
Goals: To add the team's final design with dimensions into lab archives and describe its features

Content:

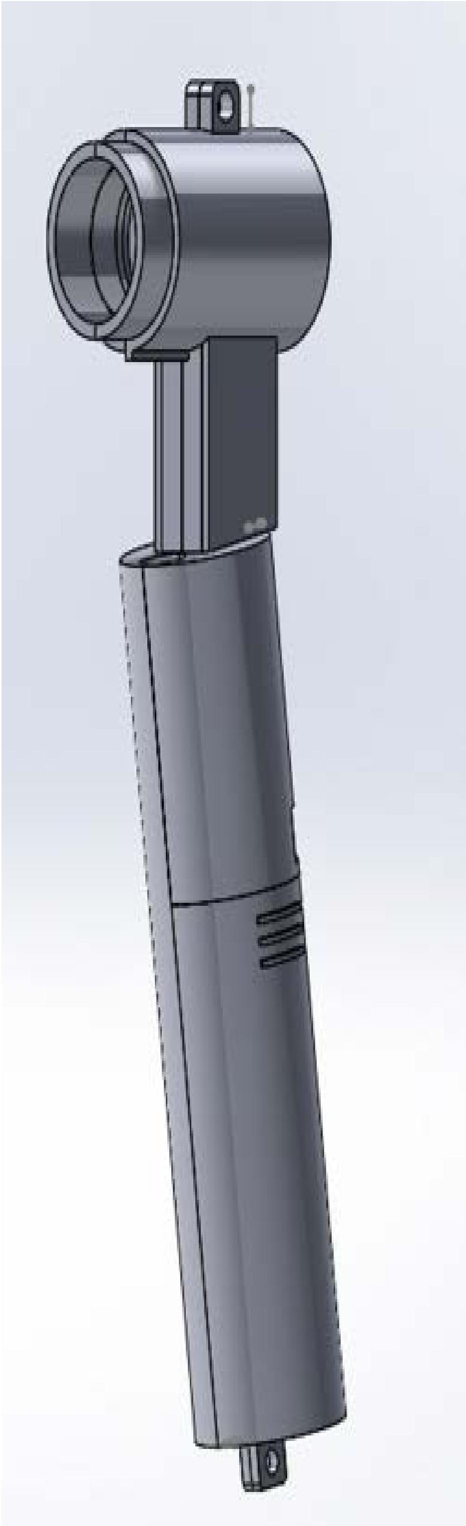
When looking at the device from the lens side it is the right part of the otoscope. The side of the design is whole which allows for the other side to be secured. Many dimensions are shown in mm.

When viewing from the lens, this is the left top of the otoscopes. This piece secures the lens, beam splitter, light source/switch, and camera into place. This means the pieces will not be affected when the battery for the light source needs to be changed.

This piece is the left bottom and acts like the back of a tv remote. This allows easy access to the light source battery when it needs replacing. It also would leave space for Bluetooth capability is a future team would like to work on that.



This image is of the completed otoscope Solidworks design fit together like it does in real life.



Finally, this last image shows the assembled final prototype for this semester of Bme 200/300. The team is proud of our design and the progress we made. A few key aspects of the device include a camera with a length of 5.3 meters. The head of the otoscope fits various specula lengths but switching out speculas leads to issues due to the light source currently being attached to the outside of the design. The camera of the device allows for USB-C and USB-A connection for a variety of monitor use.

Conclusions/action items:

The goal of this entry is to document the final design the team presented at the poster presentation and what the team will discuss in the final report. The team has made a lot of progress since the beginning of the semester. This project had many difficult components like 3D modeling of the otoscope which was done from scratch and only one group member was proficient with Solidworks. The next steps will include adding these images to the final report and updating other areas of the notebook.

Sam TAN - Dec 13, 2023, 6:30 PM CST

Internal of otoscope. Components: Magnifying lens, beam splitter, endoscope camera, button switch, microLED, CR2032 battery and holder, and additional wiring.

2023/12/10 Future Work

GRACE BOSWELL - Dec 10, 2023, 2:59 PM CST

Title: Future Work

Date: 12/10/23

Content by: Grace

Present: N/A

Goals: To list the future work that the team would need to complete to develop a better prototype.

Content:

The content listed on this page is what is listed on the poster and in the final report, other research will be completed to show how this could be accomplished.

- The function of the LED requires improvement regarding brightness and power source
- Internal wiring and circuit of the battery is oriented poorly in the current prototype
- Purchase a camera where the focus can be adjusted manually
- Find a monitor function that allows magnification of the video
- Print with material that is polished on the surface to avoid bumps

Conclusions/action items:

These are some general ideas on improvements needed in the design. These were developed from the averages and verbal information from the survey. We also know some improvements are needed based on the team's own opinions and while working with the device.

2023/10/11-One way Mirror

Zakki Mirza - Oct 12, 2023, 11:53 AM CDT

Title: One way mirror flim by FILMGOO

Date: 10/10/23

Content by: Sam

Present: N/A

Goals: N/A

Content:

Otoscope Components
One way film Use as one way mirror FILMGOO Amazon B0BXL38743 10/10/2023 1 $11.99 $18.98
https://www.amazon.com/Reflective-Privacy-Stickers-Blocking-Covering/dp/B0BXL38743/ref=sr_1_2_sspa?crid=3017HXDT658DY&keywords=one%2Bway%2Bmirror&qid=1696894696&s=home-garden&sprefix=one%2Bway%2Bmi%2Cgarden%2C559&sr=1-2-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&th=1

amazon.com

Details for Order #114-6568962-9430665

Print this page for your records.

Order Placed: October 10, 2023
Amazon.com order number: 114-6568962-9430665
Order Total: $18.98

Not Yet Shipped

Items Ordered	**Price**
1 of: *Window Privacy Film One Way Daytime Mirror Tint Treatments UV Heat Control Vinyl Stickers Sun Block Glass Paper Door Covering Reflective (Silver, 17.5 Inch x 6.5 Feet)* Sold by: filmgoo (seller profile) | Product question? Ask Seller Supplied by: Other Condition: New	$11.99

Shipping Address:
Sam Tan
1402 REGENT ST APT 224
MADISON, WI 53711-2250
United States

Shipping Speed:
Standard Shipping

Payment information

Payment Method:
Visa ending in 6214

Billing address
Aubrey Starr
2015 LINDEN DR
MADISON, WI 53706-1100
United States

Item(s) Subtotal:	$11.99
Shipping & Handling:	$6.99

Total before tax:	$18.98
Estimated tax to be collected:	$0.00

Grand Total:	**$18.98**

To view the status of your order, return to Order Summary.

Conclusions/action items:

N/A

2023/10/17- Beam Splitter Cube

Zakki Mirza - Oct 19, 2023, 1:36 PM CDT

Title: Beam Splitter Cube

Date: 10/17

Content by: Sam

Present: N/A

Goals: N/A

Content:

https://www.amazon.com/dp/B0B34FK2GF/ref=twister_B0B34FV476?_encoding=UTF8&th=1

Beam splitter cube, side length of 20mm.

14.99 for one, 21.99 after shipping.


amazon.com

Details for Order #111-8962542-4473844

Order Placed: October 16, 2023
Amazon.com order number: 111-8962542-4473844
Order Total: $21.23

Not Yet Shipped

Items Ordered	Price
1 of: Beam Splitter Cube, Optical Glass Dichroic Prism Ratio 50:50	$14.99

Condition: New

Shipping Address:
United States

Shipping Speed:
Standard Shipping

Payment information

Payment Method:

Billing address:
United States

Item(s) Subtotal:	$14.99
Shipping & Handling:	$6.99
Promotion Applied:	-$0.75
Total before tax:	$21.23
Estimated tax to be collected:	$0.00
Grand Total:	**$21.23**

To view the status of your order, return to Order Summary.

Conclusions/action items:

Fabrication

2023/10/19 - Digital Otoscope

Zakki Mirza - Oct 19, 2023, 1:41 PM CDT

Title: Digital Otoscope

Date: 2023/10/19

Content by: Zakki Mirza

Present: N/A

Goals: N/A

Content:

Digital otoscope - Amazon.com: Anykit Digital Otoscope for iPhone, iPad & Android Device, Ultra Clear View Ear Camera with Ear Wax Removal Tools, Video Ear Scope Otoscope with Light, Support Capture Photo & Record Videos : Industrial & Scientific

Details for Order #111-8982542-4473844

Order Placed: October 18, 2023
Amazon.com order number: 111-8982542-4473844
Order Total: $21.23

Not Yet Shipped

Items Ordered — Price
1 of: Beam Splitter Cube, Optical Glass Dichroic Prism Ratio 50:50 Spectrome Science — $14.99

Shipping Address:

Shipping Speed:
Standard Shipping

Payment information

Payment Method:

Billing address

Item(s) Subtotal: $14.99
Shipping & Handling: $6.99
Promotion Applied: -$0.75
Total before tax: $21.23
Estimated tax to be collected: $0.00
Grand Total: $21.23

To view the status of your order, return to Order Summary.

Conclusions/action items:

2023/11/1 - Plano-Convex Lens & Plate Beamsplitter

Zakki Mirza - Nov 02, 2023, 1:10 PM CDT

Title: Plano-Convex Lens & Plate Beamsplitter

Date: 11/1/2023

Content by: Zakki Mirza

Present: N/A

Goals: N/A

Content:

Plano-Convex Lens & Plate Beamsplitter purchase receipt through **www.edmundoptics.com**


Thank you for your order with www.edmundoptics.com! Below is a summary of your web order details.

Shipping Address

Billing Address

Shipping Method

Payment Method

Conclusions/action items:

Fabrication

2023/12/10- Final Expense Charts

Title: Final Expense Charts

Date: 12/10/2023

Content by: Grace

Present: N/A

Goals: To document where and what the team purchased to accomplish our goal for the device.

Content:

This first sheet is a detailed description of our items, the description, manufacturer, vendor, date, cost, and link. This was very helpful to the team so we cou

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#					
One way film	Use as one way mirror	FILMGOO	Not Found	Amazon	B0BXL38743	10/10/2023	1	$11.99	$18.98	https://www.amazon.com/Reflective-Privacy-Stickers-Blocking-Cove
Beam Splitter Cube	Cube that creates images in two directions	NYJLGD	Not Found	Amazon	B0B34FK2GF	10/15/2023	1	$14.99	$21.99	https://www.amazon.com/dp/B0B34FK2GF/ref=twister_B0B34FV47
Digital Otoscope	Otoscope with a camera	Anykit	Not Found	Amazon	B0C4KYGBQW	10/18/2023	1	$29.99	$36.98	https://www.amazon.com/Anykit-Digital-Otoscope-Android-Remova
Advanced										
Camera	For the camera portion	T Takmly	713869882136	Amazon	B07PBF6DX5	10/23/2023	1	$18.99	$37.86	https://www.amazon.com/Seesi-Endoscope-Waterproof-Inspection-
Endoscope	Small camera for video portion	Teslong	8595768091	Amazon	B07HVT2XZL	11/3/2023	1	$49.99	$49.99	https://www.amazon.com/Generation-Teslong-Megapixels-Inspectio
2032 Batteries	Power Led	LiCB	Not Found	Amazon	B071D4DKTZ	10/23/2023	1	$5.99	See J7	https://www.amazon.com/LiCB-CR2032-Lithium-Battery-10-Pack/dp
LED	Lightning	keenus	CD0603WM	Amazon	B091BS2ZLW	10/23/2023	1	$8.79	See J7	**https://www.amazon.com/30pcs-Pre-soldered-Micro-Waterproof-**
Battery Holder	Easy switch of batteries	Alinan US	Not Found	Amazon	B09KTXB87B	10/23/2023	1	$5.99	See J7	https://www.amazon.com/Alinan-Button-Battery-Storage-Container
Lens	Magnifier	Edmund	32-481	Edmund	32-481	11/1	1	$28.50	$28.50	**https://www.edmundoptics.com/p/250mm-dia-x-1000mm-fl-uncc**
Beam Splitter Plate	Plate that creates images in two directions	Edmund	46-694	Edmund	46-694	11/1	1	$48	$48	**https://www.edmundoptics.com/p/20-x-27mm-40r60t-plate-bean**
Lens	Magnifier	Edmund	32-481	Edmund	32-481	11/28	1	$28.50	$45.50	
Fabrication Material Costs										
3D print	Otoscope Head	N/A		MakerSpace		10/23/2023	1		$1.60	
3D print	Otoscope Head	N/A		MakerSpace		10/24/2023	1		$1.68	
Hardware	Otoscope Head	N/A		MakerSpace		Varies	Varies		$3.15	
3D print	Otoscope Head	N/A		MakerSpace		10/25/2023	1		$1.50	
3D print	Otoscope Head	N/A		MakerSpace		11/3	1		$8.60	
3D print	Otoscope Head	N/A		MakerSpace		11/14	1		$9.20	

Others										
								TOTAL:	**313.53**	

More items were added to this sheet which makes the total: $334.65

This second table is a more condensed version of the one above. The team will most likely attach this material spreadsheet to the final report so readers ca

Item Nam
One Way
Beam Spli Cube
Digital Ot
Camera
Endoscop
2032 Batt
LED
Battery H
Lens
Beam Spli Plate
Lens
3D print/Hard

Conclusions/action items:

Overall these spreadsheets have helped the team stay organized throughout this process. The team should check over the totals one more time to make s

2023/11/11-Fabricated Otoscope, Whole

Sam TAN - Nov 11, 2023, 3:15 PM CST

Title: Fabricated Initial design 1 otoscope

Date: 11/11

Content by: Sam

Present: N/A

Goals: 3D print otoscope

Content:

Conclusions/action items:

Modify

2023/11/16- Fabricated Otoscope, Whole for 12.5mm, Take 1

Sam TAN - Nov 16, 2023, 1:35 PM CST

Title: 12.5mm camera Otoscope print

Date: 11/16

Content by: Sam

Present: N/A

Goals: N/A

Content:

Conclusions/action items:

Modify and reprint

2023/11/24- Fabricated Otoscope, Whole for 12.5mm, Take 2

Sam TAN - Nov 24, 2023, 9:29 PM CST

Title: 12.5mm camera Otoscope print

Date: 11/24

Content by: Sam

Present: N/A

Goals: N/A

Content:

Conclusions/action items:

Modify and reprint

2023/11/27- Drop Test

GRACE BOSWELL - Nov 27, 2023, 7:30 PM CST

Title: Drop Test

Date: 11/27/2023

Content by: Grace, Declan, Bobby, and Jose

Present: Grace, Declan, Bobby, and Jose

Goals: To test the durability of the pla used for the otoscope

Content:

Otoscope used: First full prototype- nothing inside

- mass:
- the force of the otoscope hitting the ground- ignoring air resistance- drops inside the building- tested on

Testing procedure:

- Drop the otoscope from 50 inches above ground onto a hard surface
- The orientation of the otoscope will be parallel to the ground
- The procedure will be repeated 10 times and pictures of damage will be taken after each drop along with a rating
    - rating of no damage (1) to unusable (10)

Drop 1: 5: battery case broke off- head still intact and therefore useable

Drop 2: 9: Still salvageable- would require slight repair before use- such as glue

Drop 3: 9: No changes from drop 2

Drop 4: 9: No changes from drop 2

Drop 5: 9: No changes

Drop 6: 9: No changes

Drop 7: 9: No changes

Drop 8: 9: No changes

Drop 9: 9: No changes

Drop 10: 9: No changes

At the end of 10 drops, the screw on the end of the otoscope stayed intact which allowed the head of the otoscope to stay protected

This test was not accurate because it did not include the beam splitter, camera, magnifying lens, battery, or light source. This test allowed the team to understand the changes needed in the support of the otoscope. The second prototype added the screws in the middle of the body

Trial 2: With 2nd prototype- same procedure

Drop 1: 1

Drop 2: 1

Drop 3: 2: nut loosened on the head, retightened before next drop, suggest adding locking nuts to final design/grease

Drop 4: 2: No change

Drop 5: 2: No change

Drop 6: 2: No change

Drop 7: 2: No change

Drop 8: 2: No change

Drop 9: 2: No change

Drop 10: 2: No change

Conclusions/action items:

The team needs to look at changing the type of supports within the prototype due to the chance they may break upon impact. These narrow supports are not strong enough to withstand a drop onto solid ground. This can be combatted with a stronger material in a future design and with tighter nuts and boltz.

GRACE BOSWELL - Nov 29, 2023, 2:50 PM CST

Pictures were not taken after each drop because there were multiple drops that did not cause change to the prototype.

Prototype 1

Prototype 2:

2023/11/27 Otoscope Survey: Google Form

JOSE RAMIREZ - Dec 09, 2023, 12:18 AM CST

Title: Otoscope Survey: Google Form

Date: 11/27/2023

Content by: Grace and Jose

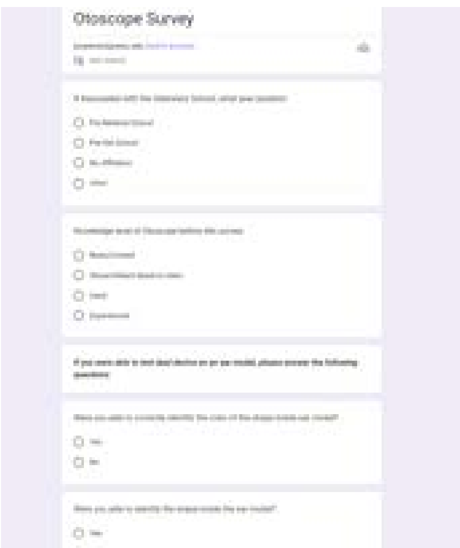
Present: All members present

Goals: To create the google form survey that will be answered after the participants test our dual otoscope.

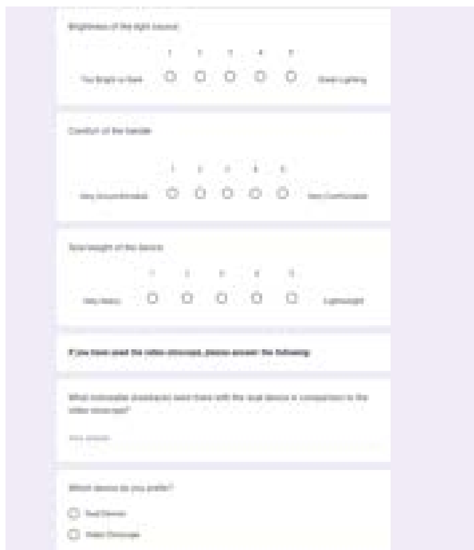
Content:

[Link to Google Form]

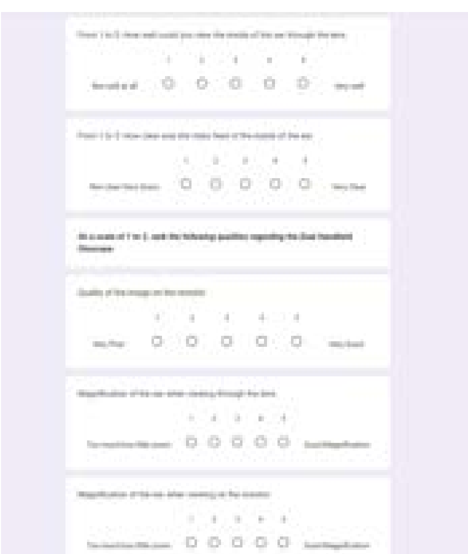
1.



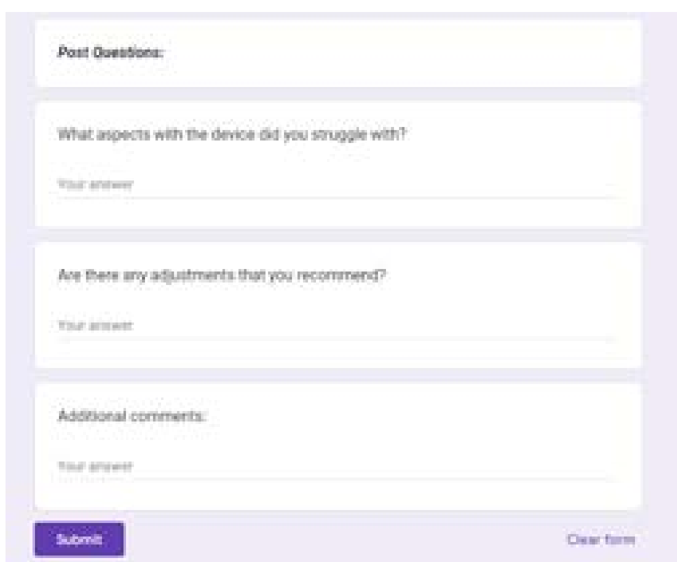
3.



2



4.



Post Questions:

What aspects with the device did you struggle with?

Your answer

Are there any adjustments that you recommend?

Your answer

Additional comments:

Your answer

Submit

Clear form

Conclusions/action items:

Completed Google form that will be used by participants who are testing are final prototype.

2023/11/17 Otoscope Final Prototype - Testing Procedure

JOSE RAMIREZ - Dec 09, 2023, 5:44 PM CST

Title: Otoscope Final Prototype - Testing Procedure

Date: 11/27/2023

Content by: Jose Ramirez

Present: All members present

Goals: To create a testing procedure for the Final Prototype for which we will follow

Content:

Pre-Procedure:

- We will be using the most up-to-date prototype that we have
- For testing occurring at the Vet School on Thursday 11/30, we will be using the 3D ear-model at the Vet School.
- For testing occurring outside the the Vet School we plan to use a 3D ear model that we hope to print out ourselves.

Procedure Steps:

1.) Participant will be given the dual otoscope and asked to inspect the inside of the 3D ear-model.

2.) The group member proctoring the testing will ask the participant the shape and color inside the ear. The group member will take note of whether or not the shape color was identified correctly

3.) The participant can continue to use the lens view of the otoscope to develop a better impression of the device

4.) Once the participant is done using the lens, the group member present will then operate the otoscope and allow for the participant to experience the camera view

5.) Once the participant is done with the camera view they will fill out the google form survey.

2023/11/29- Pearson's Correlation Coefficient

Sam TAN - Nov 29, 2023, 10:19 PM CST

Title: Survey Test

Date: 11/29

Content by: Sam

Present: N/A

Goals: Figure out test to conduct on survey data on the correlation between performance.

Content:

The pearson's correlation coefficient tells whether two sets of data have correlation or not.

$$r = \frac{1}{n-1}\sum_{i=1}^{n}\left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)$$

r is the coefficient.

When r=1, we have perfect positive correlation

r=-1, we have perfect negative correlation.

r=0, we have perfect no correlation.

This test is the best to use to find correlation between two data samples because it does not lose paired information, meaning that samples retain bivariate data.

Three tests going to be conducted.

1. Magnification of lens vs. how well could you view through the lens.

2. Magnification of monitor vs. how well could you view through the video feed.

3. Quality of image on monitor vs. how well could you view though the video feed.

These three test can tell us if magnification plays a crucial role in the ease of viewing and image quality.

Conclusions/action items:

Gather survey data and conduct tests. More sample is preferred because bigger population (n) gives a better result.

2023/12/01- Pearson Correlation Null Hypothesis

Sam TAN - Dec 01, 2023, 1:24 PM CST

Title: Null Hypothesis

Date: 12/1

Content by: Sam

Present: N/A

Goals: Develop null hypothesis to use the correlation test

Content:

In previous entry, we can use matLab to obtain a r value for the three, possibly more, tests we're conducting. For the null hypothesis, we are going to assume that there is no correlation between the two variables in each test. By using the the following formulas, we can reject the null hypothesis if value t is very large or that r is very far from 0.

$$\hat{se}(r) = \sqrt{(1 - r^2)/(n - 2)} \qquad t = \frac{(r - 0)}{\hat{se}(r)}$$

Conclusions/action items:

Conduct test

2023/11/11- Design 1 Camera Refinement

JOSE RAMIREZ - Dec 09, 2023, 6:55 PM CST

Title: Design 1 Camera choice

Date: 11/11/23

Content by: Sam

Present: N/A

Goals: Better camera.

Content:

As some initial method testing was conducted, the team realized that the camera quality is super low. While viewing through the speculum, everything is blurred, as figure 2 in attachments. Thus the team conducted different tests with different cameras, each with different resolution quality and focal range. The camera initially implanted in the otoscope was 720p with 2-10cm focal range. We conducted a 12 megapixel phone camera (iphone13) with various focal range. We can see that the photo is significantly better, as in figure 3 in attachments. We also test the quality using a mac webcam, which was found to be only 480p but with a higher focal range. We can see from the pictures that the webcam actually provides a better quality than the camera with 720p, as figure 1 in attachments. Thus we conclude/hypothesized that focal range was causing a low quality picture/video of the otoscope, instead of resolution. A new camera was ordered that provides up to 1ft of focal range and down to 0.17inch, with a high resolution of 2560x1440p, which is 3.6Megapixels.

Conclusions/action items:

Conduct further investigation into camera

Sam TAN - Nov 11, 2023, 3:12 PM CST

Download

Photo_on_2023-11-6_at_11.03_PM.jpg (184 kB) Figure 1

Sam TAN - Nov 11, 2023, 3:12 PM CST

Download

266a854620aadf90397981ea181528cf.JPG (331 kB) Figure 2

Sam TAN - Nov 11, 2023, 3:13 PM CST

Download

60d20739646c4b6bc628923dbfbc9ad3.JPG (142 kB) Figure 3

2023/11/14- Design 1 Camera Refinement V2

JOSE RAMIREZ - Dec 10, 2023, 10:08 PM CST

Title: Design 1 Camera Choice 2

Date: 11/14

Content by: Sam

Present: Sam

Goals: Test quality for the most recent order of endoscope camera from teslong.

Content:

attached is picture gathered with the new camera from teslong, with autofocus and 2560x1440 resolution. As can see from the attachment, compared to previous entry for older version of the camera, this camera provides a much clearer view at that specific distance, also being able to focus automatically can save time for instructors. However, with comparison to an iPhone 13 camera, as can see from earlier entry on 11/11, quality is still better in the iphone which is understandable considering the price.

Conclusions/action items:

The team decided to move on with this camera and thus remodeling was conducted even before the camera delivered. Printing is also taking place at the same time. Next step is to assemble to otoscope and invite vet students and instructors to survey for the performance of this product.

Sam TAN - Nov 14, 2023, 2:07 PM CST

Download

Screenshot_2023-11-14_at_14.04.36.png (292 kB)

2023/11/17 Focal length measurement and testing

HAOMING FANG (hfang45@wisc.edu) - Nov 29, 2023, 2:50 PM CST

Title: Design 1 focal length measurement and testing

Date: 11/07

Content by: Bobby & Sam

Present: Bobby

Goals: Measure the focal length needed and decide on the optic lens we need

Content:

The measurement was taken according to the method as described in the research note of my personal lab archive folder under "Research Notes" "Biology and Physiology". It is determined that the focal length should be around 10cm for optimal focus.

Conclusions/action items:

The team decided to move on with this plano concave lens. Printing is also taking place at the same time. Next step is to assemble to otoscope and invite vet students and instructors to survey for the performance of this product.

2023/11/30 - Testing @ Vet School

JOSE RAMIREZ - Dec 01, 2023, 1:45 PM CST

Title: Testing at Vet School(General Notes)

Date: 11//30/2023

Content by: Jose

Present: Grace, Sam, Jose

Goals: To take notes on feedback given during testing as well as well as marking down flaws that were made evident to us during testing. A more detailed and comprehensive analysis and evaluation of testing results will be done once all testing is completed.

Content:

VERBAL FEEDBACK:

- Very much like using a regular otoscope and does a good job in simulating experiencing of giving dog and examination.
- When teaching students how to use a lens otoscope a polished version of our prototype, would be preferred over their current lens otoscope.
- Very lightweight in comparison to regular lens otoscope.

GENERAL NOTES:

- Since light is not in the inside of the specula, sometimes debris can block the light but allow the lens view to see clearly.
- Need to reprint otoscope head because the specula currently use tape and is not secured very well. The specula falls off when navigating inside the ear if there is no tape attached.
- White light LED leads to some discoloration, could potentially use warm LED light instead.
- The slit in the otoscope head permits outside light to enter the camera view which causes disturbances in the video feed as well as not allowing the camera to focus.
- Some inconsistencies when it comes to camera quality specifically the camera going not being in focus. Once the camera became focused it was relatively consistent in staying in focus.
- There is a lot of Black Space on the video feed that could be cropped out or zoomed out of.

Conclusions/action items:

2023/12/4 - Summary of Testing Results

JOSE RAMIREZ - Dec 07, 2023, 6:00 PM CST

Title: Summary of Testing Results (Survey)

Date: 12/4/2023

Content by: Jose Ramirez

Goals: To create a comprehensive summary of the testing results obtained from the otoscope survey.

Content:

Link to Google Form

Link to Spreadsheet

Results from Otoscope Survey:

Demographics of respondents:

A total of 23 responses were submitted were recorded

- *Major/Career*
    - 10 of 23 (43%) were engineering students
    - 10 of 23 (43%) were apart of the Vet School
    - The rest were a Kinesiology Major, Health Promotion on Equity, and the other did not respond
- *Experience Level*
    - 11 of 23 (48%) had no experience using a otoscope
    - 12 of 23 (52%) had at least some experience
        - 4 of those 12 (17.4% of total) classified themselves as "Experienced"

Response Results:

Ear Model/Letter Reading Results

- 100% of people were able to read the symbol inside the ear model
- 100% of people were able to read the letters

***Note:* There was no time restriction and they were able to continuously able to adjust

- How well could you view the inside of the ear through the lens
    - Mean: 4.24
    - Low: 2 (frequency of 1)
- How clear was the video feed of the inside of the ear
    - Mean: 4.33
    - Low: 1 (frequency of 1)

Statistics of each aspect:

- Quality of the image on the monitor
    - Mean: 4.43

- Low: 3 (frequency of 3)
- Magnification of the ear when viewing through the lens:
  - Mean: 4.22
  - Low: 1 (frequency of 1)
- Magnification of the ear when viewing on the monitor:
  - Mean: 3.78
  - Low: 2 (frequency of 5)
- Brightness of the light source:
  - Mean: 3.52
  - Low: 1 (frequency of 1)
- Comfort of the handle:
  - Mean: 4.52
  - Low: 1 (frequency of 1)
- Size/weight of the device:
  - Mean: 4.347826087
  - Low: 3 (frequency of 3)

Biggest Takeaways/Feedback:

LED Issues:

- LED light was not bright enough at all times. This was partly due to the fact that LED was attached on the outside of the cone which was not what was originally planned. This also potentially caused for ear model blockages to not let the entirety of the light illuminate the camera view
- The white LED light might be causing some discoloration. A warm LED light might be a better alternative

Camera Issues

- The camera would have very inconsistent focus, and this would lead to very blurry footage
- There was a lot of black space on the monitor view, so the image appears very small. Magnification on the monitor view improve the viewer experience

Otoscope Body/Head

- Otoscope head has a slit that permits outside light to enter the camera view which causes disturbances in the video feed as well as not allowing the camera to focus.
- The specula can't be affixed to the otoscope head, so the specula falls off during use
- Material is kind of brittle and inexpensive so if the otoscope is dropped damages could occur

Reflection and Potential future changes to testing procedure:

Survey Questions Improvements

- Some of the Survey questions were vague and worded poorly.
- Additionally some of the questions are redundant and kind of ask the same thing

Procedure Modification

- Some participants had never used an otoscope before so they had no frame of reference to rate our prototype, so it would be wise to give them a lens otoscope and provide a frame of reference.

Conclusions/action items:

In my opinion, the testing was extremely successful despite some of its flaws. The two goals of our testing was to identify flaws/future improvements that can be made and determine how well our features meet the design specification. Both of those goals were met because we identified issues that we did not foresee in our design as well as getting a better idea of how our protype actually works.

2023/12/4-Survey Test Result

Sam TAN - Dec 04, 2023, 7:38 PM CST

Title: Result

Date: 12/4

Content by: Sam

Present: N/A

Goals: Result of the correlation test

Content:

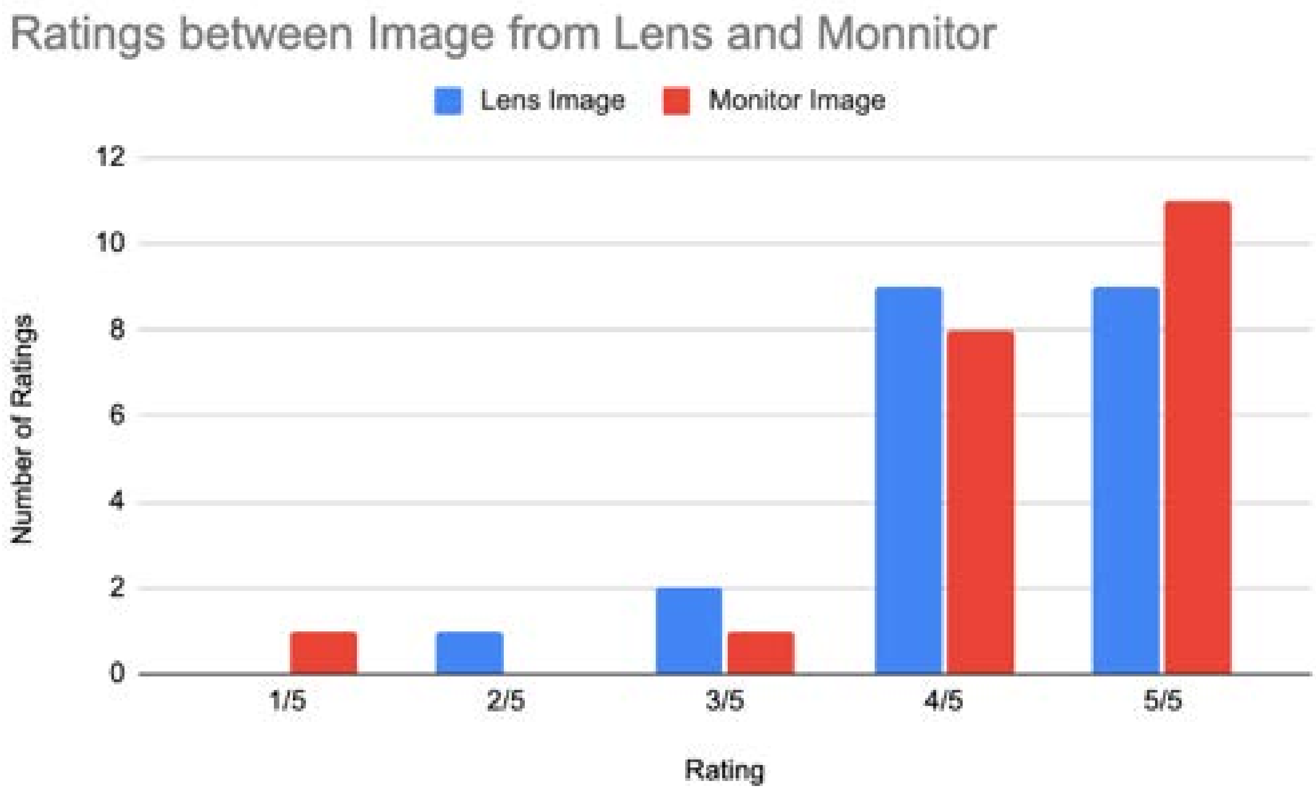
The result from the pearson's correlation test was 0.15, which the image quality did not really impacted the overall score of the otoscope.

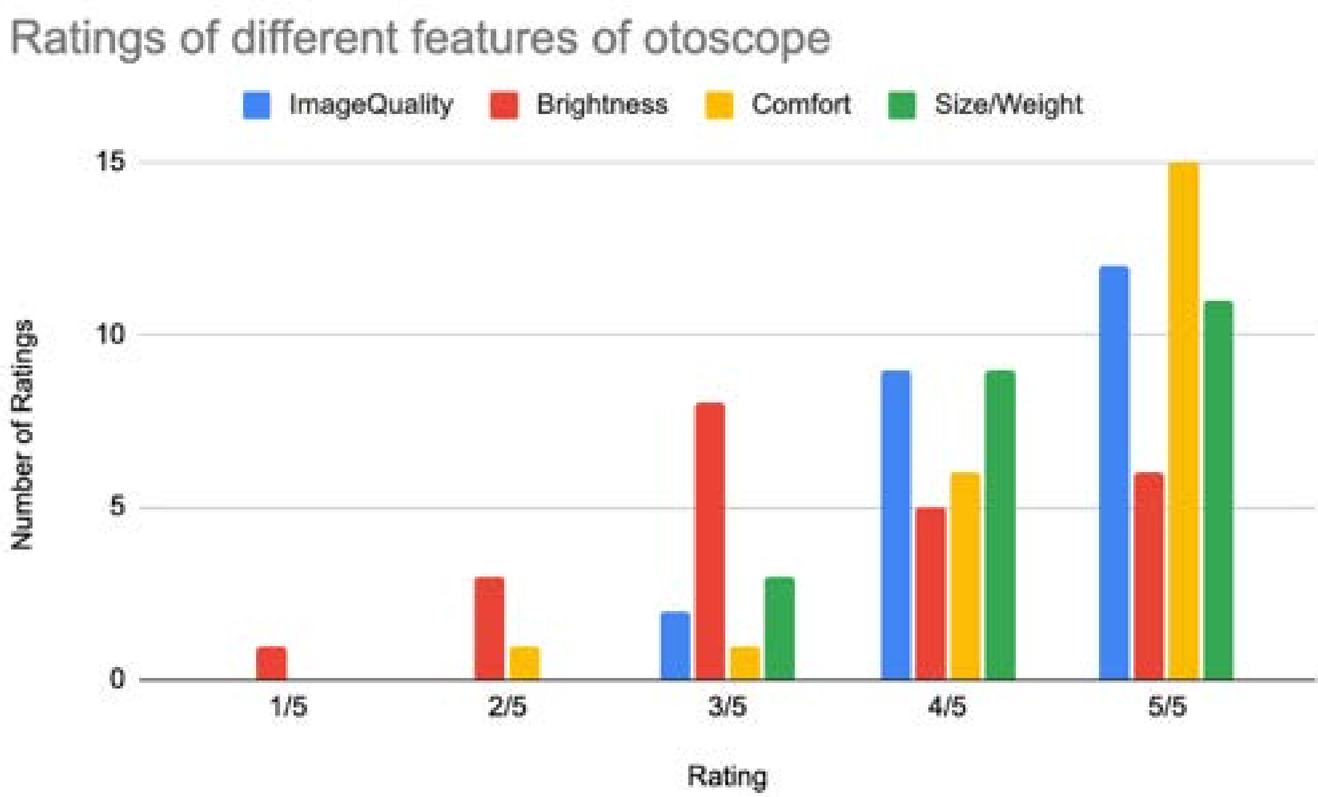
However, a fallacy was found when conducting the test.

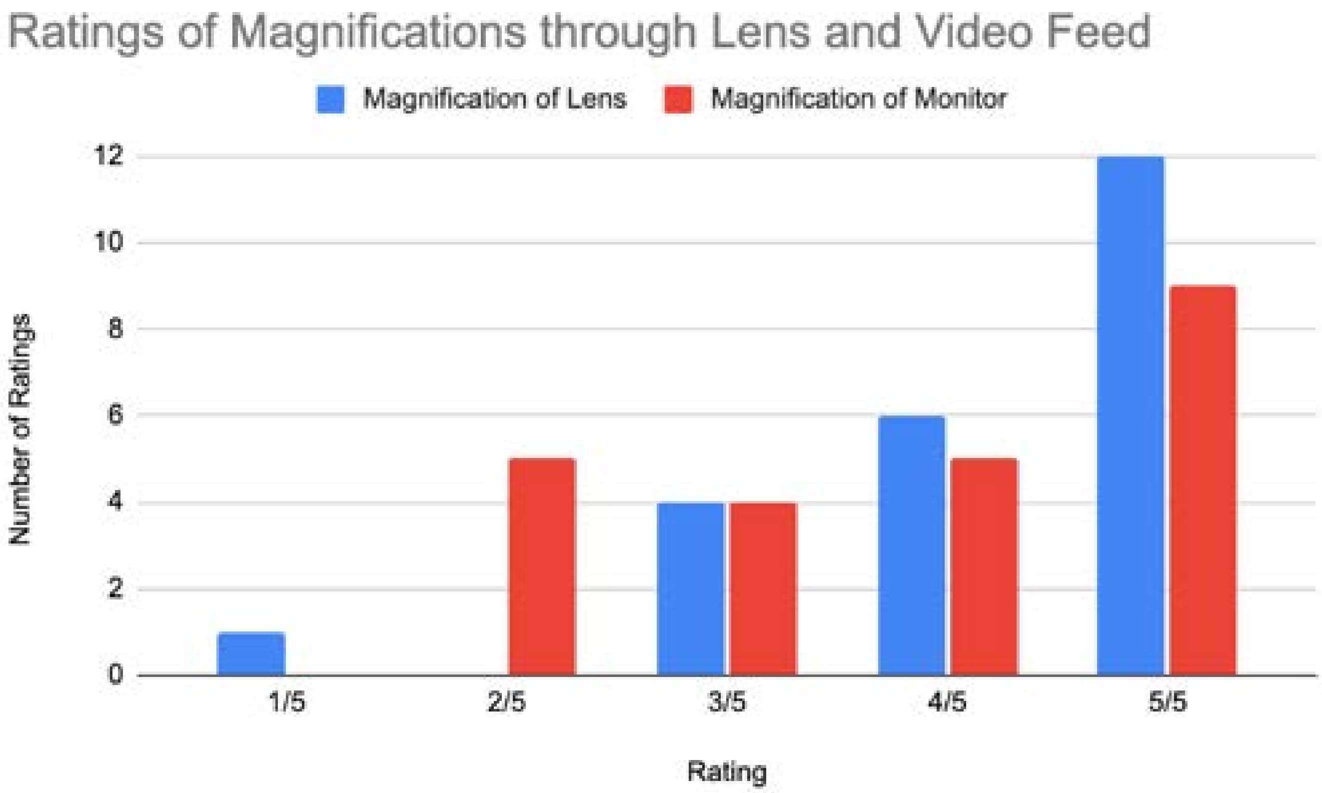
1. The rating is on a scale of 5, which all data points are integer that are within 3-5. This made it extremely hard to find any correlation because of the narrow range. Graph and data plots were extremely narrowed as well. This results in a insignificant correlation. Further research suggested that most correlation test uses data in a broader range, and data such as height, age, and forces are more suitable data examples for using the pearson's correlation coefficient and any regression analysis.

To further analyze the data collected through survey, bar graphs were generated and medians, mean, standard deviation were calculated instead of correlation coefficient. The team thought these values could better identify the success criteria of the testing protocol and determine any further discussion and improvement need to be addressed.

Three bar graphs were done, analyzing the key features of the otoscope, magnifications of the otoscope, and general lens and monitor video quality.


Ratings between Image from Lens and Monnitor
Lens Image
Monitor Image
Number of Ratings
12
10
8
6
4
2
0
1/5
2/5
3/5
4/5
5/5
Rating


Ratings of different features of otoscope
ImageQuality
Brightness
Comfort
Size/Weight
Number of Ratings
15
10
5
0
1/5
2/5
3/5
4/5
5/5
Rating



Conclusions/action items:

We can see that, in general, we score well in most categories. Noticed in the magnification graph, scores were significantly higher in lens than in monitor, this is also something we address but not solved during the designing process. Due to the adaptability of the camera and the application it uses, magnification was not possible. This fits the original intended use of the camera, which was an endoscope and not for medical procedures. Magnification in the lens score generally higher because it was built similar to the original handheld otoscope which had been proven to work better by industries. Features of the otoscope generally show a trend of having higher scores except for brightness. LED was a problem towards the end of testing that it wasn't bright enough using a 3V battery, even though the LED showed enough brightness early stage without assembly. We can also see an tie in ratings of images through lens and monitor as some people would prefer one over the other and this is completely personal.

2023/12/08 Survey histogram

Sam TAN - Dec 08, 2023, 8:06 PM CST

Title: Histogram of Survey data

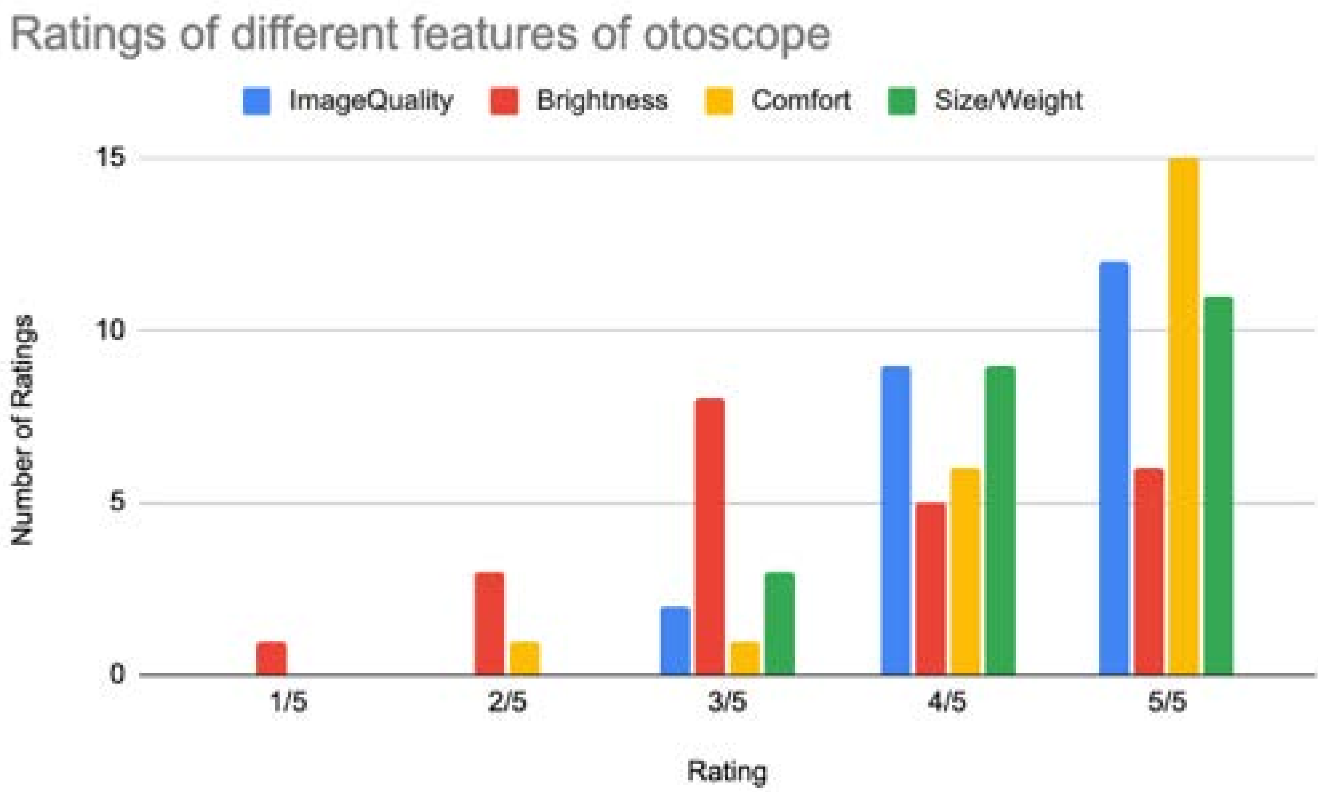
Date: 12/4/2023

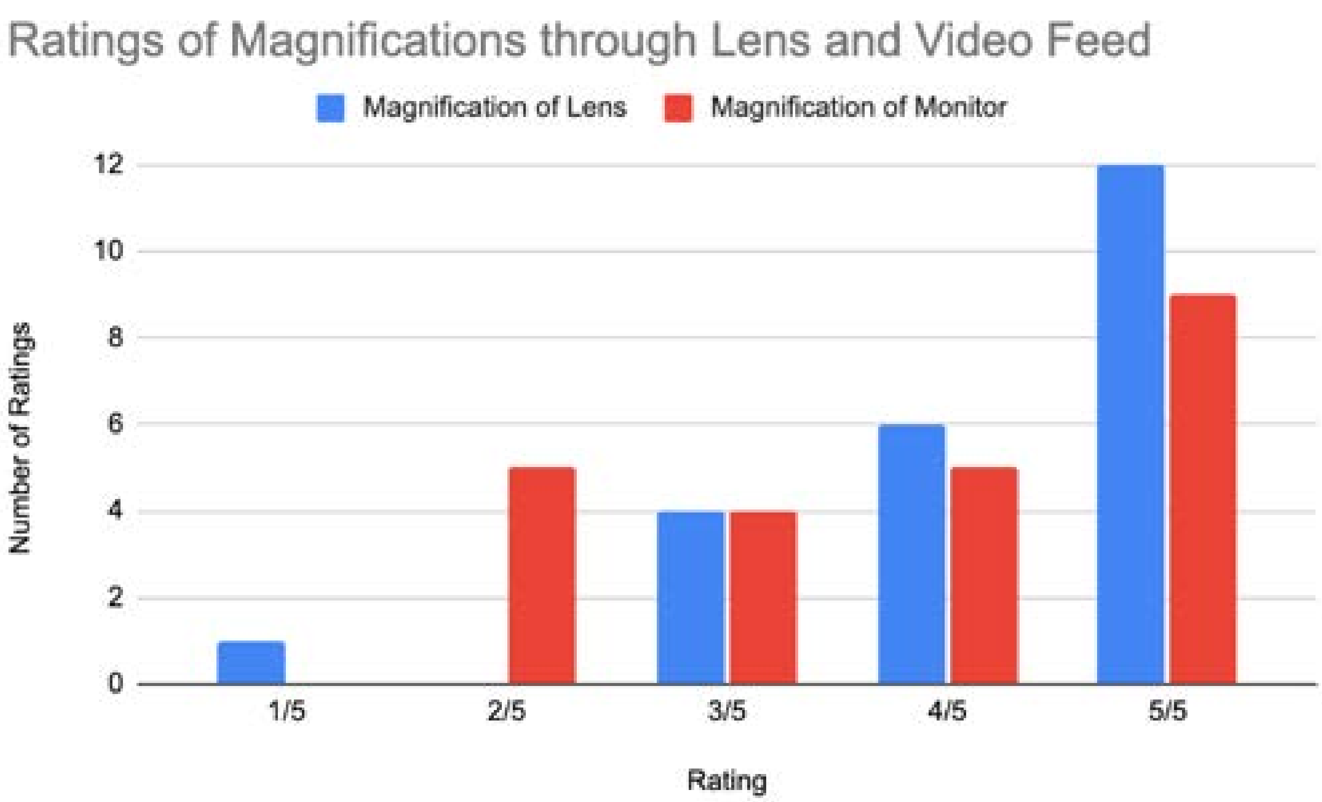
Content by: Sam

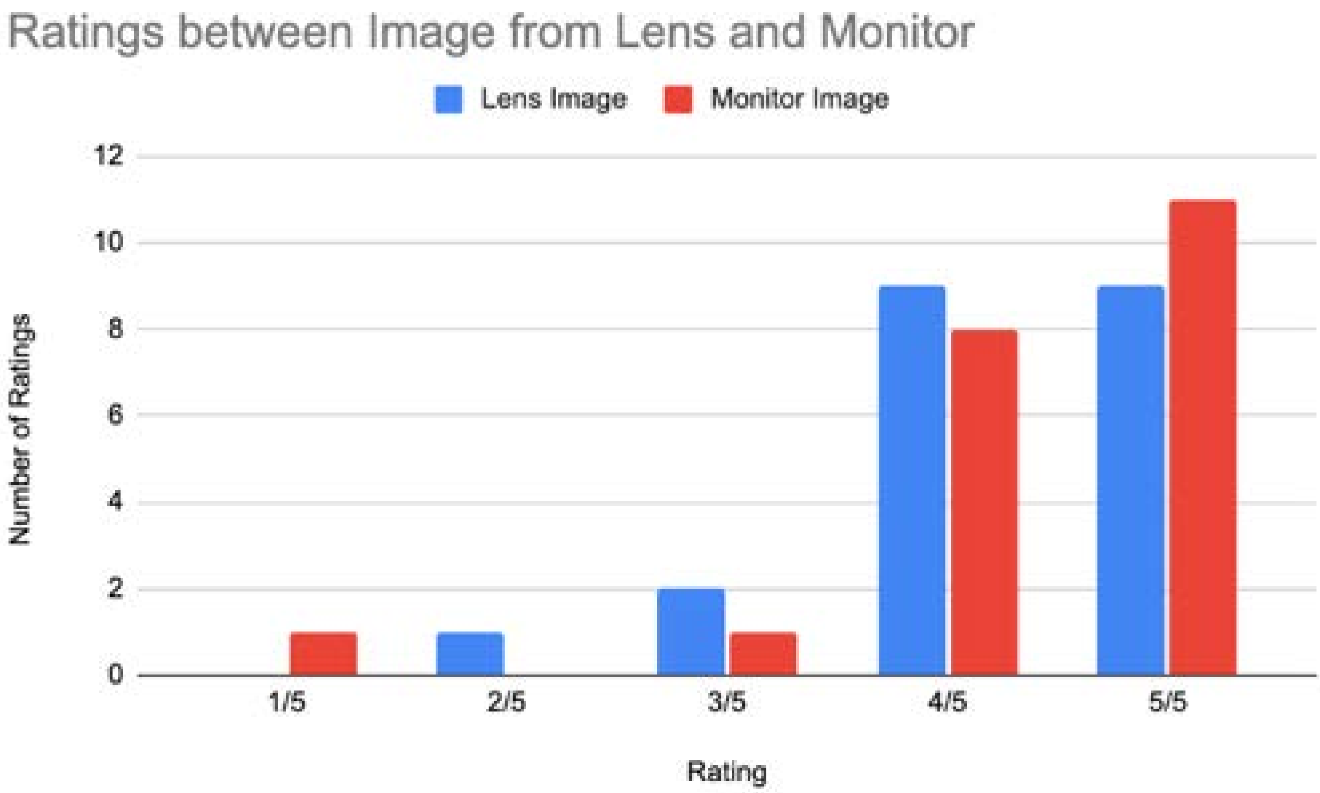
Present: N/A

Goals: Graph out the histogram of the survey data

Content:


Ratings of different features of otoscope
ImageQuality
Brightness
Comfort
Size/Weight
15
10
5
0
Number of Ratings
1/5
2/5
3/5
4/5
5/5
Rating


Ratings of Magnifications through Lens and Video Feed
Magnification of Lens
Magnification of Monitor
12
10
8
6
4
2
0
Number of Ratings
1/5
2/5
3/5
4/5
5/5
Rating



Conclusions/action items:

In image 1, we can see that brightness show a trend of score 3 which indicates that brightness was a issue in the otoscope. This correspond with what our method testing showed. We also see a good positive trend in the other three criteria. Size and comfort has the most in the top tiers meaning that our device is significantly better than the current otoscopes. In image2, we can see a somewhat even distribution in magnification of monitor but a positive trend in the magnification of lens. This was also something we can improve on by designing a better camera platform to allow magnification. Image quality in both lens and monitor are aligning well, with most survey answers in either 4 or 5 out of 5 which is what we hoped to achieved as well.

2023/12/10- Pearson's Correlation Fail

GRACE BOSWELL - Dec 10, 2023, 2:32 PM CST

Title: Pearson's Correlation Fail

Date: 12/10/2023

Content by: Grace

Present: N/A

Goals: Document why the team did not use Pearson's correlation test.

Content:

The team decided not to use the person correlation test because we decided it did not apply to our testing for various reasons. Source [1] is from Pennsylvania State University and it is from a statistics class they teach. It gives common uses and misuses of correlation coefficients.

Below planning, the team did not look into the specific requirements needed to get an understandable value. The first issue that the team encountered was that the variation in the rating was too small. If we were to do this assessment of data we would have needed the survey to go from 1-10 or even 1-100.

Another reason the team discovered through the source is that caution should be taken when trying to interpret correlation through a large number of variables. In our survey, we had many different aspects to rate which would be difficult to correlate them all to each other.

Also, correlation does not imply causation, and the team would need to work on understanding and developing data so that we would not infer that one thing caused another.

References:

[1] “18.5 - Use and Misuse of Correlation Coefficients | STAT 509,” *online.stat.psu.edu*, 2023. https://online.stat.psu.edu/stat509/lesson/18/18.5 (accessed Dec. 10, 2023).

Conclusions/action items:

The team wishes this test would have worked to develop our data on a deeper level. If we were to do this experiment again we would take longer to develop a survey that would give us helpful data. Another idea the team had was to set up questions and a rating system similar to that of our design matrix. This would have been a good way to compare it to our original design and our improvements.

2023/12/10- Drop Test Fail

GRACE BOSWELL - Dec 10, 2023, 2:42 PM CST

Title: Drop Test Fail

Date: 12/10/23

Content by: Grace

Present: N/A

Goals: To understand why the team did not put drop test data on the poster or in the final report.

Content:

The drop test data and procedure are listed in the protocol. This test was not placed on any documentation other than in the notebook. There are a few reasons why the team decided on this. While completing the test the team decided on the damage done and gave it ratings. This type of testing is biased and should not be shown. Also, there was not a clear rating system, and not all parts of the final design were in the otoscope when it was dropped.

This test allowed the team to decide on future work that would help the next team with this project. The first prototype did not have a screw that attached the bottom left side to the right side of the otoscope. It just had tiny supports that broke instantly after the first drop. Our next prototype did add a screw which added stability. Another piece of future work would be to print with a higher-quality material. A higher quality material would be less likely to break compared to pla. We also could have made the supports larger.

Conclusions/action items:

Overall this test was inconclusive in giving the team usable data to display to those looking at our project. If given more time the team would come up with more tests that accurately showed ways to get more quantitative data.

Preliminary Product Design Specifications: 9/22/23

Title: Preliminary Product Design Specifications

Date: 09/22/23

Content by: All

Present: N/A

Goals: To all our client and advisor to see our plan for the functionality of the device and its specific requirements it should follow.

Content:

Dual Handheld and Video Otoscope - BME 200/300 Section 310

Product Design Specifications

September 21, 2023

Team: Grace Boswell, Sam Tan, Bobby Fang, Jose Ramirez, Declan McHugh, and Zakki Mirza

Client: Dr. Lara Tomich

Advisor: Professor Justin Williams

Function:

A typical handheld otoscope consists of three main parts: head, tail, and the speculum. The speculum is a thin tube that inserts into the ear canal of animals with a light source at the tip. This part of the otoscope is designed to be able to comfortably create light pathways to go through and direct lights into the head component of the otoscope. The head of the otoscope is a box with a magnifying lens, which is usually convex, that projects a virtual enlarged image of the ear canal to the observer. The tail of the otoscope is for holding, and storage for camera and other essential processing components of the otoscope. Video otoscopes come in a variety of designs. Without the need of a magnifying glass, a video otoscope can be smaller in size. The Dual Handheld and Video Otoscope is needed to integrate functions of video otoscope to a typical handheld otoscope for distant viewers. While maintaining the features and the three main parts of a handheld otoscope, a digital camera is needed to feed live.

Client requirements:

- The otoscope resembles features of a traditional handheld otoscope (lenses)
- The otoscope has video relay ability
- External Light Source
- Maintain expenses below the budget
- Capable for using currently existing speculums

Design Requirements:

1. Physical and Operational Characteristics

   a. *Performance requirements:* The redesign of the handheld otoscope must meet basic otoscope features, this includes: allow light to emit, reflect, and gather back to the viewer. The video relay to a distant viewer must be stable, smooth. Although no requirements from the client, the resolution and framerate of the camera should maintain industry specification for a video otoscope at a sensor resolution of 1280 x 1024 and frame rate of 30 FPS [1].

   b. *Safety:* During student examination, a trained handler or veterinary technician should also be present all the time of the examination to assist with collecting data and analysis on performance. This can be the exam instructor as the distant viewer or someone who is familiar with the process and the device. This is to avoid injuries for both students and the animal subject during the process. The otoscope should also not consist of exposed electrical components and potentially sharp edges that could cause harm to both student and animal subject [2]. Users or students need to check the basic functions and each part of the otoscope to make sure the otoscope is in functional shape and each component on the otoscope is working to their intended function only, prior to the use of animal subjects and handled with care to avoid animal abuse. Users or students also need to consider examination duration to avoid overheating from the light source and possible damage to camera functions.

   c. *Accuracy and Reliability:* Magnifying lenses of the otoscope should accurately enlarge the real image. Image through the lens should resemble similar details to the camera captured images. A minimum of 50 percent accuracy should be achieved when two images overlap and are compared.

   d. *Life in Service:* Otoscopes tend to have long lives in service, the product should run 10,000 exams without major failures. The battery life should be sustained one day in a vet clinic each time fully charged if batteries are used.

   e. *Shelf Life:* Power off, disconnect all electrical connections when not in use and store properly. If batteries are used, store them in a dry environment. Storage temperature limitation between -20℃ and 55℃, humidity limitation of 10% and 95% [3].

   f. *Operating Environment:* The otoscope operates between the temperature limitation of 10℃ and 49℃, humidity limitation of 30% and 90%, atmospheric pressure limitation of 500hPa and 1060hPa [3].

   g. *Ergonomics:* The device will feature a comfortable grip, intuitive controls, and an optimally balanced weight distribution to reduce strain on the user's hand and wrist. The product should not be bulky and avoid sharp edges and corners for user comforty. Additionally, the ergonomic design will take into account the ease of cleaning and maintaining the otoscope to uphold the highest standards of hygiene in clinical settings.

   h. *Size:* The size of the otoscope will be based on the size of the otoscope gifted to us by the client. The brand of the otoscope is Welch Allyn Veterinary Pneumatic Otoscope [4]. Its measurements are 196.48 mm in length, 24.5 mm long on the top head, and 30.92 mm in diameter. Different sized ear speculum are placed at the front of the otoscope. This device will be portable because it will be used for everyday use.

i. *Weight:* This device will range from 0.453592 to 0.907185 kilograms based on the materials chosen for the camera and video transmission to the monitor. This device needs to be lightweight due to students having to carefully examine dogs with it.

j. *Materials:* 3D printers from the UW maker space will be used to print 3D prototypes of the product [5]. The printing method chosen will most likely be FDM/FFF methods. A laser cutter from the maker space will be used ideally. The laser cutter will be the Universal ILS9.150D [6]. A ESP-32 CAM module along with a 75mm OV2640 is the current solution for the replacement of the digital camera portion of the tail [7].

k. *Aesthetics, Appearance, and Finish:* The appearance and finish should remain mostly similar to currently in used ones for recognizability.

2. Production Characteristics
   a. *Quantity:* One or two. More upon request by client.

   b. *Target Product Cost:* Cost of a typical video otoscope on the market is relatively inexpensive, around $25.99 to $49.99 [8]. Although the client does not have a target cost of the product, maintaining the cost relatively close to the market price is ideal and friendly to all labs and teaching faculties.

3. Miscellaneous
   a. *Standards and Specifications:* The product will not be mass produced, so there's no manufacturer-required standards. According to the FDA otoscopes fall into the generic category and do not need FDA clearance. Manufacturers are required to register their device. [9]

   b. *Customer:* There is a slight preference for the camera feed to be wirelessly connected to the monitor/viewing device, however it is completely adequate to have a wired connection for the video feed. Additionally, a recording function to be able to review footage is desirable. Lastly, there is a preference for having the viewing experience be on a monitor rather than a cellular device.

   c. *Patient-related concerns:* The otoscope cannot harm the patient in any way and must be as comfortable as possible for the user and patient while being used. The patient should react the same way as it reacts to previously used otoscopes.

   d. *Competition:* Many video otoscopes and handheld otoscopes are available to purchase online. Their price varies based on functionality. However, these designs are often for human use, options for animal otoscopy are not often available to pick and choose from. Out of those available, some are either handheld otoscopes with no video feature, or video otoscopes that aren’t handheld for student examination. One competing design is the Wispr Digital Otoscope [10]. This video otoscope is a close replacement for the handheld otoscope, and comes with video function in replacement for the lenses. However, this does not satisfy the lens requirements and is extremely costly considering the teaching faculty and budget for animal exams.

References:

[1] DE500 Digital Video Otoscope https://fireflyglobal.com/de-500-usb-digital-ear-scope/

[2] R. Touroo, K. Baucom, M. Kessler, M. Smith-Blackmore, Minimum standards and best practices for the clinical veterinary forensic examination of the suspected abused animal, Forensic Science International: Reports, Volume 2, 2020, 100150, ISSN 2665-9107, https://doi.org/10.1016/j.fsir.2020.100150.

[3] 3.5 V Diagnostic Otoscope and Ophthalmoscope, User Manual, Multi-Language https://www.hillrom.com/en/products/pneumatic-otoscope-veterinary/

[4]“Welch Allyn Pneumatic Otoscope,” *MedicalDeviceDepot.com*. https://www.medicaldevicedepot.com/Welch-Allyn-Pneumatic-Otoscope-p/20260.htm?dfw_tracker=3918-15657&gclid=Cj0KCQjwrs2XBhDjARIsAHVymmRxW4csdg1rOvKVI3eqJ1oMAlgIBif8N3RJeI2STa3oPLlnxopudMsaAkf4EALw_wcB (accessed Sep. 22, 2023).

[5] “3D Printing at the Makerspace.” *UW Makerspace*, https://making.engr.wisc.edu/3d-printing-the-makerspace/.

[6] “Ils9.150D Platform.” *ULS*, https://www.ulsinc.com/products/platforms/ils9150d.

[7] ESP32 CAM Camera Module With OV2640 Kit DIY 2.4 GHz WiFi Development Module 8MB PSRAM 66 2MP ESP32-S ESP32-CAM

[8] Soares, C., Clifton, W., & Freeman, W. D. (2019). Use of Handheld Video Otoscopy for the Diagnosis of Acute Otitis Media: Technical Note. Cureus, 11(9), e5547. https://doi.org/10.7759/cureus.5547

[9]“Product Classification,” *www.accessdata.fda.gov*, Sep. 18, 2023. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpcd/classification.cfm?ID=ERA (accessed Sep. 21, 2023).

[10] Wispr Digital Otoscope. https://www.wiscmed.com/product/wispr-digital-otoscope-model-wispr24701/?gclid=Cj0KCQjw9rSoBhCiARIsAFOiplmDF1Le_byTSON8m1-Bulv5Z8tPAztulL8Drj8UEoRjRisfjVB1SewaAoPUEALw_wcB

Conclusions/action items:

While doing the preliminary design specifications, it has helped the team decide and understand the requirements we need to follow to satisfy the client and to keep their patients safe. Based on these requirements we will begin drawing sketches of various designs and use the design matrix to decide on a final design. Research will also continue on what camera we will use and where it will be placed on the otoscope.

Preliminary Presentations: 10/06/23

GRACE BOSWELL - Oct 09, 2023, 7:51 AM CDT

Title: Preliminary Presentations

Date: 10/06/23

Content by: All

Present: All

Goals: To develop a well-thought-out presentation that allows our advisor and peers to see our progress.

Content:

https://docs.google.com/presentation/d/1OIaMBmmDWZu-CwK7InJavlyXxe-Qr5kYOtZoxMJh6Bk/edit#slide=id.g286188e4431_0_187

Conclusions/action items:

This presentation took a lot of effort to put together and it was a lot of pressure for most of us to present it in front of many people. We were able to educate those watching through words on the screen, verbal descriptions, and pictures. The team plans to meet with the client soon because she was unable to attend the meeting and give her an update on our next steps. Some other things the team needs to accomplish are completing the preliminary report before its due date on 10/11. This report will not be fully done because we do not have a prototype to test yet.

Preliminary Report: 10/11/23

Declan McHugh - Oct 10, 2023, 7:24 PM CDT

Title: Preliminary Report

Date: 10/11/13

Content by: All

Present: All

Goals: To complete a document that allows readers to see our design process, final design plan, and how it was tested in a well-organized manner.

Content: Attached - Preliminary Report pdf

Conclusions/action items:

Based on this report the team may have to decide which design we might focus more on, due to the complex nature of the 1 way mirror inside design 1 and due to the need for an extremely small camera which is used within design 3. This decision will most likely come up during our prototyping phase when we truly see the complexity of the various designs. After designing we will need to find ways to test these items in a quantitative way. This will be difficult because are device is quite qualitative.

Sam TAN - Oct 11, 2023, 3:30 PM CDT

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Preliminary_Report.pdf (562 kB)

Poster and Poster Presentation Script: 12/10/23

GRACE BOSWELL - Dec 10, 2023, 1:18 PM CST

Title: Poster and Poster Presentation Script

Date: 12/10/2023

Content by: Grace

Present: N/A

Goals: To document the work done on the poster.

Content:

The image below is the final poster the team printed and presented at the poster presentations on 12/08. I would say it went successfully. One issue the team had was we were at the end of a hallway so we did not get many people walking down and talking to us. One advantage of being at the end of the hallway was that it was quieter which made it easier to talk to the people who did come by us. The team overall still could use work on presentation skills.

Script: The team decided to make a script at our team meeting on 12/07/2023 so other group members could easily read what the others were going to discuss. This helped us make sure there was no repetition of information, which still did occur because there was not much background/motivation to discuss and the abstract overlapped with some of these parts. This script also helped the team practice because we had something to assist us while practicing.

Zakki

A dog's ear consists of the inner, middle, and outer ear and the purpose of the otoscope is to allow the user to view the middle ear and examine it.

A beam splitter allows a particular area of interest to be viewed through two faces of the cube. One face is 180^0 in the middle of the cube, and the other face is 90^0 about the middle of the cube. A semi-reflective surface at a 45^0 to the horizontal allows for light to be reflected and for light to pass through from both POVs.

A traditional handheld otoscope consists of a battery, light source, magnifying lens, and specula, and a video otoscope has the same features except a screen and camera replace the lens.

PDS:

Our product needs to include the traditional otoscope lens view and video relay capabilities, an external light source, it has to be around 200 mm in height and around 31 mm in handle diameter (to maintain consistency with existing handheld otoscopes), it has to be under 2 lb in weight, easy to use for novice veterinary students, and be similar to otoscopes used by currently practicing students.

Bobby:

The three main motivations for our design are to make otoscopic techniques easier to learn for novice veterinary students, to make otoscopic examinations accessible to animals who are far from veterinary professionals, and to potentially expand the technologies to human health as well. To do that, our problem statement is that: Current handheld otoscope designs in veterinary practice either cannot stream live videos of examinations to remote devices or feature video functionality instead of the traditional lens view, which is essential for simulation training. The team aims to develop a handheld otoscope that combines live video capabilities, enabling faculty members to assess student-performed examinations in real time.

Sam:

The otoscope's main body is separated into three main components, each model individually in Solidworks. The main reason for this is for better and easier assembly.. Thus the team came up with a way to enclose accessories, which is to split the otoscope into a symmetrical left and right part. The idea is that when all the accessories parts are put in place in one half, the other half can snap right onto the first half and screws can be used to securely tighten both half with all accessories inside. The battery is placed in the handle and needs to be changed if it runs out. However, removing the entire half is not ideal because that results in the exposure of all accessories inside, for example, the beam splitter and lenses, when reassembled which causes potential damage to these optical components. Due to this consideration, one-half of the otoscope is split into a top part and a bottom part. The top part retains the features of the symmetrical part and is screwed together permanently which is not designed to reopen once closed but able to be opened if any optical part such as the beam splitter or lens needs to be changed. The bottom part acts as a case for the battery and can be taken off very easily similar to a TV remote if a battery change is needed. After all, parts are finalized on Solidworks, the STL file is taken to the MakerSpace of UWMadison to print on the ultimaker. The printed pieces are assembled to create the final prototype.

Jose:

Our testing consisted of giving our prototype and ear model to participants and asking them to each test out its functionality. These participants ranged from engineering students, vet students, veterinarians, and professors, all with different levels of experience

with the otoscope
We then asked them to fill out a survey that was designed to identify flaws and potential improvements in our prototype. We asked them to rate each aspect of the prototype on a scale from 1 to 5. The aspects we tested for were the lens magnification, the quality of the image on the monitor, the brightness of LED, comfort, and size/weight.
Just as importantly, we also made sure to record their verbal feedback as they were testing out our prototype.
We also tried to gauge from the more experienced users of an otoscope how the general "feel" of our prototype compared to the actual lens otoscope.
Some of the issues we identified from our testing:
Were that the brightness of the LED was underwhelming which is exemplified in its low average score of three
Additionally, there was inconsistency when it came to camera focus when the otoscope was inside the ear model
Lastly, the specula wasn't perfectly affixed, so it had a tendency to become loosened
Now I'll pass it off to Grace who will further expand upon some of the conclusions we were able to draw from our results.

<u>Grace</u>

Based on our testing the team has concluded the following results. As shown above, the magnification of the lens was rated higher than the monitor. This was not achieved as the team excepted from the PDS. We wanted the magnification to be as similar as possible for the lens and monitor for optimal learning.
Image quality was rated higher for the monitor, this aligns with the PDS because our client wanted a device with image quality similar to a handheld otoscope.
The PDS also required the prototype to be comfortable to hold and weigh less than 2 pounds.
Overall 76.9 percent of participants preferred the prototype for teaching compared to a handheld otoscope. To increase this percentage the team has laid out future work.
To begin the function of the LED requires improvement due to its location on the specula and its brightness. Inside the otoscope, the wiring is poorly oriented which causes the camera to shift, this will be improved. The team could potentially purchase a camera where the focus can be adjusted manually.
To improve the magnification of the monitor a computer program could be found that allows a user to zoom in and out. The final change would be to print with a higher-quality material to avoid an unsmooth surface on the handle of the otoscope.

Conclusions/action items:

The page is crucial to the information presented at the final poster presentation and relates to our final deliverables. The next steps include looking over the rubric for the final notebook and final report to make last-minute touches to improve our work.

Final Report: 12/13/23

Sam TAN - Dec 13, 2023, 7:56 PM CST

Title: Final Report

Date: 12/13/23

Content by: Grace

Present: N/A

Goals: To report our semester-long work clearly for our advisor, client, and other students to see.

Content:

Attached

Conclusions/action items:

Thanks for a semester of hard work

Sam TAN - Dec 13, 2023, 7:53 PM CST


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Biomedical Engineering
UNIVERSITY OF WISCONSIN-MADISON

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Final_Report.pdf (5.06 MB)

Progress Report 1: 09/14/23

GRACE BOSWELL - Sep 14, 2023, 11:00 AM CDT

Title:

Date: Progress Report 1

Content by: Whole Team

Present: Whole Team

Goals: To update our client and advisor on our progress during the first week.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 1

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 9/7-9/14

Team:
Sam Tan stan68@wisc.edu
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Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement
The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update
First group meeting was conducted, team members were introduced to each other and team roles were assigned. Individual responsibilities are clarified. The communicator will reach out to the client this week. Client meeting will be held Thursday September 14th 2023 to get more insights into the project and introduce the team to the client.

Summary of Team Role Accomplishments

- Bobby (Team Leader)

- Worked on the progress report.
- Conducted literature search on relevant fields of study.
- Conducted research on competing products research.

- Grace (Communicator)
- Communicated with Professor Williams about the group's availability on Fridays.
- Communicated with the client by introducing the group and sending the website link.
- Developed questions to ask the client at our meeting.
- Sam (BSAC)
- Created shared file spaces and started researching competing designs, patents and standards.
- Declan (Co-BWIG)
- Generated questions for our client.
- Researched the market for the product.
- Added project summary to website.
- Jose (Co-BWIG)
- Uploaded and formatted team photo to website.
- Zakki (BPAG)
    - Started researching anatomy/physiology of ear and existing designs
    - Brainstorming potential resources we may need

Weekly/Ongoing Difficulties

- N/A

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
- To conclude the client's needs and requirements after the client meeting.
- Draw out an initial plan on the designing of the product.
- Discuss and assign research roles with the team.
- Further research.
- Grace (Communicator)
- To email the completed progress report to Professor Williams and Dr. Lara Tomich.
- To research physiological and anatomical structures of the ear and competing designs.
- Sam (BSAC)
- Competing Design research and physiology/anatomy research.
- Start thinking about project design specifications and design matrix
- Declan (Co-BWIG)
- Brainstorm design ideas and begin materials research.
- Follow up on new questions generated from the first client meeting.
- Jose (Co-BWIG)
- To upload progress report to the project website upon its finalization
- To begin research and formulate a better understanding of project specifications
- Zakki (BPAG)
    - Continue researching physiology/anatomy of the ear and existing otoscope designs
    - Begin brainstorming potential designs and start brainstorming materials
    - Communicate with team ahead of time about what materials we will need

- Team
  - Further research on:
- Competing Products
- Product Uses
- Materials
- Relevant Medical Topics
  - Brainstorm many ideas to then research their practicality
  - Start to fill out Product Design Specifications based on questions answered at the first client meeting.

Activities

Team Member	Task	Time (hrs)	Total to date
Grace Boswell	Emailed Professor Williams and client. Completed research on relevant topics.	**1**	**1**
Sam Tan	Problem statement, research on anatomy. Communicate with the client.	**1**	**1**
Jose Ramirez	Uploaded and captioned team photo onto the website.	**.5**	**.5**
Bobby Fang	Worked on the progress report. Conducted literature search on relevant fields of study. Conducted research on competing products research.	**1**	**1**
Declan McHugh	Wrote Project summary, filled out personal and team sections of Progress Report, and Researched various related topics to gain a better understanding of products goals.	**.75**	**.75**
Zakki Mirza	Researched anatomy/physiology of ear and existing otoscope designs, brainstormed questions for our client	**0.5**	**0.5**
Team	Assigned Team Roles and took team photo.	**.25**	**.25**

Expenses: $0

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/29		0%	No
Preliminary Presentations	10/06		0%	No
Preliminary Deliverables	10/11		0%	No
Show and Tell	11/03		0%	No
Poster Presentations	12/08		0%	No
Final Deliverables	12/13		0%	No

Conclusions/action items: While completing the progress report we realized everyone needs to complete additional research to understand this project. During the next week, we are going to complete additional research based on our client meeting questions/answers. We also need to start our product design specifications which is due next week.

Progress Report 2: 09/21/23

GRACE BOSWELL - Sep 21, 2023, 4:05 PM CDT

Title: Progress Report 2

Date: 09/21

Content by: All

Present: N/A

Goals: To update our client and advisor on the progress of our project.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 2

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 9/15-9/21

Team:
Sam Tan stan68@wisc.edu
Team Leader / BSAC
Haoming (Bobby) Fang hfang45@wisc.edu
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Communicator
Jose Ramirez jsramirez3@wisc.edu
BWIG
Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement
The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update

The team has completed individual research that will be compiled into the preliminary design specifications. This research is based on the questions asked at the first client meeting and research will continue after the second client meeting on 9/21 to see the otoscope and video otoscope in person. Members have begun preliminary sketches of the device and have designed variations based on wired and wireless video screening.

Summary of Team Role Accomplishments

- Bobby (Team Leader)
  - N/A
- Grace (Communicator)
  - Completed research on the functions of an otoscope and video otoscope
  - Attended client meeting last week to understand their expectations and ask questions
  - Communicated with client about another meeting on 9/21 to see the otoscopes in person
- Sam (BSAC)
  - Research on anatomy
  - Met with client and asked questions
  - Created initial sketch of possible design ideas
- Declan (Co-BWIG)
  - N/A
- Jose (Co-BWIG)
  - Attended meeting with client to develop a better understanding of design specifications
  - Conducted research on endoscopic/otoscopic cameras that could potentially fit the design specifications.
- Zakki (BPAG)
  - Got a better understanding of the clients needs - helped with brainstorming design ideas
  - Continued research on different types of otoscopes.

Weekly/Ongoing Difficulties

- N/A

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
  - Organize meeting with client
  - Conducted further researches on potentially useful hardwares on the design, including digital cameras and pentaprisms
  - To finish the project design drawing
- Grace (Communicator)
  - To meet with the client at the Vet School to see the otoscopes in person
  - To email the completed progress report to the client and advisor
  - To add the completed progress report to our lab archives
  - Add design ideas to lab archives
- Sam (BSAC)
  - Meet with client at Vet School
  - Design Sketches
  - Research
- Declan (Co-BWIG)
  - N/A
- Jose (Co-BWIG)

  - Upload completed team documents to team website
  - Continue to conduct research
  - Begin preliminary design sketches
- Zakki (BPAG)
  - Continue any more needed research
  - Begin working on potential designs after meeting with the client a second time
  - Start thinking about what we may need to buy for prototyping

- Team
  - Client Meeting #2
- Generate more questions
- Take measurements and photos of otoscope
  - To complete the PDS

Activities

Team Member	Task	Time (hrs)	Total to date
Grace Boswell	Communicated with client and advisor Researched Worked on progress report	**1.25**	**2.25**
Sam Tan	Design Research/Sketches	**1**	**2**
Jose Ramirez	Camera Research	**1**	**1.5**
Bobby Fang	Research/Design	**1**	**2**
Declan McHugh	N/A	**0**	**.75**
Zakki Mirza	Continue research on otoscopes	**0.5**	**1**
Team	Met with the client and advisor	**1.5**	**1.75**

Expenses: $0

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/29		0%	No
Preliminary Presentations	10/06		0%	No
Preliminary Deliverables	10/11		0%	No
Show and Tell	11/03		0%	No
Poster Presentations	12/08		0%	No
Final Deliverables	12/13		0%	No

Conclusions/action items:

While doing the progress reports it helps the team realize what our priorities have been and how we may improve them to be more productive in the following weeks. This week many of the team members have completed research and we will continue to do so after the second client meeting. The next thing we will work on is the PDS because that is due on 09/22. We will also continue to research competing designs and draw/ plan out own for the design matrix.

Progress Report 3: 09/28/23

GRACE BOSWELL - Oct 01, 2023, 1:22 PM CDT

Title: Progress Report 3

Date: 09/28

Content by: All

Present: All

Goals: To allow our client and advisor to see our progress.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 3

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 9/22-9/28

Team:

Sam Tan stan68@wisc.edu
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Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement

The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update

Over the past week the team has completed two large aspects of the design. First the work was divided for the preliminary product description. This allowed us to divide and conquer the work. Then we came together to discuss what everyone wrote and fixed the mistakes. The second task we tackled was the design matrix. Four of the team members met to discuss our three top designs and we gave them ratings based on different criteria that were important to the client. Based on this information the team is beginning to look at different materials we will need to purchase to complete our prototype and final design.

Summary of Team Role Accomplishments

- Bobby (Team Leader)
  - Completed client meetings, and gained valuable insights into customers' need
  - Worked on one design matrix
  - Worked on design matrix criteria
  - Completed the design idea of the add-on module
  - participated in the scoring of the designs
- Grace (Communicator)
  - Successfully scheduled a second client meeting and met with the team at the Vet school
  - Worked on the design matrix
  - Helped complete the PDS last week
  - Measured dimensions of the given otoscope
  - Worked on status updates and timeline
- Sam (BSAC)
  - Second Client Meeting at Vet School
  - Finalized first design sketch idea
  - Design Matrix
  - Research on one-way mirrors, light ray movements, 3D printing methods, and camera choices.
- Declan (Co-BWIG)
  - Created 3D model of specula cone with a spot for camera-based camera measurements in product research (will need to be edited to perfectly fit the camera we buy)
  - Researched specula material
  - Researched 3D printing materials and strategies to reduce breakage and best resemble a specula
- Jose (Co-BWIG)
  - Created a drawing of the camera design with expected measurements
  - Worked and provided input on the design matrix
  - Conducted a little more research on cameras
- Zakki (BPAG)
  - Made edits on the design matrix document
  - Continued researching existing relevant camera specifications

Weekly/Ongoing Difficulties

- Camera Choice

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
  - To arrange further meetings with the team members to set up the plan to build the prototype
- Grace (Communicator)
  - To continue communicating with the client and advisor
  - Work on preliminary presentation

- Sam (BSAC)
  - Preliminary presentation
  - Start thinking about ordering materials
  - BSAC Meeting
- Declan (Co-BWIG)
  - Take Intro to Machining (and retake Intro to Shop Tools if needed) in order to use a sander to smooth out rough edges of the design if needed
  - Research 2.5mm camera data cable types as well as compatibility with products capable of wifi and Bluetooth transmission.
  - Take Intro to Electronics to learn to be able to get power to the transmission module and camera without the need for an external wire.
  - Possibly decide on a camera to buy by the end of the week.
- Jose (Co-BWIG)
  - Begin the creation process of the preliminary presentation
  - Upload all relevant documents to the project website
- Zakki (BPAG)
  - Continue researching potential camera systems/specifications that we may use
  - Work on the preliminary presentation
  - Communicate with team about any materials we may need to purchase

- Team
  - Work on Preliminary Presentation
  - Finalize Design idea
  - Order needed materials

Activities

Team Member	**Task**	**Time (hrs)**	**Total to date**
Grace Boswell	Worked on the design matrix Took measurements of the otoscope Wrote brief status update and updated timeline	**2**	**4.25**
Sam Tan	Design matrix Camera and mirror research	**1**	**4**
Jose Ramirez	Design Matrix Hidden Camera Design Drawing	**3**	**4.5**
Bobby Fang	Design idea Design matrix Team meeting	**4**	**6**
Declan McHugh	3D model of specula cone - 1.5 Researched possible specula material & 3D printing - .75	**2.25**	**4**
Zakki Mirza	Worked on design matrix Continued research on cameras	**1.5**	**2.5**

Team	Met on 09/27 to work on the design matrix	**2**	**3.75**

Expenses: $0

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/28	Sam, Grace, Bobby, Jose	100%	Yes
Preliminary Presentations	10/06	All	0%	No
Preliminary Deliverables	10/11	All	0%	No
Show and Tell	11/03	All	0%	No
Poster Presentations	12/08	All	0%	No
Final Deliverables	12/13	All	0%	No

Dual Handheld and Video Otoscope - BME 200/300 Section 310

Preliminary Design Matrix

September 23, 2023

Client: Dr. Lara Tomich

Advisor: Professor Justin Williams

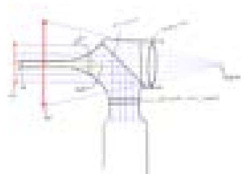
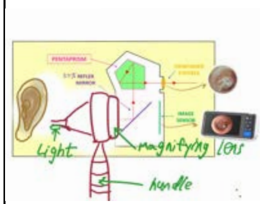
Team:

Sam Tan	stan68@wisc.edu	BSAC/Team Leader
Grace Boswell	gboswell@wisc.edu	Communicator
Haoming Fang	hfang45@wisc.edu	Team Leader
Jose Ramirez	jsramirez3@wisc.edu	BWIG

Declan McHugh dvmchugh@wisc.edu BWIG

Zakki Mirza zkmirza@wisc.edu BPAG

Design Matrix:

Criteria (Weight %)	**Design1: 1-way Mirror** 	**Design 2: Add on Module** 	**Design 3: Hidden Camera** 
Effectiveness (25)	4.5/5	4.5/5	3.5/5
Ease of Fabrication (20)	2/5	2/5	3/5
Ease of Usage (15)	4/5	2.5/5	4/5
Adjustability (10)	2.5/5	4/5	2/5
Safety (10)	4/5	4/5	3/5
Size/weight (10)	4/5	2.5/5	4/5
Cost (10)	3/5	3/5	4.5/5
Total = 100	**61.5**	**57**	**68.5**

Design Matrix Criteria:

- Effectiveness
    - Designs in this criteria will be evaluated based on their ability to seamlessly integrate the capabilities of both a video otoscope and a traditional handheld otoscope. The accuracy and precision of the designs will be assessed to determine if the device will give a similar user experience compared to the regular handheld otoscope while minimizing the perceptive difference between video output and visual output from the lens. This criterion was given a weighting of 25% because it's the main goal of the project.

- Ease of Fabrication
    - The general complexity of the design includes removable parts, internal structure, software adaptabilities, and electrical circuit components. Designs will be evaluated based on the estimated time to fabricate, and how each design minimizes the efforts required so future teams can remake the design from design sketches. This criterion was given a weighting of 20% because considering time, deadline, and future replication of the design, a good balance must be made between innovation and efficiency.

- Ease of Usage
    - The device should offer clients the same level of ease and familiarity as a conventional otoscope, ensuring a smooth transition to this upgraded tool. The user interface, ergonomics, and functionality of a basic otoscope should be intuitive and require minimal training. This criterion was given a weighting of 15% because the device should have similar usability to the original otoscopes to ensure an easy transition between the two devices.

- Adjustability
    - Otoscopes come with different sizes of speculum that fit different sizes of test subjects. This criterion will be evaluated based on the number of sizes of speculum to fit and how well they fit. Adjustability is also evaluated on the different types of lenses suitable for the otoscope design. This criterion was given a weighting of 10% because, although not specifically requested by the client, being able to adapt to changes and making different users comfortable is also crucial.

- Cost
    - Designs will be evaluated based on how much materials will be required, if any if not using the given otoscope from the client. This can be 3D printing costs or other add-on costs. Other components, such as Arduino circuits, camera will not be included since every design will be using the same camera and circuits presumably. This criterion was given a weighting of 10% because although the budget is plentiful, keeping the manufacturing costs low can still be beneficial if the design ever moves beyond the prototype stage.

- Safety
    - This includes the evaluation of overall aesthetics and each component should not be harmful to any test subjects or users. This criterion was given a weighting of 10 percent because the safety of the dogs is important to the final design. It is weighted lower in comparison to some of the other criteria because the safety of the dog is mainly based on user error and the size of the specula used.

- Size/Weight
    - This category is based on the design's dimensions and the otoscope's weight. This device needs to be lightweight and able to be held comfortably in the hands of a veterinary student. The specula needs to fit comfortably in a larger dog's ear. This criterion was given a weighting of 10 percent because the weight and size of the device may impact its functionality.

Design 1: One Way Mirror

- This design utilizes two convex lenses to achieve a magnifying goal. The real image goes through the tip of the specula into the first lens positioned just at the beginning of the otoscope body that projects a larger virtual image (image 1) to the back. Image 1 then goes through a 45-degree arranged 1-way mirror that reflects only 70% of light. The rest is through another convex lens to enlarge the image for the local viewer. This view must keep close contact with the otoscope thus providing a dark environment for the 30% remainder light to be viewable. The 70% reflected light is captured by a camera below which is transferred to a distant viewer. This design scores second for its complexity which causes harder fabrication methods and requires more materials thus bringing costs up. However, this design is very effective and requires less space thus giving users the same experiences as if they were using the original handheld otoscope.

Design 2: Add on Module

- This design is for an external module to be added to regular handheld otoscopes to integrate video output capacity while maintaining the original optical output, with the goal of keeping the perceptive difference minimal between the digital and optical output, and also ensuring that users can effortlessly transition between these modes. As shown in image 2, the otoscope should fit on the regular otoscope's magnifying lens side. The optical output would first be reflected by a 50 percent polarizing mirror, with part of the image going through the mirror directly to the image sensor, and the rest of the image reflected upward into a pentaprism, to eventually flip the image back up-right and to the visual lens. This design scores the lowest mainly due to the add-on module being bulky and interfering with the user and might affect user experience. However, this design also outperformed the other two designs because of how easily this can be adjusted and very affected.

Design 3: Hidden Camera

- This design uses a camera inside the nozzle attachment that would be affixed around the specula cone. The total diameter of the attachment would be a maximum of 5mm. The camera would have a wired connection to either a video output device (e.g.: laptop, phone, etc.) or a wireless wifi-box that an external device would connect to. Ideally, the camera and wire would not be obtrusive to any form of functionality because the nozzle would essentially act as a second larger specula cone. The wire would be secured onto the otoscope so as to not be a disturbance to the user. This design scored the highest mainly because of the size and cost. However, this design might not be as effective and adjustable as the other two designs.

Conclusion:

Design 3 won based on the seven categories. Within the seven categories under evaluation, design 3 scored the highest for ease of fabrication, ease of usage, size/weight, and cost. Those criteria focused on the overall expectation for delivery. Since design 3 makes the least amount of alteration to the original handheld otoscope, the team also believed that this can be a better option for students getting familiar with the new design compared to the other two designs.

Conclusions/action items:

In this weeks progress report we shared what we have accomplished. Our main accomplishment is that we picked criteria and gave them a weight based on their importance. We discovered our values were calculated wrong so based on this issue we may decide to change which design we are going with. Now we are going to look at cameras and decide which one will be the best fit for size and cost.

Progress Report 4: 10/05/23

GRACE BOSWELL - Oct 09, 2023, 7:43 AM CDT

Title: Progress Report 4

Date: 10/05/23

Content by: All

Present: All

Goals: To continue to document our progress along the design process.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 4

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 9/29-10/5

Team:
Sam Tan stan68@wisc.edu
Team Leader / BSAC
Haoming (Bobby) Fang hfang45@wisc.edu
Team Leader
Grace Boswell gboswell@wisc.edu
Communicator
Jose Ramirez jsramirez3@wisc.edu
BWIG
Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement
The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update

The team has finished the presentation and gathered as a group to practice presenting together. Started working on the preliminary report. Each team member has done individual research regarding the materials the team needed for prototyping.

Summary of Team Role Accomplishments

- Bobby (Team Leader)
  - Redrawn design sketch with updated dimensions
  - Team meeting to prepare for presentation
  - Conducted research on competing product
- Grace (Communicator)
  - Preliminary presentation
  - Communicated with the clients and advisor
- Sam (BSAC)
  - Preliminary Presentation
  - Research
- Declan (Co-BWIG)
  - Completed Intro to Machining Canvas Class
  - Measured Otoscope Specula to update CAD drawing for presentation
  - Worked to Create Preliminary Presentation
  - Researched Camera's for design
- Jose (Co-BWIG)
  - Preliminary Presentation
  - Began work on preliminary report
- Zakki (BPAG)
  - Researched potential mirrors for design 1
  - Preliminary presentation
  - Began working on preliminary report

Weekly/Ongoing Difficulties

- Design 3 Camera options
- Design 1 Film options

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
  - Research on camera options
  - Decide on manufacturing plan
- Grace (Communicator)
  - Complete my section of the preliminary report
- Sam (BSAC)
  - Preliminary Report
  - Start buying materials
- Declan (Co-BWIG)
  - Reserve Machine and make practice part to get Intro to machining certification

- Finish Preliminary designs section of Preliminary Report
- Jose (Co-BWIG)
  - Complete and submit preliminary report to website
  - Practice preliminary presentation
- Zakki (BPAG)
  - Continue research on relevant materials
  - Work on necessary documentation and presentations like the preliminary report and presentation
  - Make sure to be ready for the preliminary presentation

- Team
  - Preliminary Report
  - Materials research
  - Gather as a team to decide on material order forms.

Activities

Team Member	Task	Time (hrs)	Total to date
Grace Boswell	Preliminary report/presentation	**1.25**	**5.5**
Sam Tan	Preliminary presentation and report	**1.5**	**5.5**
Jose Ramirez	Preliminary presentation and report	**1.5**	**6**
Bobby Fang	Research Presentation and report sketch	**2**	**8**
Declan McHugh	Preliminary Presentation - 1 Camera Research - .25 Intro to Machining - 1.75	**3**	**7**
Zakki Mirza	Research Preliminary presentation and report	**1.5**	**4**
Team	Preliminary Presentation & Report Meetings	1	**4.75**

Expenses: $0

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/28	Sam, Grace, Bobby, Jose	100%	Yes
Preliminary Presentations	10/06	All	100%	Yes
Preliminary Deliverables	10/11	All	50%	No
Show and Tell	11/03	All	0%	No
Poster Presentations	12/08	All	0%	No
Final Deliverables	12/13	All	0%	No

Conclusions/action items:

While working on this progress report the team realized how far we have come in the background work. This also made us recognize that we need to buy materials as soon as we can to begin prototyping. Since we are potentially working on 2 designs, we must be prepared for both. Some of our action items are to research/buy a micro-camera, buy an otoscope that we can manipulate, and CAD/Solidworks and 3D model of an otoscope.

Progress Report 5: 10/12/23

GRACE BOSWELL - Oct 15, 2023, 3:22 PM CDT

Title: Progress Report 5

Date: 10/12/23

Content by: All

Present: All

Goals: To keep track of each group member's activities and the time they have spent on the project. This allows the advisor and client to see our progress.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 5

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 10/6-10/12

Team:
Sam Tan stan68@wisc.edu
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Haoming (Bobby) Fang hfang45@wisc.edu
Team Leader
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Communicator
Jose Ramirez jsramirez3@wisc.edu
BWIG
Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement
The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update

Finished up on a preliminary report. First design is one the way to fabrication. Initial rough design materials are ordered and expected to be delivered on 10/13.

Summary of Team Role Accomplishments

- Bobby (Team Leader)
    - Preliminary reports on global impact, problem statement and current methods
    - Researches on studies comparing the two types of otoscopes
    - Research on camera options
- Grace (Communicator)
    - Completed my portion of the preliminary report
    - Communicated with the client about the presentation and upcoming work
    - Updated labarchives
- Sam (BSAC)
    - Preliminary Report
    - Contacted Aubrey C Starr regarding material purchasing.
    - Contacted MakerSpace/Teamlab about fabrication methods (no response yet)
- Declan (Co-BWIG)
    - Preliminary Report
    - Updated Lab Archives
    - Uploaded Preliminary Report to Website
- Jose (Co-BWIG)
    - Worked on the conclusion portion of the preliminary report
- Zakki (BPAG)
    - Preliminary report
    - Ensured proper documentation of purchased materials

Weekly/Ongoing Difficulties

Sam: Camera Choice - WebCam and corresponding application.

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
    - Decide on the camera to purchase
- Grace (Communicator)
    - To look for cameras for our design
    - Work on 3D models of otoscopes
- Sam (BSAC)
    - Preliminary method testing of concept
    - Order materials for designs
    - Get in contact with MakerSpace and TeamLab about fabrication methods
    - Prepare for any show and tell material
    - Test the validation of key features of design 1.
- Declan (Co-BWIG)
    - Meet with team to start development of prototype and better understand one-way mirror film

- Jose (Co-BWIG)
  - Pursue camera options for third design
- Zakki (BPAG)
  - Look for potential cameras to start prototyping

- Team
  - Design 1 Consultation

Activities

Team Member	Task	Time (hrs)	Total to date
Grace Boswell	Updated labarchives (progress report, presentation, report pages) Preliminary Report Communicated with clients/advisor	**1.5**	**7**
Sam Tan	Report Material Order	**3**	**8.5**
Jose Ramirez	Preliminary Report	**.5**	**6.5**
Bobby Fang	Report Research	**3**	**11**
Declan McHugh	Preliminary Report - .5	**.5**	**7.5**
Zakki Mirza	Progress report, ensuring proper documentation of materials	**1.5**	**5.5**
Team	Met to work on preliminary report	**2**	**6.75**

Expenses: $18.98
One-Way Mirror Film - 18.98

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/28	Sam, Grace, Bobby, Jose	100%	Yes
Preliminary Presentations	10/06	All	100%	Yes
Preliminary Deliverables	10/11	All	100%	Yes
First stage of Prototype (rough product)	11/03	Sam	10%	
Show and Tell	11/03	All	10%	No
Poster Presentations	12/08	All	0%	No
Final Deliverables	12/13	All	0%	No

Conclusions/action items:

Based on this progress report, over the past week, the team has not spent a lot of time on the actual building of the device. It was mainly spent on the presentation and preparing the preliminary report. Many group members had midterms over the past week which distracted them from this project. The team will begin to look at materials to buy. We will also meet sometime soon to develop everyone's understanding of the projected device.

Progress Report 6: 10/19/23

GRACE BOSWELL - Oct 18, 2023, 10:49 PM CDT

Title: Progress Report 6

Date: 10/19/23

Content by: All

Present: N/A

Goals: To track our progress in a clear and concise way for our client and advisor to view.

Content:

Conclusions/action items:

Based on this progress report it is showing that the group has started to show progress on our beginning prototypes. This is important because the show and tell is coming up soon and we need something to show the audience. We are going to use our gifted otoscope to show the audience a 3D-printed ear canal model. And we will also use 3D-printed otoscope models to demonstrate our 1-way mirror design.

Progress Report 7: 10/26/2023

GRACE BOSWELL - Nov 01, 2023, 8:55 PM CDT

Title: Progress Report 7

Date: 10/26/2023

Content by: All

Present: All

Goals: To update our advisor and client on our progress.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 7

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 10/20-10/26

Team:

Sam Tan stan68@wisc.edu
Team Leader / BSAC
Haoming (Bobby) Fang hfang45@wisc.edu
Team Leader
Grace Boswell gboswell@wisc.edu
Communicator
Jose Ramirez jsramirez3@wisc.edu
BWIG
Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement

The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update

- Design 1 Head portion printed and under evaluation for possible multiple reprints.
- Lots of material orders coming in

Summary of Team Role Accomplishments

- Bobby (Team Leader)
  - Working on show and tell model
  - Researching on optic lens options for design 1

- Grace (Communicator)
  - 3d modeling for ear canal
  - Communicated with client and advisor
- Sam (BSAC)
  - 3d modeling of otoscope head
  - Ear canal modeling
  - Material order
  - 3d printing
  - Adjustments to model (remodeling and reprints)
- Declan (Co-BWIG)
  - Material Order
  - Show & Tell Model Design 3

- Jose (Co-BWIG)
  - Updated Project Website with relevant information
- Zakki (BPAG)
  - Kept track of purchased materials (we're still waiting on some orders we've placed)
  - Researched potential 3D printing materials for our final design

Weekly/Ongoing Difficulties

Sam- Lens

Sam -Handle Design

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
  - Decide and purchase optic lens
  - Finish lighting design for design 1
- Grace (Communicator)
  - To finish 3D modeling of the ear canal
  - Print 3D model of ear canal before show and tell
  - Communicate with client and advisor
- Sam (BSAC)
  - LED

  - Lens
  - Print more adjustments
  - Think about handle attachment

- Declan (Co-BWIG)
  - Print 3D model
  - Deconstruct and test video otoscope camera with beam splitter

- Jose (Co-BWIG)
  - Collaborate with Declan on Design 3 prototype for Show and Tell

- Zakki (BPAG)
  - Continue prototyping and tweeking designs accordingly
  - Research any relevant topics when necessary

- Team
  - To have items prepared for show and tell

Activities

Team Member	**Task**	**Time (hrs)**	**Total to date**
Grace Boswell	3D modeling	**2**	**13.5**
Sam Tan	Material Order 3D modeling Printing	**6**	**22.5**
Jose Ramirez	Design 3 Prototype	**.5**	**8**
Bobby Fang	Reseach	**1**	**14**
Declan McHugh	Design 3 Prototype Material Order	**.5**	**10.5**
Zakki Mirza	Ensured proper documentation of purchased materials (still waiting on the materials getting delivered) Research potential final 3D printing materials	**1**	**7.5**
Team	Ear Canal (10/23)	**2**	**10.75**

Expenses: $70.95

One-Way Mirror Film - 18.98

Beam Splitter Cube - 21.98

Anykit Digital Otoscope - 29.99 (approx. - before tax & shipping)

Following: total- 37.86

- MicroLED
- Lithium Battery
- Battery Holder
- Endoscope Camera

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/28	Sam, Grace, Bobby, Jose	100%	Yes
Preliminary Presentations	10/06	All	100%	Yes
Preliminary Deliverables	10/11	All	100%	Yes
3D Printed Otoscope Body with Beam Splitter Cube	11/02	Sam	50%	No
LED Light Source	10/29	Bobby, Zakki	20%	No
Ear Canal Model for Test	11/02	Grace, Sam	15%	No
Design 3 Work	11/1	Jose, Declan	15%	No
Show and Tell	11/03	All	10%	No
Poster Presentations	12/08	All	0%	No
Final Deliverables	12/13	All	0%	No

Conclusions/action items:

This document has helped the team locate who has spent time on what portions of the project. Our timeline has helped us keep track of our progress and gives us reality checks for if our goals are accomplishable.

Progress Report 8: 11/02/23

GRACE BOSWELL - Nov 08, 2023, 5:08 PM CST

Title: Progress Report 8

Date: 11/02/2023

Content by: All

Present: All

Goals: To update the client and advisor on our progress and difficulties.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 8

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 10/27-11/2

Team:
Sam Tan stan68@wisc.edu
Team Leader / BSAC
Haoming (Bobby) Fang hfang45@wisc.edu
Team Leader
Grace Boswell gboswell@wisc.edu
Communicator
Jose Ramirez jsramirez3@wisc.edu
BWIG
Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement
The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update

- Materials arrived (LED, battery, battery holder, camera)
- Initial testing and evaluations of ordered material conducted to check work.
- More materials are ordered (new plate beam splitter, convex lens)

Summary of Team Role Accomplishments

- Bobby (Team Leader)

  - Researched into optical lens' operational principles and options
  - Ordered a convex lens and a new plate beam splitter
  - Measured effective focal length and various different requirements
  - Helped in prototyping
  - Working on LED option

- Grace (Communicator)
  - 3D modeling of ear canal
  - Communicated with client and advisor
- Sam (BSAC)
  - 3D modeling of the otoscope head to accommodate with handle, lens, and beam splitter
  - Initial testing
  - Material purchasing
- Declan (Co-BWIG)
  - Researched properties of lenses to better understand focal length
  - Continued work on specula 3D model

- Jose (Co-BWIG)
  - Tested out Anykit Digital otoscope.
- Zakki (BPAG)
  - Researched reflective and protective materials to use for LED light wirework
  - Ensured proper documentation of purchased materials

Weekly/Ongoing Difficulties

Sam- Lens

Sam -Handle Design

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
  - Work on LED part
- Grace (Communicator)
  - To make a print of the ear canal
  - Send out progress report
- Sam (BSAC)
  - Otoscope Handle
- Declan (Co-BWIG)
  - Test first print prototype with camera from digital otoscope or purchase secondary digital camera

- Jose (Co-BWIG)
  - Finalize Preparations for Show and Tell
- Zakki (BPAG)
  - Set up LED part
- Team
  - To have items prepared for show and tell

Activities

Team Member	Task	Time (hrs)	Total to date
Grace Boswell	Attended meeting Worked on 3D modeling	**1**	**14.5**
Sam Tan	Material Ordering 3d modeling 3d printing Method Testing	**6**	**28.5**
Jose Ramirez	Tested out Anykit Digital Otoscope Attended meeting	**1.5**	**8.5**
Bobby Fang	Material Ordering Measuring Researching	**2**	**16**
Declan McHugh	Researched properties of lenses to better understand focal length (.5) Continued work on specula 3D model	**.5**	**11**
Zakki Mirza	Researched materials for LED portion of design 1 Ensured proper documentation of purchased materials	**1**	**8.5**
Team	Zoom team meeting	**1**	**11.75**

Expenses: $108.81

One-Way Mirror Film - 18.98

Beam Splitter Cube - 21.98

Anykit Digital Otoscope - 29.99 (approx. - before tax & shipping)

Following: total- 37.86

- MicroLED
- Lithium Battery
- Battery Holder
- Endoscope Camera

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/28	Sam, Grace, Bobby, Jose	100%	Yes
Preliminary Presentations	10/06	All	100%	Yes
Preliminary Deliverables	10/11	All	100%	Yes
3D Printed Otoscope Body with Beam Splitter Cube	11/02	Sam	100%	Yes
LED Light Source	10/29	Bobby, Zakki	100%	Yes
Ear Canal Model for Test	11/02	Grace, Sam	15%	No
Design 3 Work	11/01	Jose, Declan	15%	No
3D printed otoscope (whole)	11/10	Sam	0%	No
LED/ Batter (soldering)	11/14	Bobby, Zakki	0%	No
Show and Tell	11/03	All	80%	Yes
Poster Presentations	12/08	All	0%	No
Final Deliverables	12/13	All	0%	No

Conclusions/action items:

The team is ready for the show and tell which is happening on 11/03. We have 2 video otoscopes to model our 3D-printed prototype. We have prepared topics to discuss with the other groups

Progress Report 9: 11/09/23

GRACE BOSWELL - Nov 15, 2023, 10:21 AM CST

Title: Progress Report 9

Date: 11/09/23

Content by: All

Present: All

Goals: To update our advisor and client on our progress and difficulties.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 9

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 10/3-11/9

Team:
Sam Tan stan68@wisc.edu
Team Leader / BSAC
Haoming (Bobby) Fang hfang45@wisc.edu
Team Leader
Grace Boswell gboswell@wisc.edu
Communicator
Jose Ramirez jsramirez3@wisc.edu
BWIG
Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement
The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update
- First full version of the otoscope is printed and evaluated.
- More materials ordered (lens, new camera)
- Prints- 5.5mm completed.

Summary of Team Role Accomplishments

- Bobby (Team Leader)

  - N/A
- Grace (Communicator)
  - Worked on survey to ask people while testing device
- Sam (BSAC)
  - Modified Design
  - Print otoscope (for 5.5mm camera)
  - Order camera
- Declan (Co-BWIG)
  - Recorded show and tell input and brainstormed on gained ideas
  - Disassemble purchased otoscope for parts and to better understand structure
- Jose (Co-BWIG)
  - Plan disassemble ANYKIT otoscope
- Zakki (BPAG)
  - Worked on designing concepts for design 1 with Sam
  - Ensured proper documentation of purchased materials

Weekly/Ongoing Difficulties

Sam**-** Camera

Declan **-** Specula 3D print

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
  - N/A
- Grace (Communicator)
  - To finish survey and develop a plan on who to ask
- Sam (BSAC)
  - Test new camera
  - Design and Print otoscope that fits the new camera
- Declan (Co-BWIG)
  - Print second (camera within circular specula end) 3D design
- Jose (Co-BWIG)
  - Investigate the usefulness of the disassembled ANYKIT otoscope
- Zakki (BPAG)
  - Work on solidifying LED and battery system for design 1
- Team
  - Build final prototype

Activities

Team Member	**Task**	**Time (hrs)**	**Total to date**
Grace Boswell	Worked on survey	**.5**	**15**
Sam Tan	Print otoscope Modify design Order Camera	**8**	**36.5**
Jose Ramirez	Disassemble ANYKIT otoscope process	**1**	**9.5**
Bobby Fang	N/A	**N/A**	**16**
Declan McHugh	disassemble digital otoscope Show & Tell Brainstorming	**2**	**13**
Zakki Mirza	Worked on designing concepts for design 1 with Sam. Ensured proper documentation of purchased materials	**1**	**9.5**
Team	N/A	**0**	**11.75**

Expenses: $108.81

One-Way Mirror Film - 18.98

Beam Splitter Cube - 21.98

Anykit Digital Otoscope - 29.99 (approx. - before tax & shipping)

Following: total- 37.86

- MicroLED
- Lithium Battery
- Battery Holder
- Endoscope Camera

Lens -

Beam Splitter Plate -

Endoscope Camera - 49.99

Various Hardware and Makerspace Prints - N/A

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/28	Sam, Grace, Bobby, Jose	100%	Yes
Preliminary Presentations	10/06	All	100%	Yes
Preliminary Deliverables	10/11	All	100%	Yes
3D Printed Otoscope Body with Beam Splitter Cube	11/02	Sam	100%	Yes
LED Light Source	10/29	Bobby, Zakki	100%	Yes
Ear Canal Model for Test	11/02	Grace, Sam	15%	No
Design 3 Work	11/01	Jose, Declan	30%	No
3D printed otoscope (whole)	11/10	Sam	100%	Yes
Modifications to model	12/6	Sam	25%	No
LED/ Battery (soldering)	11/14	Bobby, Zakki	0%	No
Show and Tell	11/03	All	100%	Yes
Poster Presentations	12/08	All	0%	No
Final Deliverables	12/13	All	0%	No

Conclusions/action items:

The team has come a long way on this device and now we have learned that we need to begin testing our device. The plan is to meet with our client on 11/16 to discuss her options on the device and see if any changes need to be made. We are also going to ask her if she has any pre-vet/ vet students who would be willing to test our device. We are also going to ask some of our friends who are not experienced with an otoscope. The team will also begin working on the poster and final report.

Progress Report 10: 11/16/23

GRACE BOSWELL - Nov 15, 2023, 10:24 AM CST

Title: Progress Report 10

Date: 11/16/23

Content by: All

Present: All

Goals: To allow our client and advisor to see what we have accomplished and what needs to be worked on.

Content:

Conclusions/action items:

This progress report has helped us realize that our device is pretty finalized. The team received the new camera and is working on editing the 3D model to accommodate the different sizes of wiring. The light source has been soldered to the battery. The team is potentially meeting with the client later today and will discuss testing plans.

Progress Report 11/12: 11/30/2023

GRACE BOSWELL - Dec 03, 2023, 5:36 PM CST

Title: Progress Report 11

Date: 11/30/2023

Content by: Grace

Present: All

Goals: To show our advisor and client our progress in a concise way.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 11

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 11/17- 11/30

Team:
Sam Tan stan68@wisc.edu
Team Leader / BSAC
Haoming (Bobby) Fang hfang45@wisc.edu
Team Leader
Grace Boswell gboswell@wisc.edu
Communicator
Jose Ramirez jsramirez3@wisc.edu
BWIG
Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement
The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update
- Survey with various students within the engineering department, veterinary department, and client.
- Noticed a few errors with the printed piece and problem with LED.

Summary of Team Role Accomplishments

- Bobby (Team Leader)

- Participated in the client meeting
- Redesigned and finished soldering the led light - battery - switch connection
- Tested device, found out led light is not bright enough
- Reconnected the led to external of the specula
- Grace (Communicator)
- Communicated with client to set up meeting on 11/27
- Scheduled time to test with vet's and vet students on 11/30
- Worked on poster (finished first draft of all but testing/discussion)
- Tested device
- Sam (BSAC)
- Otoscope Reprint
- Drop test and soldering/otoscope testing
- Client meet/survey
- Declan (Co-BWIG)
- Otoscope testing
- Dog ear testing model
- Jose (Co-BWIG)
- Completed Google form otoscope survey that will be used for testing
- Created Testing procedure for testing on 11/29 and 11/30 at the Vet School.
- Attended group makerspace meeting and client meeting
- Zakki (BPAG)
- Worked on Final Report
- Updated Expense Sheet

Weekly/Ongoing Difficulties

The LED is not bright enough, and the coin battery may not support a bright enough light source. This is somewhat fixed by placing the LED outside but also raises some problems such as the LED being blocked by curves in the ear canal resulting in a total blockage of light in some positions within the ear canal.

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
- Potentially redesign the led light
- More testing
- Grace (Communicator)
- To test product and add test results to poster
- To begin work on final report

- Sam (BSAC)
  - Final report
- Declan (Co-BWIG)
  - Finigh model
- Jose (Co-BWIG)
  - Analyze testing results
  - Begin working on final report
  - Went to Vet School to test device for students
- Zakki (BPAG)
  - Continue testing the prototype and analyze the results
  - Work on the final report
- Team
  - To complete poster and final report

Activities

Team Member	Task	Time (hrs)	Total to date
Grace Boswell	Met with clients and team Fabricated/Tested/ Worked on poster/ Worked on testing google form Went to vet school to test device	**8**	**24**
Sam Tan	Prototype assembly Survey with client	**7**	**47.5**
Jose Ramirez	Attended team and client meeting Completed testing survey and procedure Went to Vet School to test prototype and wrote down general notes and feedback	**8.5**	**18**
Bobby Fang	Testing, Redesigning, meeting	**4**	**20**
Declan McHugh	Team Client Meeting Otoscope testing & Ear model	**4**	**17**
Zakki Mirza	Worked on Final Report and Updated Expense Sheet	**.5**	**12**
Team	N/A	**0**	**11.75**

Expenses: $154.31

One-Way Mirror Film - 18.98

Beam Splitter Cube - 21.98

Anykit Digital Otoscope - 29.99 (approx. - before tax & shipping)

Following: total- 37.86

- MicroLED
- Lithium Battery
- Battery Holder
- Endoscope Camera

Lens - 28.00

Beam Splitter Plate - 48.00

Endoscope Camera - 49.99

Various Hardware and Makerspace Prints - N/A

Extra Lens - 45.5

Project Timeline:

Project Goal	**Deadline**	**Team Assigned**	**Progress**	**Completed**
Design Matrix	9/28	Sam, Grace, Bobby, Jose	100%	Yes
Preliminary Presentations	10/06	All	100%	Yes
Preliminary Deliverables	10/11	All	100%	Yes
3D Printed Otoscope Body with Beam Splitter Cube	11/02	Sam	100%	Yes

LED Light Source	10/29	Bobby, Zakki	100%	Yes
Ear Canal Model for Test	11/02	Grace, Sam	15%	No
Design 3 Work	11/01	Jose, Declan	30%	No
3D printed otoscope (whole)	11/10	Sam	100%	Yes
Modifications to model	12/6	Sam	100%	Yes
LED/ Battery (soldering)	11/14	Bobby, Zakki	100%	Yes
Show and Tell	11/03	All	100%	Yes
Poster Presentations	12/08	All	50%	No
Final Deliverables	12/13	All	0%	No

Conclusions/action items:

The team spent a lot of time testing and fabricating this week. We must finish testing soon because that data needs to go on the final poster which is due Friday, December 8th. Once the surveying is completed it will be used to calculate values and show correlation between values/questions.

Progress Report 13: 12/07/23

GRACE BOSWELL - Dec 10, 2023, 1:26 PM CST

Title: Progress Report 13

Date: 12/07/23

Content by: Grace

Present: N/A

Goals: To update our client and advisor on our progress.

Content:

Dual Handheld and Video Otoscopy Unit

Progress Report 13

Client: Dr. Lara Tomich
Advisor: Prof. Justin Williams
Date: 12/1- 12/7

Team:
Sam Tan stan68@wisc.edu
Team Leader / BSAC
Haoming (Bobby) Fang hfang45@wisc.edu
Team Leader
Grace Boswell gboswell@wisc.edu
Communicator
Jose Ramirez jsramirez3@wisc.edu
BWIG
Declan McHugh dvmchugh@wisc.edu
BWIG
Zakki Mirza zkmirza@wisc.edu
BPAG

Problem Statement
The current designs of handheld otoscopes for animal practice do not allow video transfer to a distant view compared to a video otoscope, which is practiced differently in simulations. The goal is to design a handheld otoscope with video capabilities to allow student-performed examinations to be visualized to the faculty for assessments.

Brief Status Update

- Poster printed
- Graphs generated from survey results
- Final report

Summary of Team Role Accomplishments

- Bobby (Team Leader)
  - Worked on data analysis and visualization for the poster

- Printed Poster
- Found and helped fix resolution problems, and reprinted the poster.
- Worked on final report
- Grace (Communicator)
- Communicated with client
- Attended group meeting
- Worked on poster
- Sam (BSAC)
- Prototype Testing
- Survey analysis
- Declan (Co-BWIG)
- Poster presentation script
- Jose (Co-BWIG)
- Attended Group Meeting
- Created Summary Document of Test Results Lab Archives
- Helped with final modifications on final poster
- Zakki (BPAG)
- Attended Group Meeting
- Worked on Final Report

Weekly/Ongoing Difficulties

N/A

Upcoming Team and Individual Goals:

- Bobby (Team Leader)
- Final report
- Grace (Communicator)
- Finish my portions of final report
- Practice for final presentation
- Sam (BSAC)
- Final report
- Declan (Co-BWIG)
- Practice for Final Presentation
- Finish Final Report
- Jose (Co-BWIG)
- Practice Final Presentation
- Work on Final report

- Zakki (BPAG)
  - Finish up Final Report
    Practice for Final Presentation
- Team
  -

Activities

Team Member	Task	Time (hrs)	Total to date
Grace Boswell	Worked on poster and went to group meetings	**3**	**27**
Sam Tan	Analysis (Graphs) Discussion	**4**	**51.5**
Jose Ramirez	Attended Group Meeting Created Summary Document of Test Results Lab Archives Helped with final modifications on final poster	**3**	**21**
Bobby Fang	Working on poster and data analysis	**4**	**24**
Declan McHugh	Poster presentation script	**1**	**18**
Zakki Mirza	Worked on Final Report Gave input on final adjustments to the final poster Attended Group Meeting	**2**	**14**
Team	4	**4**	**15.75**

Expenses: $154.31
One-Way Mirror Film - 18.98

Beam Splitter Cube - 21.98

Anykit Digital Otoscope - 29.99 (approx. - before tax & shipping)

Following: total- 37.86

- MicroLED

- Lithium Battery
- Battery Holder
- Endoscope Camera

Lens - 28.00

Beam Splitter Plate - 48.00

Endoscope Camera - 49.99

Various Hardware and Makerspace Prints - N/A

Extra Lens - 45.5

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Design Matrix	9/28	Sam, Grace, Bobby, Jose	100%	Yes
Preliminary Presentations	10/06	All	100%	Yes
Preliminary Deliverables	10/11	All	100%	Yes
3D Printed Otoscope Body with Beam Splitter Cube	11/02	Sam	100%	Yes
LED Light Source	10/29	Bobby, Zakki	100%	Yes
Ear Canal Model for Test	11/02	Grace, Sam	15%	No
Design 3 Work	11/01	Jose, Declan	30%	No
3D printed otoscope (whole)	11/10	Sam	100%	Yes
Modifications to model	12/6	Sam	100%	Yes
LED/ Battery (soldering)	11/14	Bobby, Zakki	100%	Yes
Show and Tell	11/03	All	100%	Yes

Poster Presentations	12/08	All	90%	No
Final Deliverables	12/13	All	50%	No

Conclusions/action items:

This is the final progress report for the team this semester. The project timeline shows the various work the team has done to accomplish our goal. To finish up work for the semester the team needs to finalize notebooks and the final report. Based on this progress report the team is ready to present our information is a well organized manner.

2023/09/10-Ear Anatomy Research

Sam TAN - Sep 10, 2023, 2:20 PM CDT

Title: Ear Anatomy

Date: 9/10

Content by: Sam

Present: N/A

Goals: To understand the basic anatomy of ear.

Content:

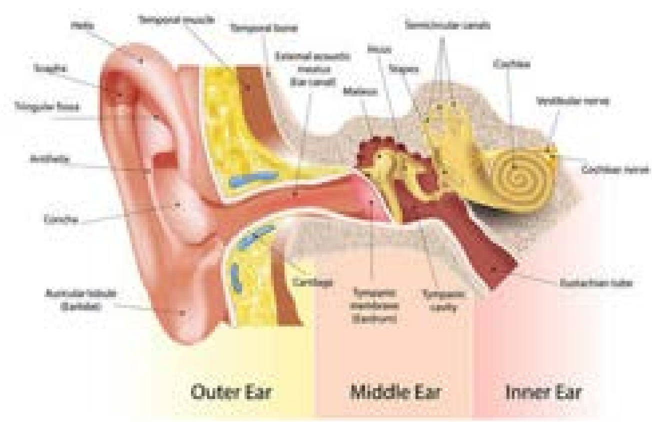
Attached.

In human as an example, a otoscope is used mainly to stick inside somewhere of the middle ear through the ear canal. Mainly focus on looking at the ear drum.

Conclusions/action items:

Continue research, client meeting with list of questions.

Sam TAN - Sep 10, 2023, 2:19 PM CDT



Download

ear-anatomy.jpg (89.4 kB)

Sam TAN - Sep 10, 2023, 2:19 PM CDT

Download

acm9604_460x300.jpg (59 kB)

Sam TAN - Sep 16, 2023, 8:40 PM CDT

Correction: Human Ear Anatomy

2023/9/16-Canine Ear Anatomy

Sam TAN - Sep 16, 2023, 8:54 PM CDT

Title: Anatomy of a Canine Ear

Date: 9/16/23

Content by: Sam

Present: N/A

Goals: Study the anatomy of a canine ear

Content:

Cole, L. K. (2009). Anatomy and physiology of the canine ear. *Veterinary Dermatology*, *20*(5–6), 412–421. https://doi.org/10.1111/j.1365-3164.2009.00849.x

The four main components to a canine ear, pinna, external ear canal, middl ear and inner ear.

The pinna is a structure that collect sound waves and transmit to the tympanic membrane. The elastic auricular cartilage expands to form the pinna. The skin covering the concave aspect of the pinna is more tightly attached to the auricular cartilage than the skin than the convex aspect of the pinna.

The external ear canal is composed of two elastic cartilages, the auricular and annular. The antitragus is a thin, elongated piece of cartilage caudal to the tragus and separated from it by the intertragic incisure. This anatomical region is the area into which one inserts the otoscopic cone or otoendoscope for otoscope examinations.

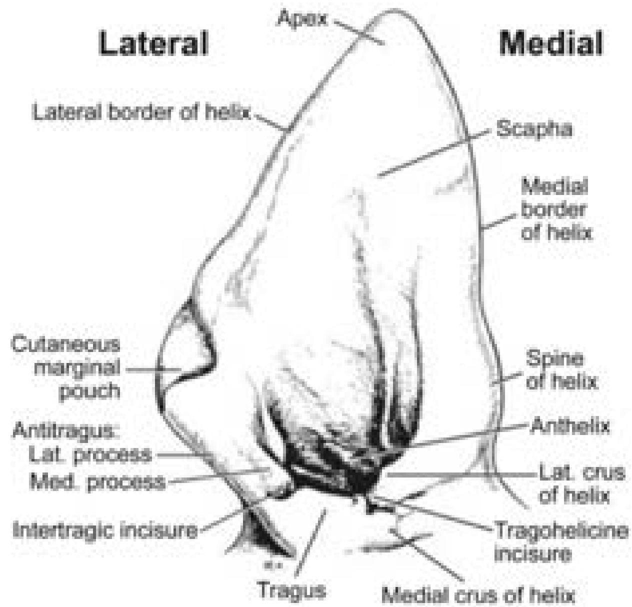
Middle ear consists of an air-filled tympanic cavity, three auditory ossicles and their associated muscles and ligaments, and the tympanic membrane. The tympanic membrane is located at a 45° angle in relation to the central axis of the horizontal part of the external ear canal.

The inner ear is housed in a bony labyrinth in the petrous portion of the temporal bone. The bony labyrinth consists of a perilymphatic chamber (vestibule), three semicircular canals (each with an ampulla), and a spiral cochlea.

Conclusions/action items:

Research on Otoscope Anatomy after meeting with client.

Sam TAN - Sep 16, 2023, 8:53 PM CDT



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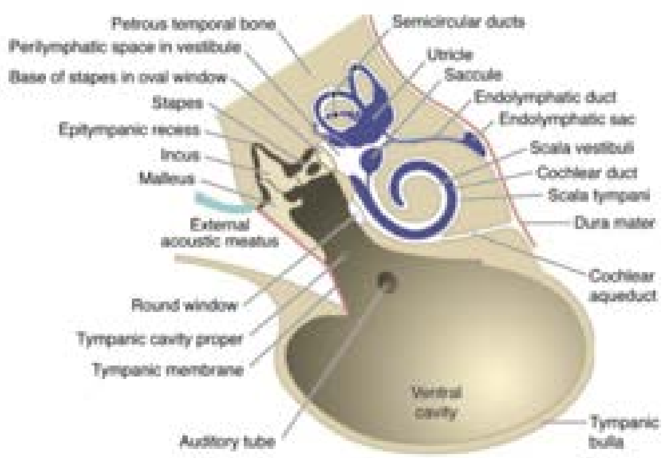
Sam TAN - Sep 16, 2023, 8:53 PM CDT



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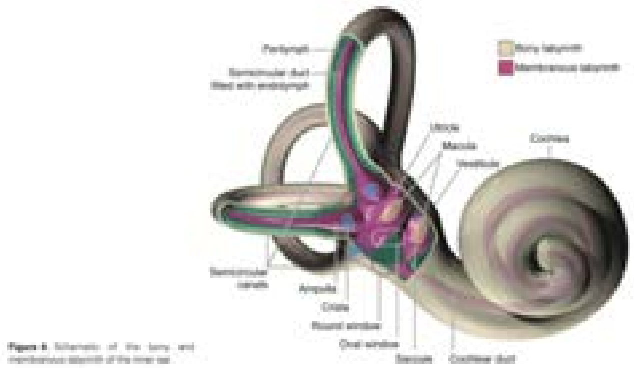
Sam TAN - Sep 16, 2023, 8:53 PM CDT



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2023/9/21-Animal Operation Ethics

Sam TAN - Sep 21, 2023, 12:30 PM CDT

Title: Use of Handheld Video Otoscopy for the Diagnosis of Acute Otitis Media: Technical Note

Date: 9/21/23

Content by: Sam

Present: NA

Goals: Research about ethics and techniques on otoscopy with animals.

Content:

Soares, C., Clifton, W., & Freeman, W. D. (2019). Use of Handheld Video Otoscopy for the Diagnosis of Acute Otitis Media: Technical Note. Cureus, 11(9), e5547. https://doi.org/10.7759/cureus.5547

The camera is then inserted into the auditory canal for examination of the external auditory canal. The video otoscope also has attachable curettes. The curettes can be used to remove impacted wax and foreign objects from the auditory canal with a decreased risk of tympanic membrane perforation because the curettes are video guided. There is a need for improvement and standardization of how otoscopic examination is taught in medical schools across the country. With the use of video otoscopy, there is no need for medical students to guess if they indeed saw what their attending did. The use of video otoscopy phone applications allows the attending and the student to experience the examination simultaneously.

Conclusions/action items:

Research on animal safety and ethics.

2023/9/21-Animal Examination Standards, Basic

Sam TAN - Sep 21, 2023, 12:49 PM CDT

Title: Minimum standards and best practices for the clinical veterinary forensic examination of the suspected abused animal

Date: 9/21/23

Content by: Sam

Present: N/A

Goals: This is about animal forensic but can be also considered for animal testing using the otoscope.

Content:

R. Touroo, K. Baucom, M. Kessler, M. Smith-Blackmore, Minimum standards and best practices for the clinical veterinary forensic examination of the suspected abused animal, Forensic Science International: Reports, Volume 2, 2020, 100150, ISSN 2665-9107,

https://doi.org/10.1016/j.fsir.2020.100150.

2.1 'A trained handler and/or veterinary technician should also be present at the time of examination to assist with collecting and documenting evidence. The handling and packaging of evidence should be performed by individuals with training and/or experience in these processes. The name(s) of any person(s) present during a forensic examination should be documented.'

2.2 'Veterinarians shall always conduct themselves with the expectation that their work may be used in legal proceedings. As such, they should ensure that they are meeting the minimum standards of care and that all examinations, testing, treatment, and care are within the scope of owner consent, or authorized by law enforcement. '

Conclusions/action items:

research on materials and parts

2023/9/16-BEBIRD R1 Ear Wax Removal Tool

Sam TAN - Sep 16, 2023, 8:36 PM CDT

Title: Current Design 1

Date: 9/16/23

Content by: Sam

Present: N/A

Goals: Research about current designs and how it fails to reach client's goal.

Link: https://www.amazon.com/BEBIRD%C2%AE-Removal-Otoscope-Silicone-Compatible/dp/B08M9G18H3/ref=sr_1_1_sspa?crid=3UKAYG061DCEC&keywords=video+otoscope+animal&qid=1694913988&sprefix=video+otoscope+animal%2Caps%2C134&sr=8-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1

Content:

This product is an ear wax removal tool, which is a otoscope in some sort. This product has many pros and cons and things we can adapt to included in our own design as well.

Pros:

This design is relatively cheap to other products on the market, and significantly cheaper than a traditional otoscope in the client's description link.

The tip of the otoscope is a camera which makes it easier to fabricate and go through the analysis. Without a traditional lens, it is also easier to see with a screen and quality is better comparing to the handheld otoscope.

This otoscope can also transform into a nasal inspection device as well as an oral examination device which make the product more dynamic to suit better situations.

Cons:

It doesn't have a handheld and lens component, which our client specifically asked to be included.

The otoscope runs on electricity which means it is energy costing and more expensive to repair than a regular otoscope. Any malfunction will require professional individuals to repair which cost time and money.

Things we can learn:

The arrangement of camera and LED light on the tip of the otoscope is a great way to design our product. It has a ring of light around the center camera which makes light evenly distributed while operating the otoscope and maintain equal brightness.

Conclusions/action items:

This is a great product relative to the price and can be use in many situations not only as an otoscope. However, it doesn't satisfy the requirement.

Next to research more on competing designs and anatomy of animal ear.

Sam TAN - Sep 21, 2023, 4:08 PM CDT

Download

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2023/9/21-DE500 Digital Video Otoscope

Sam TAN - Sep 21, 2023, 4:09 PM CDT

Title: DE500 Digital Video Otoscope

Date: 9/21/23

Content by: Sam

Present: NA

Goals: Research about the DE500 digital video otoscope

Content:

https://fireflyglobal.com/de-500-usb-digital-ear-scope/

The DE500 digital video otoscope by firefly isn't a handheld otoscope but some of the specifications can be use to determine our product. The otoscope has 1280x1024 resolution and frame rate of 30FPS. We decided to use this as our achieving spec. The price of this otoscope is relatively high, which means the design, workable condition should be much stronger and perform better than other otoscope on the market. I think this is a great design for professional technicians but won't suit for students or beginners. Thus we can adapt functions and advantages from this otoscope and reduce cost by removing unnecessary functions. This otoscope is $375.

Conclusions/action items:

More research on other otoscope on the market right now.

Sam TAN - Sep 21, 2023, 4:07 PM CDT

Download

Screen_Shot_2023-09-21_at_4.07.15_PM.png (487 kB)

2023/9/20- One way mirror

Sam TAN - Sep 20, 2023, 8:28 PM CDT

Title: Mechanisms and applications of one-way mirror

Date: 9/20/23

Content by: Sam

Present: NA

Goals: To understand how one-way mirror works.

Content:

To achieve this, half light must be reflected and the remaining lights are transparent through. Theres a thin layer of coating, called half-silver surface over the mirror. The reflective molecules on this layer of coating makes the mirror half opague. However, there must be a brightness difference between two sides of the mirror for this to be successful. The bright side is the reflected side thus lights are reflected so it acts as a mirror. The darker side is a normal glass.

Application:

In order to create 2 images in our otoscope, one for the camera and one for the local viewer, a one way mirror is assembled at 45 degree to the horizontal to reflect 70% of light to the camera and 30% of light to the local viewer. See Design idea 1.0 for more mechanisms and structures of the first draft of otoscope.

Conclusions/action items:

PDS

2023/10/05-HIDBEA One Way Privacy Window Film

Sam TAN - Oct 05, 2023, 3:57 PM CDT

Title: One way mirror research

Date: 10/5

Content by: Sam

Present: N/A

Goals: Find replacement materials for one way glass of design 1

Content:

https://www.amazon.com/HIDBEA-Blocking-Reflective-Non-Adhesive-Black-Silver/dp/B09MTC7C7N/ref=sr_1_2_sspa?crid=BYCGN7W7K9SF&keywords=one%2Bway%2Bglass&qid=1696539162&sprefix=one%2Bway%2Bglass%2Caps%2C800&sr=8-2-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&th=1

This mirror film is cheap and replaceable and very adjustable base on any need for size. this is the ideal material for the one way mirror portion of design 1.

Since we only need a small amount of it, we will order the smallest size possible and still have access materials for any tests we might conduct.

Conclusions/action items:

contact supplier for more details on the film and evaluate how effective it could be as a group.

2023/10/10- One way Film

Sam TAN - Oct 10, 2023, 7:52 PM CDT

Title: One way mirror film

Date: 10/10/23

Content by: Sam

Present: NA

Goals: Material decision for the one way mirror replacement.

Content:

This one way film is a replacement for the one way mirror. It acts as a protective film on a normal piece of glass that do what an one way mirror would do. This product is from FILMGOO and the smallest size was ordered. The cost is reasonable for a rough prototype to show on show & tell which I think would be great. Though it might be a final material, but I'm only thinking using it for preliminary showing. The final product price is 18.98.

https://www.amazon.com/Reflective-Privacy-Stickers-Blocking-Covering/dp/B0BXL38743/ref=sr_1_2_sspa?crid=3017HXDT658DY&keywords=one%2Bway%2Bmirror&qid=1696894696&s=home-garden&sprefix=one%2Bway%2Bmi%2Cgarden%2C559&sr=1-2-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&th=1

Conclusions/action items:

Prototype fabrication

2023/10/11-WebCam

Sam TAN - Oct 11, 2023, 4:52 PM CDT

Title: WebCam

Date: 10/11/23

Content by: Sam

Present: NA

Goals: Find camera for Design1, one way mirror design

Content:

https://www.amazon.com/Webcams-Computer-Microphone-110%C2%B0Wide-Angle-Conferencing/dp/B08PTNVPKX?ref_=ast_sto_dp&th=1

This is the perfect camera for design one. The size would fit within the otoscope handle and camera facing up. This product also have a very long cord to connect to a computer elsewhere. This camera does not use any other applications to have live camera feed. User can simply open up face-time, discord or any other app that allows a webcam to see live video feed.

Price of this product is also within an acceptable range.

Conclusions/action items:

Build and test camera and other components.

2023/10/16-Teleprompter Mirror

Sam TAN - Oct 16, 2023, 8:39 PM CDT

Title: Teleprompter mirror research

Date: 10/16

Content by: Sam

Present: N/A

Goals: Replacement for one way mirror.

Content:

Previous order of one way mirror film was tested and it was not ideal for the project. It does reflect, however, only in extreme condition it would function as desired. For example, the bumps and unevenness of the surface of the film create a very distorted image and the reflection is hardly visible. Such film does not provide the accurate information we were looking for so an alternative was considered for the one way mirror film.

A teleprompter mirror, often used in a teleprompter does everything we need, in fact provide a better quality image. A teleprompter mirror functions as it would allow a reflection and through light rays at the same time. However, constraints on this is that it only, and most often, comes in huge sizes. A small size that we want, often comes with high cost that we are considering as the most back up plan. Such mirror are often tempered glass which can't be used on a water jet for cutting, and such reflection would not be allowed in the laser cutter as well.

Alternative was considered in the next section of materials and parts.

Conclusions/action items:

Beam splitter

2023/10/16-Beam Splitter

Sam TAN - Oct 16, 2023, 8:43 PM CDT

Title: Beam Splitter research

Date: 10/16

Content by: Sam

Present: N/A

Goals: Replacement for one way mirror.

Content:

In the earlier entry about teleprompter mirror, I discussed the constraints of such material. The alternative for that is a beam splitter cube.

A beam splitter cube functions exactly the same as a one way mirror, though it usually comes with a cubed shape instead of the flat sheet of mirror. Such shape isn't easy to work around with either but I considered it as the best alternative for replacement .

A beam splitter creates two image in two directions, thus called a beam splitter. Details of beam splitting mechanisms were not discussed due to time constraints but will included in future entries and final presentation as a part of research and background materials.

Conclusions/action items:

Material order

2023/10/19-MicroLED

Sam TAN - Oct 19, 2023, 12:27 PM CD

Title: MicroLED

Date: 10/19/23

Content by: Sam

Present: N/A

Goals: Research about light source in design 1

Content:

https://www.amazon.com/30pcs-Pre-soldered-Micro-Waterproof-CD0603WM/dp/B091BS2ZLW/ref=asc_df_B091BS2ZLW/?tag=hyprod-20&linkCode=df0&hvadid=652493767415&hvpos=&hvnetw=g&hvrand=4979339591766953720&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9018944&hvtargid=p 2066197629061&gclid=CjwKCAjwp8OpBhAFEiwAG7NaEibWNnyv4IeKuPjdNrnlBdfHqiFiQeG_lXO8NQJFHHkinxRgnfSFGhoCSfgQAvD_BwE&th=1

MicroLED. Size: 1.5 mm.

This LED is under consideration for the light source of the otoscope. This is very small and fits next to the camera and next to the beam splitter just like the traditional Welch Allyn otoscope fro the client. The brightness of the LED wasn't found on the website but according to seller picture, it is bright enough for an otoscope. The product also comes with different resistor for different battery/power supplies. As for now, I was thinking about using a 3V coin battery, such as the 2032, the power the LED, separate from the video camera. This allows easier fabrication and easie repair since they will be using two separate systems.

Conclusions/action items:

Battery holder

2023/10/19-Coint battery (and holder)

Sam TAN - Oct 19, 2023, 12:36 PM CDT

Title: Coin battery

Date: 10/19/23

Content by: Sam

Present: N/A

Goals: Research possible power supplies for MicroLED

Content:

https://www.amazon.com/Alinan-Button-Battery-Storage-Container/dp/B09KTXB87B/ref=sr_1_3?crid=2MBJEJDHOM4M&keywords=coin%2Bbattery%2Bholder&qid=1697736495&sprefix=coin%2Bbattery%2Bholder%2Caps%2C84&sr=8-3&th=1

This is a coin battery holder, for the 2032 coin battery. This isn't the ideal size to fit inside of the otoscope handle but work can be done to accommodate its size. Other size is also researched but there're pros and cons.

The battery number 2032, is interpreted in the following ways. 20 as diameter, 32 as thickness both in mm. Such as 20mm diameter and 3.2 mm thickness for 2032. 12mm diameter and 2mm thickness for 1220.

The pros for 2032 it that it is very common to purchase, it is the most commonly use coin battery on the market thus would be great for common use. Cons: it is a little bit larger than we expected in size thus not ideal but workable.

The pros and cons for a 1220 coin battery is the complete opposite to that of a 2032.

Battery holder is also considered for the design. A holder for 2032 is very common and there are a lot of options for them and usually comes very complete with switches as well. The holder for a 1220 is less likely to have a switch and wires around it and thus making it harder to work with.

Conclusions/action items:

Make decisions and purchase materials.

2023/11/03-Buttons Dimensions

Sam TAN - Nov 03, 2023, 2:15 PM CDT

Title: Button Dimensions

Date: 11/03/23

Content by: Sam

Present: N/A

Goals: N/A

Content:

Button Dimensions:

9.82mm/10.82mm diameter

25mm length

Conclusions/action items:

Handle

2023/11/11-Teslong Endoscope

Sam TAN - Nov 11, 2023, 3:20 PM CST

Title: Teslong Endoscope Camera

Date: 11/11/23

Content by: Sam

Present: N/A

Goals: Find better camera

Content:

https://www.amazon.com/Generation-Teslong-Megapixels-Inspection-Multifunction/dp/B07HVT2XZL/ref=pd_ci_mcx_mh_mcx_views_0?pd_rd_w=Au6Sn&content-id=amzn1.sym.225b4624-972d-4629-9040-f1bf9923dd95%3Aamzn1.symc.40e6a10e-cbc4-4fa5-81e3-4435ff64d03b&pf_rd_p=225b4624-972d-4629-9040-f1bf9923dd95&pf_rd_r=HGQEG96NGQXRR1QGAPQM&pd_rd_wg=gmsdE&pd_rd_r=20b33008-ddc7-46b8-995e-a96c0b43baba&pd_rd_i=B07HVT2XZL

Endoscope, with 2560x1440p resolution and focal range of 0.7inch to 100ft. Capable for port USB, USB-C, Andriod. AutoFocus.

Conclusions/action items:

N/A

2023/9/20-Design Idea 1.0

Sam TAN - Sep 20, 2023, 8:13 PM CDT

Title: Otoscope Design Idea v1.0

Date: 9/20/23

Content by: Sam

Present: NA

Goals: Sketch possible design ideas and the light rays.

Content:

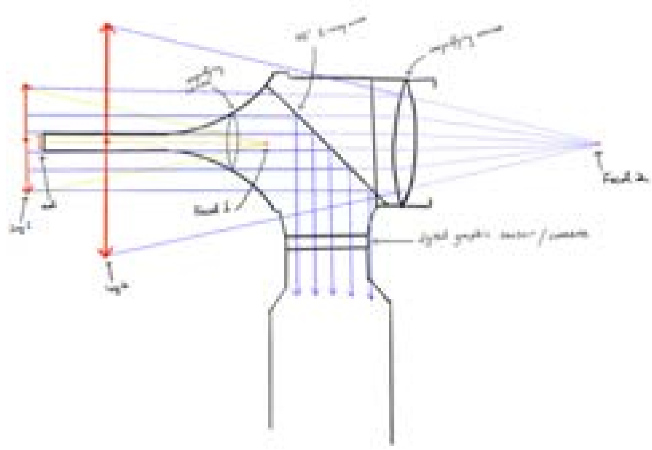
Attached.

Uses two convex lenses to achieve magnifying goal. Real image goes through the tube head into the first lens that projects a larger virtual image. The virtual image goes through a 45 degree arranged 1-way mirror that reflects only 70% of light. The rest is through another convex lens to enlarge the image for the local viewer. This view must keep close contact with the otoscope thus providing a dark environment for the 30% remainder light to be viewable. The 70% reflected light is captured by a camera below which is transfer to a distant viewer.

Conclusions/action items:

Continue Designing

Sam TAN - Sep 20, 2023, 8:09 PM CDT



Download

Untitled_Artwork.png (342 kB)

2023/9/28-Design Idea 1.0 w/ Dimensions

Sam TAN - Sep 28, 2023, 12:01 PM CDT

Title: Design idea version 1 rough dimensions

Date: 9/28/23

Content by: Sam

Present: NA

Goals: Set dimensions for design

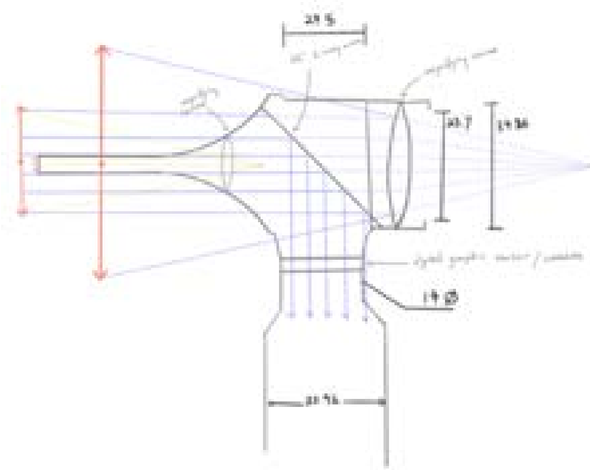
Content:

Attached

Conclusions/action items:

N/A

Sam TAN - Sep 28, 2023, 12:01 PM CDT



Download

Untitled_Artwork_2.png (331 kB)

2023/10/17-Design Idea 1.1

Sam TAN - Oct 17, 2023, 8:23 PM CDT

Title: Refined Design idea v1.1

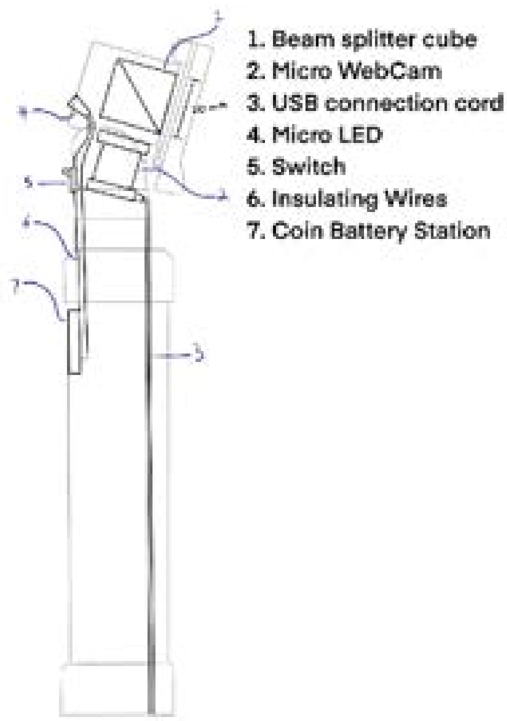
Date: 10/17

Content by: Sam

Present: Sam

Goals: Refined design

Content:



This is a modified version of the one way mirror design. The key component is the beam splitter cube, labeled as 1, in the middle. It functions like a one way mirror. They're given a 10-15 degrees tilt to make similar to current design. Underneath the beam splitter, labeled 2, is a small webcam. Dimension of webcam is unknown yet but estimated to be within 2cm in width and 2cm in length. Next to them is a micro LED system. This is the light source of the design. Connecting to the insulating wires are switch for the LED. The power source of this comes from the coin battery station located on the handle of the otoscope, labeled as 7. This is a first design idea that is more concise. Changes are subject to be made along the way.

Note: Specula is not present as we planed to use the same speculum from the client.

Conclusions/action items:

Test and buy materials.

2023/11/07-Design 1 Version 2,3,4

Sam TAN - Nov 07, 2023, 1:34 PM CST

Title: Modifications V2,3,4

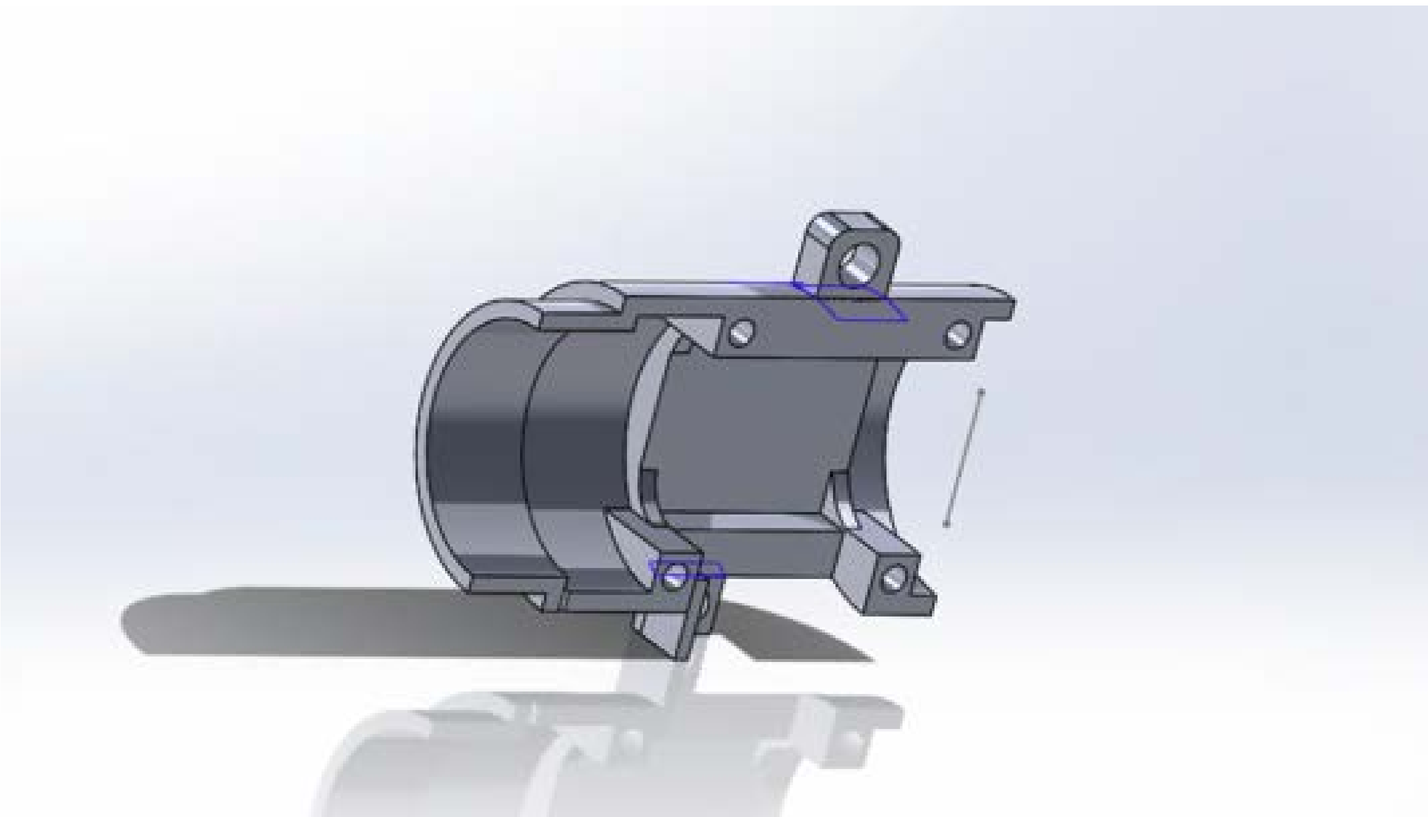
Date: 10/20

Content by: Sam

Present: N/A

Goals: Design 1

Content:



The idea for this design is to have separate connections to the handle. This was considered more complex and less ideal for ease of use.

Conclusions/action items:

Modification needed

2023/11/07- Design 1 Version 5

Sam TAN - Nov 07, 2023, 1:34 PM CST

Title: Modification Design 1

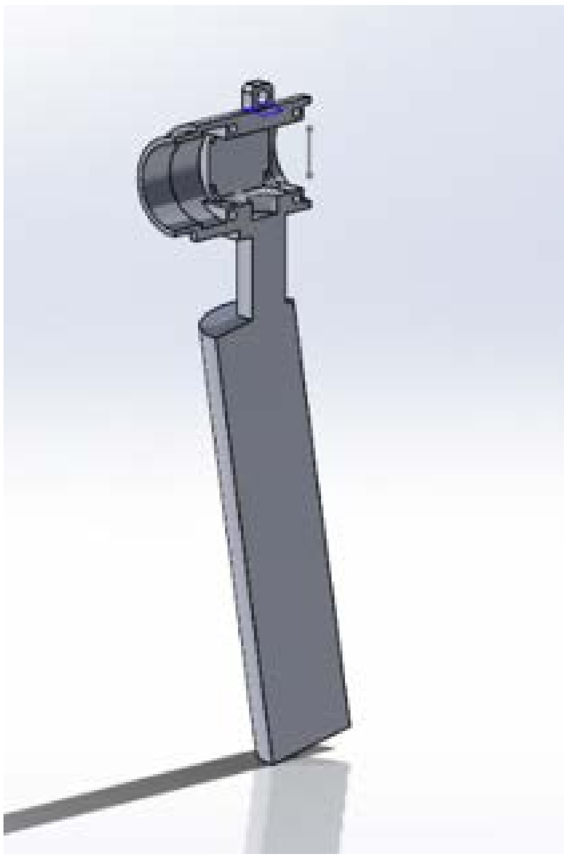
Date: 10/28

Content by: Sam

Present: N/A

Goals: Handle

Content:



Conclusions/action items:

The handle and head are connected into one piece, this will result in a more friendly ease of use, ease of fabrication, and ease of assembly. Less part means less could go wrong which makes the design better.

2023/11/07- Design 1 Version 6

Sam TAN - Nov 07, 2023, 1:34 PM CST

Title: Modification version 6

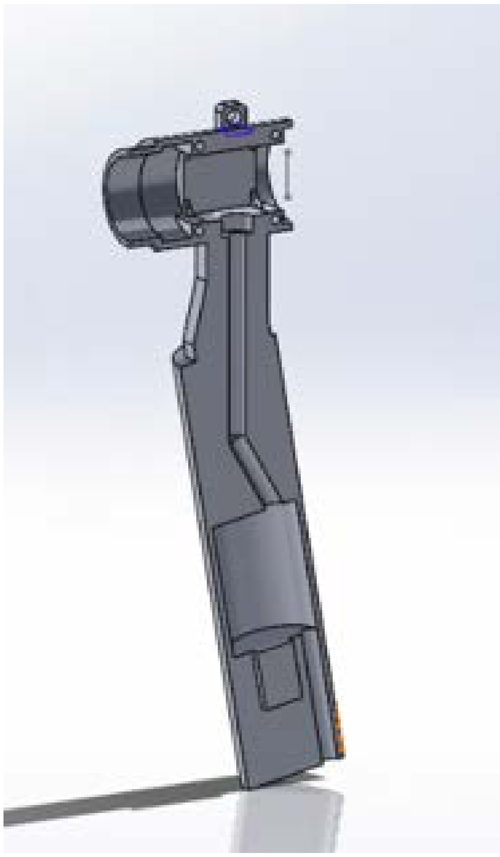
Date: 11/1

Content by: Sam

Present: N/A

Goals: Camera track

Content:



Conclusions/action items:

For this design. Camera track is cut out and other details are conducted on the otoscope body. The camera will follow the track all the way down. Battery holder will be placed on the bump area near the bottom.

2023/11/07- Design 1 Version 7

Sam TAN - Nov 07, 2023, 1:34 PM CST

Title: Modification Version 7

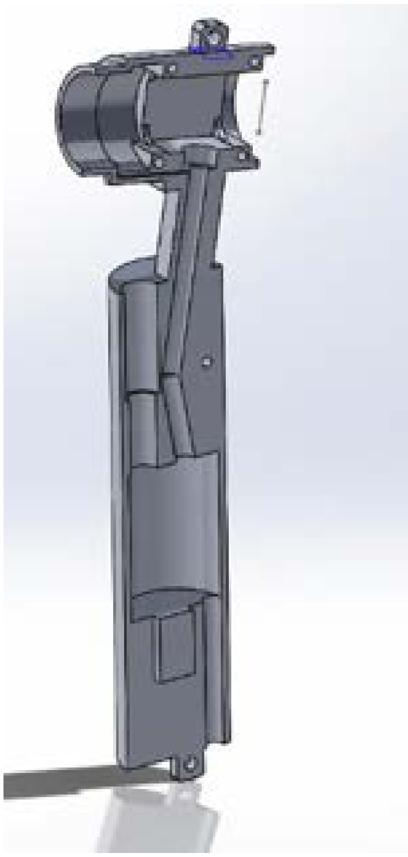
Date: 11/4

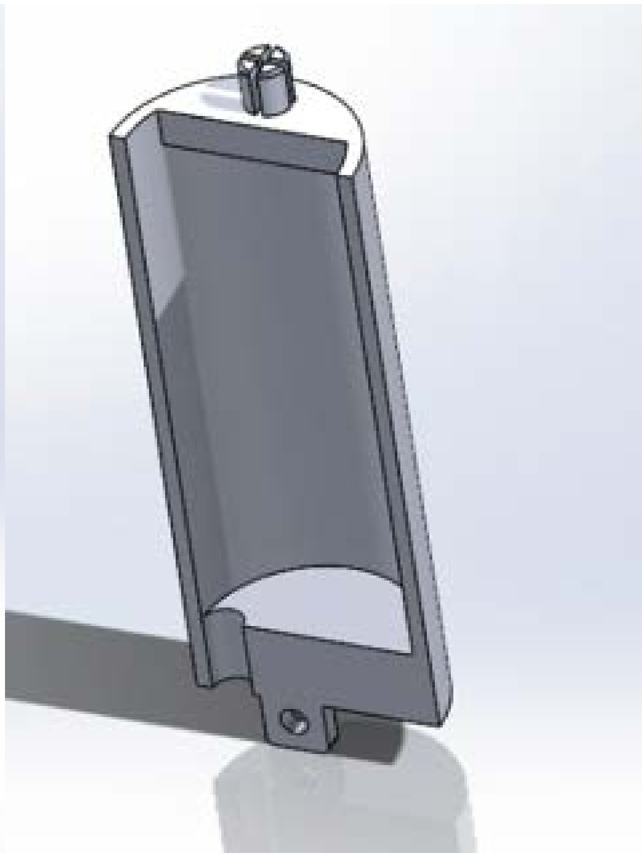
Content by: Sam

Present: N/A

Goals: Design for ease of use, TV remote design

Content:





Conclusions/action items:

For this version, button can be place near the top of the handle next to the neck to resemble the original otoscope design. The mirror symmetry (second half of the otoscope) is split into two piece. The top piece has the exact same design as the picture to the right. This part will snap on to the left half. The bottom half of the right half is close to a TV remote design. It will slide down for replacing battery if needed.

Note: The other half is not shown because it is the same as the left half.

2023/11/07- Design 1 Version 8

Sam TAN - Nov 07, 2023, 1:34 PM CST

Title: Design 1 version 8, modification 1

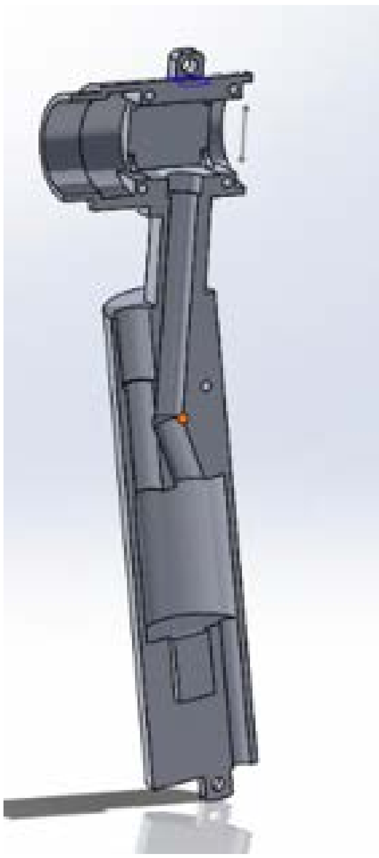
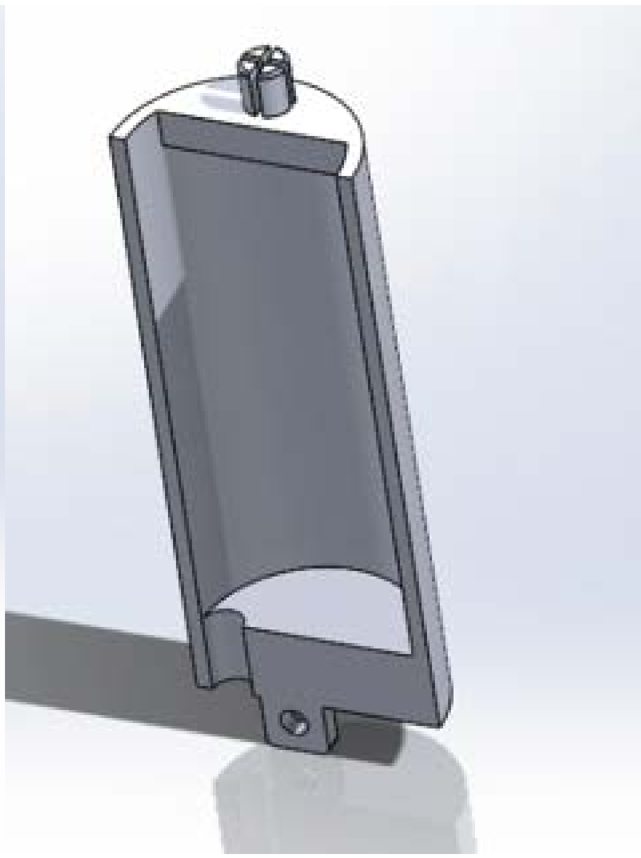
Date: 11/6

Content by: Sam

Present: N/A

Goals: Adapt for 8mm diameter camera

Content:

Conclusions/action items:

This is essentially the same design as version 7, however the camera track is design for a camera diameter of 8mm comparing to version 7, which is design for 5.5mm.

2023/11/07- Design 1 Version 9

Sam TAN - Nov 07, 2023, 1:33 PM CST

Title: Design 1 Version 9, Modification 1

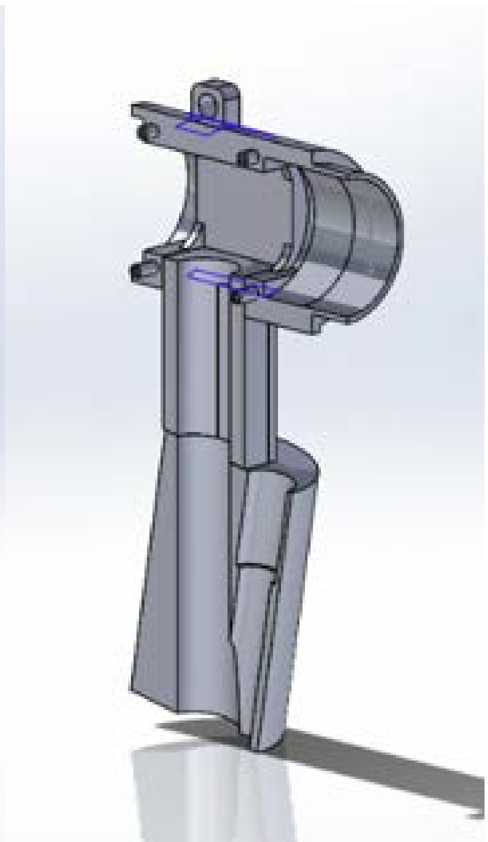
Date: 11/6

Content by: Sam

Present: N/A

Goals: Adapt for 12.5mm camera

Content:



Conclusions/action items:

Not yet completed. This is essential the same as version 7,8. Camera track is modified to fit camera with diameter 12.5mm. Small modifications to the head inner diameter to accommodate the convex lens that will be placed inside.

2023/11/24- Design 1 Version 9.1

Sam TAN - Nov 24, 2023, 9:36 PM CST

Title: Design 1 Version 9, Modification 2

Date: 11/24

Content by: Sam

Present: N/A

Goals: Adapt for 12.5mm camera

Content:

Conclusions/action items:

Comparing to version 9 modification 1, more space is carved out from the otoscope handle to fit button and excess wires. Another cut out next to the camera was done for the holding structure of the camera. A hold is also done to connect two pieces together using a screw.

Sam TAN - Dec 13, 2023, 7:57 PM CST

Note: This is the final version.

diagnosis accuracy

HAOMING FANG (hfang45@wisc.edu) - Oct 10, 2023, 8:11 PM CDT

Title: Accuracy on Different Types of Otoscopes Examinations

Date: October 10, 2023

Citation: T. Lundberg, L. Biagio de Jager, D. W. Swanepoel, and C. Laurent, “Diagnostic accuracy of a general practitioner with video-otoscopy collected by a health care facilitator compared to traditional otoscopy,” International Journal of Pediatric Otorhinolaryngology, vol. 99, pp. 49–53, 2017. doi:10.1016/j.ijporl.2017.04.045

Content by: Bobby

Present: N/A

Goals:

To compare and contrast between handheld otoscopes and video otoscopes

Content:

The study aimed to compare the diagnostic accuracy of video-otoscopy with traditional otoscopy when diagnosing otitis media (OM) in children. The research involved using video-otoscopy to capture ear images, which were later assessed by a general practitioner. The results indicated substantial diagnostic agreement between the general practitioner's otoscopic examination and an otologist's otomicroscopic diagnosis. Additionally, video-otoscopy assessments conducted by a health care facilitator and asynchronously reviewed by the general practitioner demonstrated similar or better accuracy than face-to-face otoscopy. This finding is particularly important in areas with limited access to health care personnel. However, there were some limitations to the study, such as low disease prevalence in the population. The research was supported by the county of Västerbotten and the Swedish Medical Association, with no reported conflicts of interest.

advantages of video otoscopes

HAOMING FANG (hfang45@wisc.edu) - Oct 10, 2023, 8:21 PM CDT

Title: Advantages of video otoscopes

Date: October 10, 2023

Citation: [2] "Video otoscopy," Veterinary Dermatology Center, https://itchypetvet.com/services/video-otoscopy/#:~:text=Thus%2C%20the%20video%20otoscope%20is,tumors%20in%20the%20ear%20canal. (accessed Oct. 10, 2023).

Content by: Bobby

Present: N/A

Goals:

To compare and contrast between handheld otoscopes and video otoscopes

Content:

Video otoscopy is a medical procedure that employs a short, rigid endoscope equipped with a video camera to visualize and examine the ear canal. This technology allows for magnified views displayed on a larger screen. The endoscope contains fiber optics to illuminate the ear canal with a bright light and features a working channel for instrument use and irrigation. Video otoscopy is especially useful for diagnosing and treating ear infections, ear canal growths, and debris removal. It enables deep ear cleaning, cleaning behind a ruptured eardrum, and facilitates the diagnosis, biopsy, and removal of ear canal tumors.

advantages of video in healthcare education

HAOMING FANG (hfang45@wisc.edu) - Oct 31, 2023, 3:28 PM CDT

Title: difficulties in otoscope examinations

Date: October 10, 2023

Citation: [4] H. L. Tham, F. A. Elnady, and M. K. Byrnes, “A novel canine otoscopy teaching model for veterinary students,” Journal of Veterinary Medical Education, vol. 50, no. 3, pp. 266–275, 2023. doi:10.3138/jvme-2022-0015

Content by: Bobby

Present: N/A

Goals:

to find details for difficulties in otoscope examinations education

Content:

Traditional otoscopic training in veterinary school involves using live dogs, which presents challenges such as patient restraint, stress to the dog, and the potential for trauma when performed by inexperienced individuals. This study explored the use of a novel canine teaching model for otoscopic training in first-year veterinary students. The model, created using the Elnady preservation technique, aimed to provide a realistic and durable alternative for training in a dermatology laboratory session. Student feedback was collected using a Likert scale, and the results indicated that students found the model beneficial for skill development and less stressful compared to live animal training. Most students expressed a desire for additional similar models in their training and would recommend them to fellow students.

Optic lens

HAOMING FANG (hfang45@wisc.edu) - Oct 27, 2023, 11:32 AM CDT

HAOMING FANG (hfang45@wisc.edu) - Dec 11, 2023, 7:15 PM CST

Title: Methods for measuring a lens focal length

Date: October 28, 2023

Citation: [1] S. Morel, "Methods for measuring a lens focal length," Overview of various methods for measuring a lens focal length, https://wp.optics.arizona.edu/optomech/wp-content/uploads/sites/53/2016/10/Tutorial_MorelSophie.pdf (accessed Oct. 27, 2023).

Content by: Bobby

Present: N/A

Goals:

to find information about optic lens

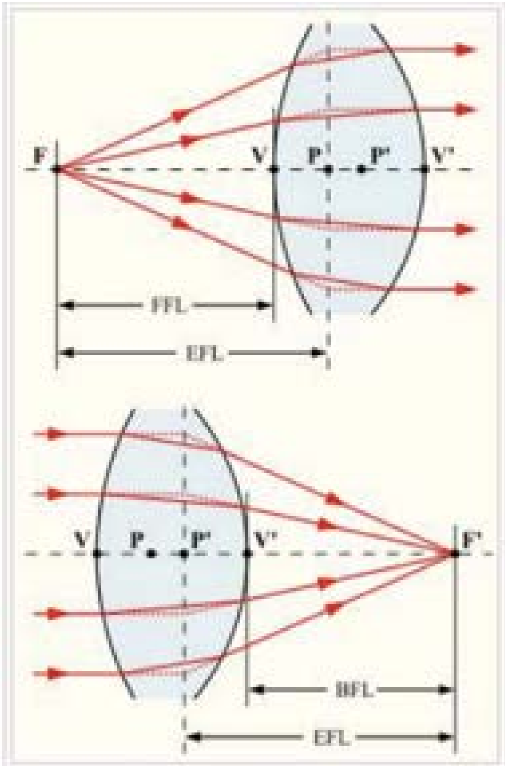
rear focal point F'

Content:

• By definition, the effective focal length EFL is the distance between the rear principal point P' and the lens's.

• The back focal length BFL is the distance between the rear vertex V' of the lens, and the rear focal point F'.

• The front focal length FFL is the distance between the front focal point F and the front vertex V.


F
V
P
P'
V'
FFL
EFL
V
P
P'
V'
F'
BFL
EFL

MACROVIEW™ VETERINARY OTOSCOPE

HAOMING FANG (hfang45@wisc.edu) - Oct 05, 2023, 4:12 PM CDT

Title: Research Note on Different Types of Otoscopes

Date: October 05, 2023

Citation: W. Allyn, MacroViewTM veterinary otoscope, https://www.welchallyn.com/content/welchallyn/americas/en/products/categories/animal-health/ear_exam/otoscopes--macroview/macroview_veterinary_otoscope.html (accessed Oct. 5, 2023).

Content by: Bobby

Present: N/A

Goals:

1. To provide information about the most popular models used

Content:

The MacroView Veterinary Otoscope by Welch Allyn offers significant advancements in otoscopy for veterinarians. It provides a wider, deeper, and clearer view of the ear, including the tympanic membrane, without the need for constant adjustment. This innovative device offers approximately 27% greater magnification, 35% larger field of view, and adjustable focus for various ear canal lengths and eyesight requirements. These features enable more precise and efficient diagnosis and treatment for a variety of animals.

Different Types of Otoscopes

HAOMING FANG (hfang45@wisc.edu) - Sep 21, 2023, 1:23 PM CDT

Title: Research Note on Different Types of Otoscopes

Date: September 20, 2023

Citation: [1] “Oaktree products,” Oaktree Products, Inc., https://www.oaktreeproducts.com/otoscope-overview#:~:text=Types%20of%20Otoscopes,less%20bulky%20than%20other%20otoscopes. (accessed Sep. 21, 2023).

Content by: Bobby

Present: N/A

Goals:

1. To provide information on the various types of otoscopes available in the market.
2. To explain the differences in light source technology used in otoscopes.
3. To discuss the battery technology options for otoscopes.

Content:

Types of Otoscopes:

Otoscopes can be categorized into three main types:

1. Pocket Otoscopes: These are designed to be compact and portable, fitting easily into a pocket. They are lightweight and typically use alkaline batteries for power.
2. Full-Size Otoscopes: Full-size otoscopes are larger and heavier than pocket otoscopes. They consist of more advanced heads and handles, which are often interchangeable across different brands.
3. Video Otoscopes: Video otoscopes are designed to connect to a computer or monitor, allowing for the projection, capture, storage, and emailing of high-quality images and videos.

Light Source Technology:

The type of bulb used in an otoscope impacts its illumination brightness, color, and heat generation. The three main types of bulbs are:

1. Halogen: Halogen bulbs provide bright bluish-white light and generate relatively little heat during use.
2. Xenon: Xenon bulbs are slightly brighter than halogen bulbs, emit a white light, and produce more heat.
3. LED: LED bulbs burn the brightest and whitest while remaining cool during operation. Some otoscopes offer the option to upgrade from halogen to LED bulbs.

The manner in which light is directed within an otoscope involves two technologies:

1. Direct Illumination: In this non-fiber optic technology, the bulb is positioned above the eyepiece's floor, directing light through the speculum's opening.
2. Fiber Optic Technology: Fiber optic bundles around the perimeter of the otoscope head deliver light, allowing for an unobstructed view through the lens.

Battery Technology:

Otoscopes are either battery-operated or hardwired. Battery-operated otoscopes may use alkaline or rechargeable batteries. Rechargeable handles can be recharged via a wall socket or specific charging stands. Rechargeable otoscope handles come in three main battery types:

1. Nickel Cadmium (NiCad): These batteries have less capacity than NiMH and Li-Ion batteries.
2. Nickel Metal Hydride (NiMH): NiMH batteries offer twice the capacity of NiCad batteries and don't suffer from memory effects.
3. Lithium Ion (Li-Ion): Li-Ion batteries provide about 50% more capacity than NiCad batteries and are lighter. They also lack memory effects and are considered more environmentally friendly.

Conclusions/Action Items:

Otoscopes come in various types, including pocket, full-size, and video otoscopes, catering to different needs.

Light source technology varies, with LED bulbs being the brightest and coolest option.

Fiber optic technology provides an unobstructed view through the otoscope lens.

Battery technology options include NiCad, NiMH, and Li-Ion, with NiMH and Li-Ion being more efficient and environmentally friendly.

When choosing an otoscope, consider the specific requirements of your practice and budget constraints.

pentaprism

HAOMING FANG (hfang45@wisc.edu) - Sep 21, 2023, 1:36 PM CDT

Title: Pentaprism: What It Is and How It Works

Date: Sep 21st, 2023

Content by: Bobby

Present: N/A

Goals:

To provide a comprehensive explanation of what a pentaprism is.

To discuss whether this can be a good fit to direct the image in our otoscope.

Content:

Introduction:

The pentaprism is a vital component in the world of photography, especially for single reflex cameras. In this article, we will delve into the workings of the pentaprism and explore its role in shaping the way photographers capture images.

The Pentaprism's Crucial Role:

The pentaprism is responsible for a significant advancement in photography, allowing photographers to view scenes through their lenses exactly as they appear to the naked eye. This innovation has been instrumental in the success of single reflex cameras, commonly known as SLRs.

Understanding the Pentaprism's Structure:

The name "pentaprism" might suggest a structure with five sides, but in reality, it typically has seven or eight sides. The term "roof pentaprism" derives from its appearance, resembling a rooftop from certain angles.

The Problem It Solves:

Before the pentaprism's introduction, photographers using reflex cameras faced an issue. These cameras employed a mirror placed at a 45° angle behind the camera lens, projecting the lens view onto a ground-glass screen. However, the photographer had to look downward to view the scene through the lens, making it less than ideal for capturing moving subjects. This setup was referred to as a waist-level reflex viewfinder, as it often required the camera to be placed at waist height for shooting.

The Pentaprism Solution:

In the mid-1930s, camera designers began exploring the use of pentaprisms in 35mm reflex cameras. This innovation allowed photographers to see through the lens via an eyepiece, facing the same direction as the camera. Moreover, the view appeared both vertically and laterally correct, thanks to the pentaprism's internal reflections that accurately transformed the view.

Challenges and Solutions:

Over the years, the popularity of the pentaprism faced challenges with the introduction of DSLR cameras featuring smaller "crop-frame" digital sensors. These sensors necessitated smaller viewfinders, which photographers found less appealing. Some cameras addressed this by using tilted pentaprism and eyepiece optic designs to magnify the view, albeit at the cost of reduced brightness. However, the resurgence of full-frame DSLRs resolved these issues, offering photographers a satisfying viewfinder experience. To reduce costs and weight, an alternative known as the pentamirror was introduced, functioning similarly to a pentaprism but employing only mirrors.

Conclusion:

The pentaprism's invention revolutionized photography by enabling photographers to view scenes precisely as they appear to the naked eye. Its enduring significance and adaptability to changing camera technologies highlight its role as a cornerstone of the photographic world.

Action Items/Recommendations:

It seems like the pentaprism is a good way to redirect the image, but it can't split an image into two for both the video and the lens.

digital camera

HAOMING FANG (hfang45@wisc.edu) - Sep 21, 2023, 1:29 PM CDT

Title: Understanding the Parts of a Camera and Their Functions

Date: September 20, 2023

Content by: Bobby

Present: N/A

Goals:

To provide an overview of the various parts of a digital camera and their functions.

To explain how each component contributes to the process of capturing photographs.

Potentially use this information to determine whether to use a micro digital camera at the tip in our design or to use parts in a digital camera to redirect the light and the image to a different place.

Content:

Viewfinder:

The viewfinder is a crucial component that allows you to frame your shot. Some modern viewfinders display additional information like shutter speed, aperture, and ISO, providing a comprehensive view before taking a photo.

Pentaprism:

The pentaprism is responsible for redirecting the light from the camera lens to the viewfinder, eliminating the need for photographers to look downward when capturing images.

Built-in Flash:

The built-in flash provides a burst of light to illuminate the subject when taking a photo. It fires only when the camera captures an image.

Flash Button:

Present on cameras with built-in flashes, the flash button helps control the flash's behavior, including its intensity, by setting flash exposure compensation.

Lens Mount:

The lens mount is a mechanical fitting that allows you to attach compatible lenses to your camera, ensuring a secure connection.

Lens Release Button:

This button allows you to safely detach the lens from the camera, enhancing ease of use and security.

Mode Dial:

The mode dial, typically located on the top-right of the camera, allows you to switch between different operating modes, including manual, automatic, semiautomatic, and scene-based modes.

Focusing Screen:

The focusing screen is a surface that helps achieve various focus effects, from sharp and high-contrast shots to blurred backgrounds (bokeh).

Condenser Lens:

This component corrects color fringing and aberration commonly found in traditional camera lenses.

Digital Sensor:

The digital sensor captures light from the lens to create an image, using either a charged-coupled device (CCD) or a complementary metal-oxide semiconductor (CMOS) imager.

Grip:

The grip, located on the right side of the camera, provides a comfortable handhold for secure handling.

Shutter:

The shutter controls the amount of light that reaches the camera sensor and determines exposure. The shutter speed setting adjusts the duration the shutter remains open.

Display:

The camera display shows critical information, allowing you to adjust settings such as exposure, ISO, and shutter speed. It also provides a preview of the image before capture.

Electronics:

Camera electronics include photo capture components, camera controllers, and user interface elements, all of which work together to capture and control images.

Remote Control Sensor:

This sensor connects the camera to remote controls, enabling remote shutter activation and timed captures.

Shutter Button:

The iconic shutter button triggers the camera to take a picture and can activate the autofocus system when half-pressed.

Autofocus System:

Digital cameras employ autofocus sensors to quickly and automatically focus on subjects, a feature absent in traditional film cameras.

Reflex and Relay Mirror:

SLR and DSLR cameras use reflex mirrors to reflect light from the lens to the viewfinder, allowing you to compose shots accurately.

Aperture:

The aperture, located within the lens, controls the amount of light passing through, affecting exposure and depth of field, influencing background blur.

Main Dial:

This dial adjusts various settings, including aperture, shutter speed, and exposure compensation, for quick and efficient shooting.

Hot Shoe:

The hot shoe permits the attachment of external flash units and accessories, enhancing photographic versatility.

Contacts:

Contacts on the lens and camera facilitate communication, transmitting data like aperture and focus adjustments.

Processing Engine:

The processing engine converts raw sensor data into viewable images, performing tasks like noise reduction and color correction.

Buffer:

The buffer temporarily stores images before writing them to the memory card, affecting burst mode capabilities.

Function Buttons:

Customizable function buttons can be programmed to quickly adjust settings such as ISO, white balance, and autofocus mode.

ISO:

ISO settings control sensor sensitivity to light, with higher ISO values improving low-light performance but potentially introducing image noise.

Red-eye Reduction:

This feature minimizes red-eye effects in portraits by emitting a pre-flash to constrict pupils before the main flash.

Memory Card Slot:

The memory card slot houses the card that stores captured photographs, and some cameras offer multiple card slots for extended storage or backup.

Tripod Mount:

The tripod mount allows you to attach the camera to a tripod or monopod for stable and sharp shots.

Zoom Elements:

Zoom lenses enable you to adjust focal lengths for different perspectives, enhancing compositional flexibility.

Batteries:

Batteries power the camera's components, enabling extended shooting and the capture of perfect shots.

Understand How Your Camera Works:

Mastery of photography involves understanding your camera's components and functions. This knowledge empowers photographers to control exposure, depth of field, and adapt to various situations and environments.

Conclusions/Action Items:

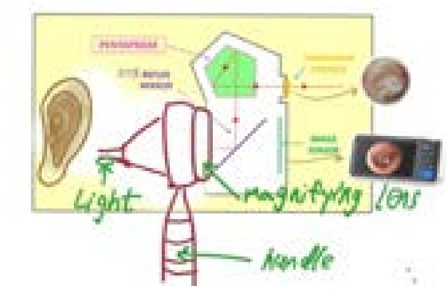
Understanding the parts of a camera and their functions is fundamental for any photographer.

Each component contributes to the photographic process, allowing for precise control and creativity.

Photographers should take the time to familiarize themselves with their camera's features to capture stunning and consistent shots.

add on module to existing otoscope

HAOMING FANG (hfang45@wisc.edu) - Sep 21, 2023, 4:14 PM CDT



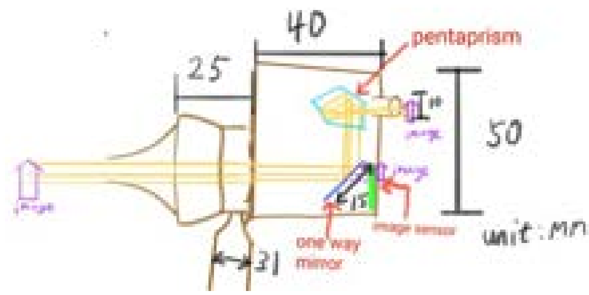
Download

34101695330743_.pic.jpg (231 kB)

HAOMING FANG (hfang45@wisc.edu) - Sep 21, 2023, 4:14 PM CDT

redrawn sketch of design 2

HAOMING FANG (hfang45@wisc.edu) - Oct 04, 2023, 4:39 PM CDT



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Project Description Research: 09/14

GRACE BOSWELL - Sep 14, 2023, 10:53 AM CDT

Title: Product Description Research

Date: 09/14

Content by: Grace Boswell

Present: N/A

Goals: To develop a better understanding of otoscopy devices and the anatomical features of dog ears.

Content:

Otoscopes for Small Animals:

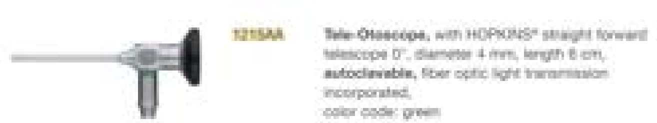
-"provides a precise means of assessment of treatment and follow-up, documentation of findings and client education"

- designed to treat the external ear: cleaning- flush/suction, curettage of inflamed ears with debris, to remove objects

- Figures 1-6 in this article give examples of otoscopy pictures of the ear (cat)

This is used for examination/flushing

-flexible instrument- other accessories can be added on



for inflamed ears/small animals

-smaller scope-less painful- animals awake

[1]“Otoscopes for Small Animals V E T 1 7 1 3 . 0 1 2 / 2 0 2 1 -E.” Accessed: Sep. 14, 2023. [Online]. Available: https://www.karlstorz.com/cps/rde/xbcr/karlstorz_assets/ASSETS/2165700.pdf

Design and Validation of a Three-Dimensional Printed Flexible Canine Otoscopy Teaching Model:

-This article's purpose is to help train veterinarians without harming the dog

- The results of this experiment were that pre-lab training significantly was more helpful with the model- using the model did not confuse their learning

- extensive knowledge of the anatomical structures of the ear and precise hand skills are needed to not cause discomfort

[2]Belle Marie Nibblett, Mary Mauldin Pereira, Fortune Sithole, P. J. Orchard, and E. B. Bauman, "Design and Validation of a Three-Dimensional Printed Flexible Canine Otoscopy Teaching Model," *Simulation in healthcare : journal of the Society for Simulation in Healthcare*, vol. 12, no. 2, pp. 91–95, Apr. 2017, doi: https://doi.org/10.1097/sih.0000000000000227.

A Novel Canine Otoscopy Teaching Model for Veterinary Students:

- Challenges with practicing on a live dog: patient restraint, stress to the dog which can cause canal damage

[3]H. L. Tham, F. A. Elnady, and M. K. Byrnes, "A Novel Canine Otoscopy Teaching Model for Veterinary Students," *Journal of Veterinary Medical Education*, vol. 50, no. 3, Jul. 2022, doi: https://doi.org/10.3138/jvme-2022-0015.

Conclusions/action items:

The research on this page is based on the relevant journal articles given on the product description of the dual handheld and video otoscopy unit page. This information has helped me create a deeper understanding of otoscopy and the anatomy of a dog/cat's ear. Based on this research I have realized I need to complete more research on competing designs and I need to watch videos of animals getting an ear exam.

Anatomy of the Ear (Dog/Cat): 09/14

GRACE BOSWELL - Sep 14, 2023, 11:33 AM CDT

Title: Anatomy of the Ear

Date: 09/14

Content by: Grace Boswell

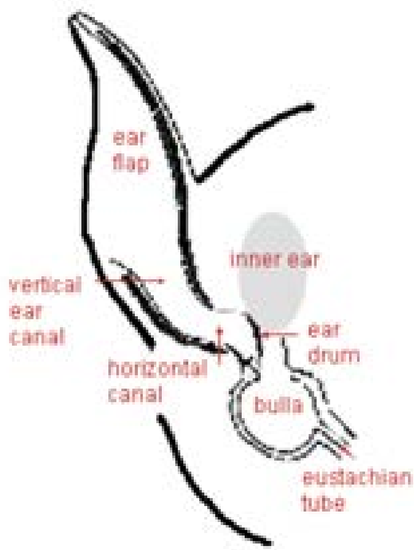
Present: N/A

Goals: To gain a deeper understanding of the anatomical/physiological functions of a dog and cat's ear.

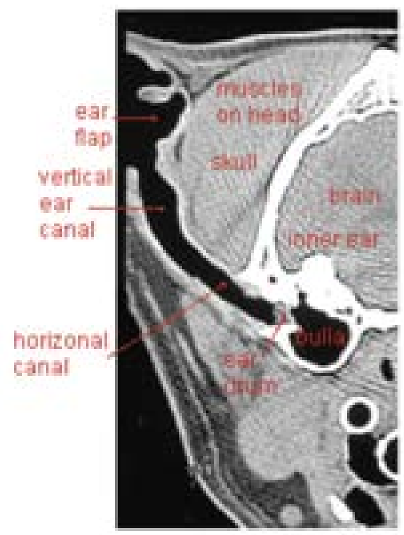
Content:

Examining and medicating the ears of a dog:

- 3 main parts of the ear: outer, middle, and inner ear



front diagram



CT diagram

Outer ear: ear flap (pinna)- some dogs have floppy or upright ears- which causes varying levels of buildup in their ears, it funnels sound, long and narrow compared to humans

Middle ear: thin membrane (eardrum/tympanic membrane), fragile, 3 bones, air-filled cavity (bulla), thin tube (eustachian tube)

Inner ear: connects to the brain, has nerves, balance and hearing

[1] "Examining and medicating the ears of a dog," *Veterinary Teaching Hospital*. https://hospital.vetmed.wsu.edu/2022/01/04/examining-and-medicating-the-ears-of-a-dog/

Examining and Medicating a cat's ears:

- extremely similar to a dog's ear anatomy

- usually, cats do not like ear exams as much as dogs

- shorter and straighter ear canal compared to dogs, manubrium is less curved

[2]“Examining and medicating a cat’s ears,” *Veterinary Teaching Hospital*, Jan. 03, 2022. https://hospital.vetmed.wsu.edu/2022/01/03/examining-and-medicating-a-cats-ears/

Conclusions/action items:

Based on the information in these two articles I have learned more about the anatomical features of cats and dogs. based on this I need to learn more about the physiological features and what about otoscopic exams that make it painful. In anatomy in high school, we learned about the anatomy of the human ear and it seems very similar to that of the dog. I also need to complete more research of otoscopy tools and how the videotaping process works.

Otoscope and Video Otoscope: 09/21

GRACE BOSWELL - Sep 21, 2023, 12:14 PM CDT

Title: Otoscope and Video Otoscope Research

Date: 09/21

Content by: Grace Boswell

Present: N/A

Goals: To understand how otoscopes work at a deeper level and see how both functions can come together in the final design.

Content:

Otoscopic Examination:

- This source starts by giving pictures of how to assemble an otoscope with descriptions underneath

- usually a light and battery source, different size cones for various patients (different size dog/cat ears)

- otoscopic examination can be very painful for animals

[1] "Otoscopic Examination Year Group: BVSc4 +." Accessed: Sep. 21, 2023. [Online]. Available: https://www.bristol.ac.uk/media-library/sites/vetscience/documents/clinical-skills/Otoscopic%20examination.pdf

Enhancing Ear Health Assessment

- traditional otoscopes provide limited visibility

- video otoscopes have a small camera at the end, some can stream the captured images and videos to a screen

-bluetooth or wired connections can be used

[2]A. Aleksandrova, "Enhancing Ear Health Assessment: The Advantages of a High-Quality Video Otoscope," *Meduc8ion*, Jul. 20, 2023. https://meduc8ion.co.uk/enhancing-ear-health-assessment-the-advantages-of-a-high-quality-video-otoscope/ (accessed Sep. 21, 2023).

Conclusions/action items:

This research included pictures in the articles that have enhanced my understanding of the otoscope and its differing functions. Now that I have researched this I need to look at competing designs. I also need to look at small cameras that can be placed at the tip of the scope but do not fog up the scope/ block it.

Standards: 09/21

GRACE BOSWELL - Sep 21, 2023, 12:27 PM CDT

Title: Standards for Otoscopes

Date: 09/21

Content by: Grace Boswell

Present: N/A

Goals: To understand the safety standards that have been put in place to keep humans/animals safe while using an otoscope.

Content:

- "If a manufacturer's device falls into a generic category of exempted class I devices as defined in 21 CFR Parts 862-892, a premarket notification application and fda clearance is not required before marketing the device in the U.S. however, these manufacturers are required to register their establishment"

- Above is what the FDA says about the use of otoscopes and the rules regarding them

- Based on this I am assuming it does not need fda clearance but needs to be registered if we decide to put this on the market or patent it

[1]“Product Classification,” *www.accessdata.fda.gov*, Sep. 18, 2023. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpcd/classification.cfm?ID=ERA (accessed Sep. 21, 2023).

Conclusions/action items:

It was difficult to find standards relating to otoscopes on the internet. I think this is because it is just used for exams and does not interfere with many parts of the body. I will continue to search for more standards that relate to otoscopes.

Design Ideas: 09/27

GRACE BOSWELL - Sep 27, 2023, 3:47 PM CDT

Title: Preliminary design ideas

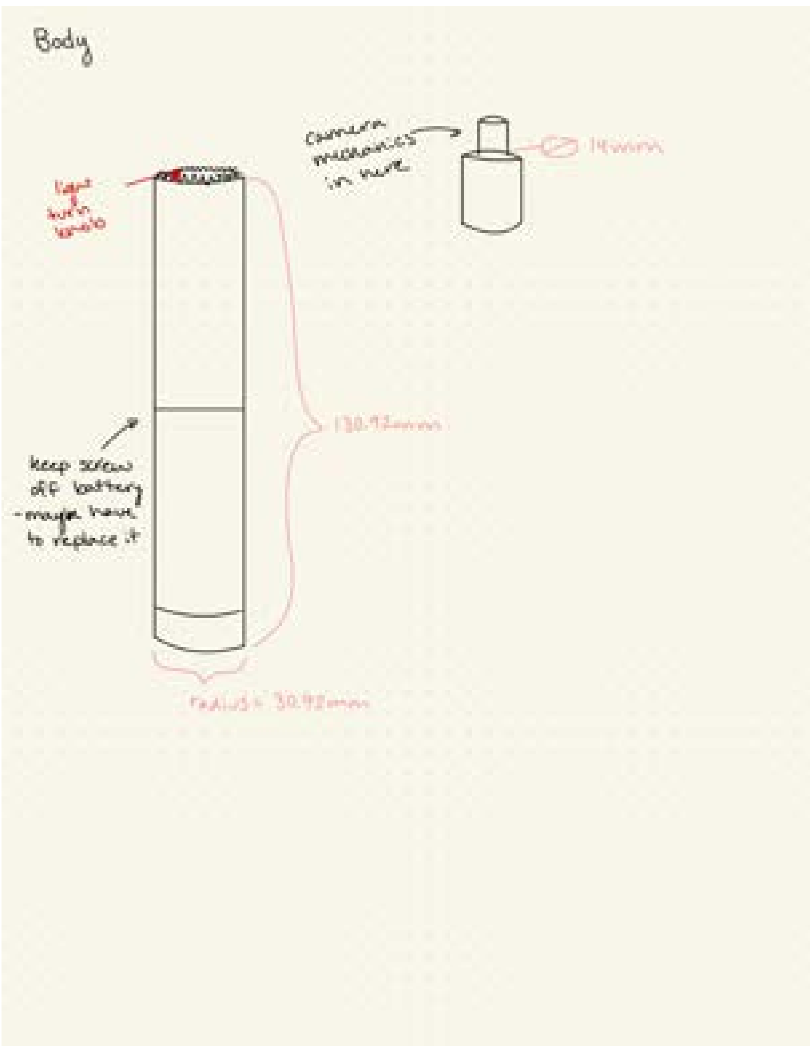
Date: 09/27/23

Content by: Grace Boswell

Present: N/A

Goals: To develop ideas for the design matrix

Content:



Conclusions/action items:

Ear Canal 3D Model: 10/19/2023

GRACE BOSWELL - Oct 18, 2023, 11:07 PM CDT

Title: Ear Canal 3D Model

Date: 10/19/2023

Content by: Grace/Sam

Present: Grace/Sam

Goals: To demonstrate a dog ear canal to use for a 3D model to practice our otoscope use. This model will also be used for testing our device.

Content:

Conclusions/action items:

Sam and Grace spent around 1.5 hours working on this 3D design of the ear model. Once the makerspace account is approved grace will take the design to the makerspace and have the employees check over the design. They will assist with the dimensions and thickness of the ear canal. They will determine if one end needs to be printed solid or if it needs to be printed in half and glued together.

Ear Canal Fail: 12/10/23

GRACE BOSWELL - Dec 10, 2023, 2:52 PM CST

Title: Ear Canal Fail

Date: 12/10/23

Content by: Grace

Present: N/A

Goals: To show why the team did not continue to work on the ear canal.

Content:

I decided to not continue this project for a few reasons. The first is that it was not a part of our client's requirements. The team agreed we should not spend valuable time building a 3D-printed ear canal. This task was difficult to begin with because I have not had experience with Solidwork, except for one assignment in interegr 170. Another issue was that printing a hallow object is very difficult. And if we split it into 2 parts then they would need to be attached with glue or tape and that is not very stable. The cost of this project would be around $25-50 depending on the type of 3D printed material. Although the team had the funds to print, we did not want to use it on unneeded projects.

Conclusions/action items:

If given more time and if the prototype developed at a faster rate the team would have completed this task. It was not originally in the client's requirements, it just would have been nice to test on a well-developed ear canal prototype instead of a cardboard box with a latex glove finger acting as it.

Client Questions: 09/13/23

GRACE BOSWELL - Sep 14, 2023, 9:34 AM CDT

Title: Client Questions

Date: 09/13/23

Content by: Grace Boswell

Present: N/A

Goals: To be prepared for the client meeting by curating thoughtful questions beforehand.

Content:

- What is the budget for this project?

- What aspects of the handheld otoscope and video otoscope do you want to be included in the design?

- What anatomical functions of cats/dogs make an ear exam painful?

Conclusions/action items: Discuss with my fellow group members so we do not have duplicate questions and do not feel unprepared. I need to complete additional research throughout this project because I do not know much about the anatomy of the ear and about medical videotaping.

Testing Survey: 11/09

GRACE BOSWELL - Nov 09, 2023, 4:36 PM CST

Title: Testing Survey

Date: 11/09

Content by: Grace

Present: Grace

Goals: To develop a survey to present people while they test our device.

Content:

Affiliation to The University of Madison:

If Associated with the Veternary School, what year/position:

On a scale of 1 to 5 rate the following qualities regarding the Dual Handheld-Video Otoscope:

Quality of the image on the monitor:

Magnification of the ear when viewing through the lens:

Magnification of the ear when viewing on the monitor:

Brightness of the light source:

Comfort of the handle:

Size/weight of the device:

If you have used the video otoscope

On a scale of 1 to 5 rate the following qualities regarding the Video

Conclusions/action items:

These are only a few beginning questions. I will continue to develop these and refine them with other group members. I am beginning to think about who to ask to test this device and what they will test it on.

Testing Survey Part 2: 11/15

JOSE RAMIREZ - Nov 27, 2023, 4:39 PM CST

Title: Testing Survey Part 2

Date: 11/15/2023

Content by: Grace

Present: N/A

Goals: To develop a survey to give to people testing our device.

Content:

Affiliation to The University of Madison:

If Associated with the Veternary School, what year/position:

Pre-Medical School ☐

Pre-Vetrenary School ☐

Knowledge level of Otoscope before this survey:

None- limited ☐ Shown/heard about in class ☐ Used ☐ Expierenced ☐

On a scale of 1 to 5 rate the following qualities regarding the Dual Handheld-Video Otoscope:

Quality of the image on the monitor:

Magnification of the ear when viewing through the lens:

Magnification of the ear when viewing on the monitor:

Brightness of the light source:

Comfort of the handle:

Size/weight of the device:

Size of lens:

If you have used the video otoscope:

On a scale of 1 to 5 rate the following qualities regarding the Video

What features of the dual device are missing from the video otoscope:

Which device do you prefer:

Post Questions:

What aspects with the device did you struggle with:

How easy was the device to navigate:

Did the given instructions effectively teach you how to use the device:

Instructor Fill in:

Time taken to master otoscope use:

Color/Shape guessed: Correct: ☐

Conclusions/action items:

This survey still needs to be fully completed and the team needs to complete a script to practice before we allow people to test the device. I will work on creating a makeshift ear drum for people to practice on. The team also plans to meet with the client on 11/16 to see if she knows people we can test the device with and to see what suggestions she has.

Future Work Research- Light Source/Inside Otoscope: 12/10/23

GRACE BOSWELL - Dec 10, 2023, 4:04 PM CST

Title: Future Work Research- Light Source

Date: 12/10/2023

Content by: Grace

Present: N/A

Goals: To complete a little research on improvements that could be made in the light source and configurations in the otoscope.

Content:

The current issues with the light source:

The color of the light (cool white) may be affecting the image on the monitor and what is seen through the lens:

- this could be determined by testing the same light source with the same size battery in cool vs warm light

- veterinarians at the vet school could tell the team what color they prefer and which they believe shows and ear canal better

- most current market otoscopes use a warm light

The light source is attached to the outside of the specula:

- The team could complete further research on how to attach a light source made for an otoscope inside the specula [1]

- the light sources are available as shown in references

- the issue is adding the light so that it does not interfere with the beam splitter

- when the light is not directed straight forward, it messes with the image formed at the lens and on the monitor

Battery size:

- very small lights are difficult to find

- our current prototype runs off a 3-volt battery, to produce a brighter light the team would need a higher voltage battery which would take up more space in the otoscope handle

- there is already some space left in the otoscope handle where the battery may be able to fit, otherwise the handle may need to be made wider in diameter or longer in length

Attachment of camera:

- glue could be used to secure the camera into place so rotation does not occur

- the place where the camera sits could be made smaller to prevent rotation

References:

[1]“Welch Allyn LED Lamp for PanOptic - Save at Tiger Medical, Inc,” www.tigermedical.com, 2023. https://www.tigermedical.com/Products/SureColor-LED-Lamp-for-PanOptic-Ophthalmoscopes__WEL03800-LED-.aspx (accessed Dec. 10, 2023).

Conclusions/action items:

Our final prototype for this semester has made great progress but there are a few small details to make it better. One of those in changing the light source to be brighter and a warm white instead of cool light. These changes could be made by a new team next semester or in the following years to create a device for the optimal learning experience.

Future Work Research- 3D Printing Material: 12/10/23

GRACE BOSWELL - Dec 10, 2023, 3:44 PM CST

Title: Future Work Research - 3D Printing Material

Date: 12/10/23

Content by: Grace

Present: N/A

Goals: To continue research on how the team could improve our prototype.

Content:

- The team printed the beginning and final prototypes with pla (polylatic acid) - filament at 100%

- This material used is not very strong, it broke easily shown by the drop test

- This material was good for prototyping because it is inexpensive [1]

- potential other materials to use- tough pla, or metal

- current market otoscopes are made of a metal, the team if we had more time could use stainless steel or titanium

- these metals are more durable, can be disinfected, and do not rust

- source 2 gives a few reasons why stainless steel does not rust

- if the team planned on putting this device on the market it would need to be able to be sterilized

- in stainless steel, there is a mixture of nickel and chromium which protects steel from rusting [2]

References:

[1]“3D Printing at The Makerspace (under construction),” UW Makerspace, 2023. https://making.engr.wisc.edu/3d-printing-the-makerspace/

[2]E. Sonstroem, “Why Stainless Steel Does Not Rust But Other Metals Do,” News - Indiana Public Media, Feb. 12, 2010. https://indianapublicmedia.org/amomentofscience/stainless-steel.php

Conclusions/action items:

If our team continued this project of if another team decided to do so they would need to print the design with a more durable and smoother material. The makerspace offers other types of 3D printing materials that could be used but all those are not as strong as metal. Although metal would be more durable and smooth it is very difficult to build with, especially for college students who do not have access to various machinery needed.

Initial Camera Research - 9/18/2023

Title: Potential Camera Attachment for Otoscope

Date: 9/18/2023

Content by: Jose Ramirez

Goals: Compile a list of endoscopic/otoscopic cameras and create a comprehensive list of strengths and limitations for each camera. Specifically, how these outlined by the client.

Content:

NIDAGE Wireless Endoscope

https://www.amazon.com/gp/product/B07C9C6P5D/ref=as_li_qf_asin_il_tl?ie=UTF8&tag=testedcom-20&creative=9325&linkCode=as2&creativeASIN=B07C9C6P5D&linkId=167324f565709a1ff78c7c00e8604

Overview:

This is a decent option for its relatively inexpensive price; however, there are two major concerns I have with utilizing this camera for our design. The first is addition to the battery/Wi-Fi box can get in the way of the user. This does have potential workarounds as the Wi-Fi box does not seem to be very heavy. Th accessible through a mobile phone app which is not ideal.

Pros:

- Inexpensive ($30-40)
- Recording functionality
- Wireless connection through Wi-Fi

Cons:

- 5ft long cable and wifi/battery box could potentially be obstructive
- Requires mobile app installation, and requires cellular device

Relevant technical/dimension specifications:

- 5mm camera probe
- 5FT semi-rigid snake cable
- Focal Distance: 1.2-8inches

******* SIMILAR ALTERNATIVE (Wireless Endoscope by Kinpthy) https://www.amazon.com/Endoscope-Borescope-Waterproof-Inspection-Smartphone/dp/I crid=112NHXZFN95OO&keywords=5mm%2Bcamera&qid=1695343720&refinements=p_72%3A1248921011&rnid=1248919011&s=industrial&sprefix=5mm 27&th=1

USB Endoscope by Takmly

https://www.amazon.com/dp/B07PBF6DX5?tag=georiot-us-default-20&th=1&psc=1&ascsubtag=dcw-us-6963818758754285000-20&geniuslink=true

Overview:

This is another relatively inexpensive camera. The upside to this camera in comparison to the NIDAGE is the superior compatibility in addition to being light

Pros:

- Great compatibility with all device including laptop/desktop
- Inexpensive ($20)
- Video Recording
- Relatively light (about half a pound/200 grams)

Cons:

- Seems to be a re-purposed webcam, so can be a little janky
- Focal length may be an issue

Relevant technical/dimension specifications:

Camera Probe Diameter: 5.5 mm/0.21 inch

Cable Length: 5 Meter/16.4 FT

Resolutions: 1280*720

Best observing: 3~10 cm(1.2~3.93 inches)

Supporting System: Android 4.0+ Windows 2000/XP/Vista/7/10, Mac OS X 10.6+

Vividia FC-520 Mini by Oasis Scientific

https://www.oasisscientific.com/store/p2/Vividia_FC-520_Mini_5mm_Diameter_200mm_Long_USB_Flexible_Inspection_Camera_Borescope_Endoscope_Microscope_with_Fixed_Focus.html

Overview:

A higher end, more expensive camera that seems to fit the design specifications relatively well. However, the price is a major deterrent to include this came similar cameras for far cheaper that should provide an equal viewing experience.

Pros:

- Flexible wire connected to the camera which could work betters as to not get in the way of user.
- The focus range is 7-10 mm which is preferable for recording ear canals.
- Decent device compatibility.

Cons

- Extremely expensive ($259)
- Device controller can be obstructive for the user.
- Lower Video Res (640 x 480)

Relevant technical/dimension specifications:

- **Probe camera diameter:** 5mm
- **Probe length**: 200mm
- **Video/Image Resolution:** 640 x 480 pixels; Format: WMV
- **Frame Rate:** up to 30FPS @ VGA
- **Focal Distance:** around 7mm to 10mm, fixed focus
- **Max. magnification:** up to 50x
- **Dimension:** Flexible cable with handle: 32cm (12.6in); **Flexible probe cable length:** 20cm (7.9in); **Flexible cable diameter**: 4mm (0.16in); **Camera head outer diameter:** 5
- **Weight:** 74g (2.5oz), including USB cable
- **Compatibility:** Windows 8/7/Vista/XP, MAC 10.5 or above

Flashmen 8mm CCTV camera

https://www.amazon.com/Flashmen-Security-Pre-made-Extension-Connectors/dp/B01M655C3L/ref=d_pd_sim_sccl_3_30/139-5868705-4765300?pd_rd_w=ZLtCy&cont
95b0-d52caf1c26f1&pf_rd_p=2351c4aa-bb60-45da-95b0-d52caf1c26f1&pf_rd_r=7VPSP5XZZ6JK4W87RQG1&pd_rd_wg=RxMMC&pd_rd_r=dc6e1168-ed29-4b44-af
52ba7686cf1b&pd_rd_i=B01M655C3L&psc=1

https://www.amazon.com/Premade-Security-Camera-Surveillance-System/dp/B071HMMN79/ref=cm_cr_arp_d_product_top?ie=UTF8&th=1

Overview:

In contrast to the previous cameras, this camera is a mini cctv camera which can be a practical alternative to the endoscopic snake camera's

Pros:

- Inexpensive ($10)
-

Cons:

- Requires BNC to HDMI adapter to connect to computer
- Very long cable

Similar Alternative: https://www.amazon.com/Flashmen-Security-Pre-made-Extension-Connectors/dp/B01M655C3L/ref=d_pd_sim_sccl_3_30/139-5868705-4765300?pc
id=amzn1.sym.2351c4aa-bb60-45da-95b0-d52caf1c26f1&pf_rd_p=2351c4aa-bb60-45da-95b0-d52caf1c26f1&pf_rd_r=7VPSP5XZZ6JK4W87RQG1&pd_rd_wg=RxMM
52ba7686cf1b&pd_rd_i=B01M655C3L&psc=1

Conclusions/action items:

Further research and consultation with team members is required to find the best potential fit for our design. I believe the best scenario is striking a good balance between i

ANYKIT Digital Otoscope Prelim Eval

JOSE RAMIREZ - Nov 02, 2023, 8:22 PM CDT

Title: ANYKIT Digital Otoscope Prelim Eval

Date: 11/2/2023

Content by: Jose Ramirez

Goals:

To see how well the ANYKIT Digital Otoscope could be incorporated into our Camera Design.

Content:

PRODUCT SPECIFICATIONS:

Camera Diameter	3.9mm
Cable Length	1.8m(5.9ft)
Resolution	640x480
Video Recording Capabilities	Yes
Focal Distance	10mm-30mm(.4in-1.2in)
View angle	68 degrees
Device Compatibility	Type-C (Android) Lightning Cable (iOS)
Software Used	Usee Plus (Downloaded from Google Play Store or App Store)
Camera Lights	6 LED lights
Waterproof Level	IP67

NOTES:

PROS:

- **Cable length is most definitely long enough** as specified by Lara
- **Video Recording and Photo Capture** capabilities.

MIXED:

- Seeing as size of camera was a major concern, **the camera diameter of 3.9 mm seems very promising**. Especially, if we modify the cone design to only have to include the upper-half or even just cut off portion leave just enough space for the camera. Further investigation and measurements is required to verify the plausibility of continuing design

CONS:

- **Camera Resolution is quite poor** due to the small size of camera, however Lara mentioned that a high resolution was not a must and video quality just had to be sufficient for decent viewing.
- There is compatibility for Android and iOS devices, but there is **no direct compatibility for USB-A, or laptops.** Lara did mention that she would prefer a large screen to view the video feed on, but it was made clear that phone compatibility was acceptable.

Conclusions/action items:

The ANYKIT video otoscope has potential to be incorporated into our third design, however as previously mentioned there is still some uncertainty if whether the camera design is large. A physical side by side comparison would be helpful to properly gain perspective on the scales of the specula and camera diameter.

Preliminary Hidden Camera Design Drawing

JOSE RAMIREZ - Sep 27, 2023, 9:20 PM CDT

Title: Preliminary Hidden Camera Design (Drawing)

Date: 9/27/2023

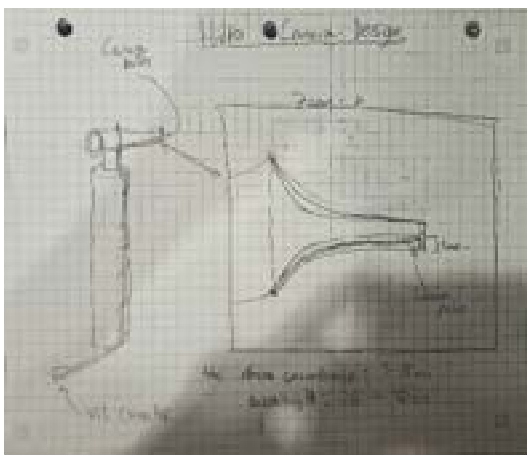
Content by: Jose Ramirez

Goals: To create a somewhat detailed drawing with expected measurements for the camera design which is featured as the third design in our design drawing.

Content:

Conclusions/action items:

JOSE RAMIREZ - Sep 27, 2023, 8:27 PM CDT



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Hidden_Camera_Design.pdf (582 kB)

Solid Works - Specula Model

JOSE RAMIREZ - Nov 03, 2023, 11:55 AM CDT

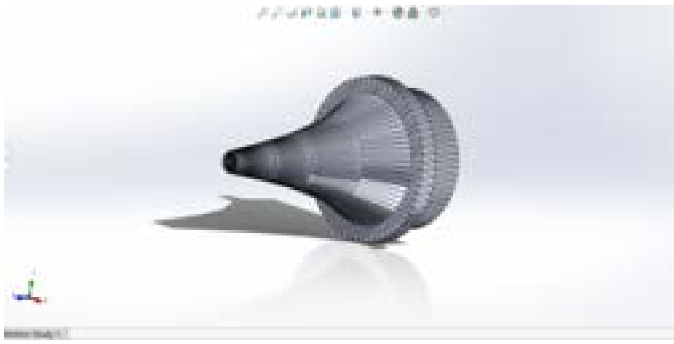
Title: Solid Works - Specula Model

Date: 11/3/2023

Content by: Jose

Content: (ATTACHED BELOW)

JOSE RAMIREZ - Nov 03, 2023, 11:59 AM CDT



Download

Specula_Model.png (476 kB)

2023/9/14-Ear Anatomy research

Zakki Mirza - Sep 14, 2023, 10:42 AM CDT

Title: Ear Anatomy/Otoscope Design

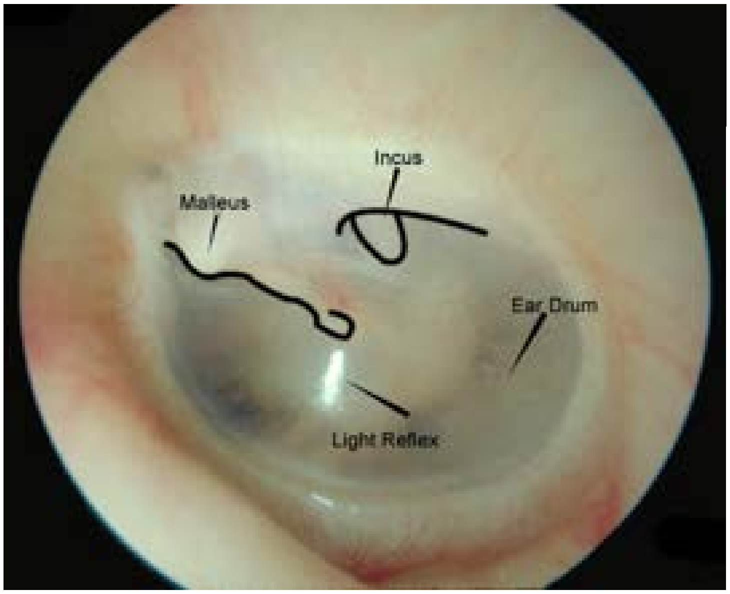
Date: 9/14/2023

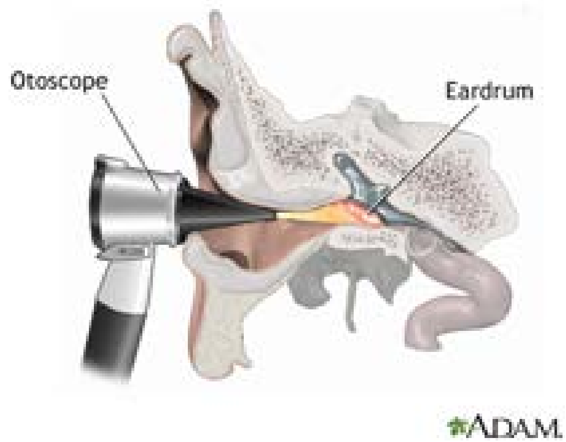
Content by: Zakki Mirza

Present: N/A

Goals: Understand the anatomy of the ear and how an otoscope views the ear. Understand the basic parts of an otoscope.

Content:


Incus
Malleus
Ear Drum
Light Reflex


Otoscope
Eardrum
ADAM.

The otoscope is used to view the middle ear (eardrum, and structures behind). Most otoscopes are similar in design as shown above.

Conclusions/action items:

Continue researching otoscope designs and materials used for prototyping/potential desings.

2023/9/21/2023-Otoscope Research

Title: Otoscope Research

Date: 2023/9/21

Content by: Zakki Mirza

Present: N/A

Goals: Get a better understanding of how an otoscope works and the different types of otoscopes used.

Content:

Types of otoscopes: https://equimed.es/en/guide-to-learn-about-hearing-examination-and-otoscopes/

- The main types of otoscopes are very similar in function but there are some differences
- Some otoscopes have a live video option to view the inside of the ear through a camera
- Other otoscopes have different lighting and visual options to account for the various needs of the patient and user
    - Stronger lights, better visualization

Different types of ear tips:


7.5mm
75mm
65mm
5 mm
55mm

Conclusions/action items:

There are different types of otoscopes for the different needs of the patient and for better visibility. There are also different ear tips for different types of ear canals.

2023/10/26 - Final Material Research

Zakki Mirza - Oct 26, 2023, 11:48 AM CDT

Title: Final Material Research

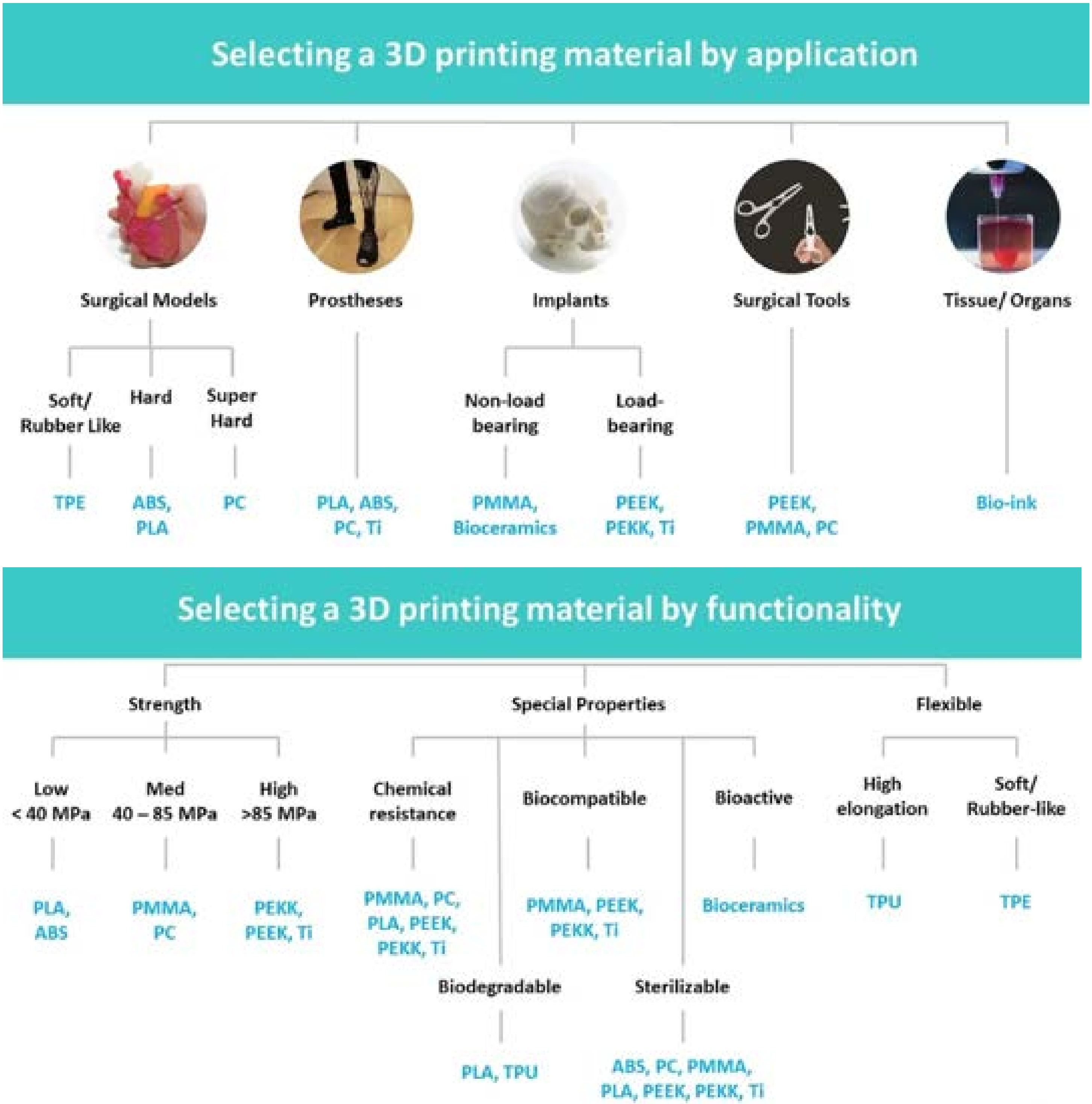
Date: 2023/10/26

Content by: Zakki Mirza

Present: N/A

Goals: find good 3D printing materials for out final prototype that are user and patient friendly.

Content: https://www.novusls.com/post/medical-3d-printing-material-selection-guide



Although our project isn't extremely dependent on the type of materials we choose to 3D print in, it is still important to consider our options and see which material would work best. Using inspiration from current BME 3D-printing materials, we can see what works best for current projects. Our final material needs to be easily cleanable and safe for both the patient and the user and it looks like PLA seems to be a strong fit so far which is great since we can print in PLA at the makerspace.

Conclusions/action items:

Discuss what materials may be useful to consider printing in when we're done prototyping.

2023/9/28 - Existing Camera Designs

Zakki Mirza - Sep 28, 2023, 4:17 PM CDT

Title: Existing Camera Designs

Date: 2023/9/28

Content by: Zakki Mirza

Present: N/A

Goals: Get a better understanding for existing camera designs we could use with ours.

Content:

Non-medical grade endoscope: https://www.industrial-needs.com/catalogue/endoscopes.pdf

- This endoscope has small enough dimensions that could prove useful to our chosen design. We can repurpose it so that it's length is shortened to however long we need but the main aspects of this specific endoscope could be useful (diameter, FOV, light).

Technical specifications	
Endoscope model	**PCE-E 45**
Length of flexible cable	450 mm
Diameter	4.0 mm
Diameter with mirror of 45°	4.6 mm
Operating temperature	-10 to +50 °C
Total lenght	595 mm
Field / angle of vision	40 °
Minimum view distance	2 mm
Light	halogen bulb
Power	3 batteries AA
Weight	340 g
Optional	camera adaptor

Video otoscope camera specification: https://fireflyglobal.com/video-otoscope-de550/

- These specifications should be kept in mind when find a camera because they have been useful to a competing design - the video otoscope.

Technical Details	
Sensor Resolution	720 x 480
Magnification	Native Optical: 15x – 30x Digital: 15x – 90x
Lens Assembly	Dual Lenses 3-Layer Glass, 650nm cutoff
Video	Format: YUY2 Frame rate: 30 FPS
Video/Image Properties	Color: 360 Level Hue, Saturation, White Balance Exposure: Brightness, Contrast Image: Sharpness, Gamma
Video, Image Files	BMP, JPG, AVI
Lighting	Ultra-Bright LEDs Fully adjustable brightness

Conclusions/action items:

We need to be mindful of the specifications of the camera we choose because it needs to be small enough so that it's not impeding any work, but it have good enough specifications to be useful in the position it's set at.

2023/10/5 - Potential Mirror Materials

Zakki Mirza - Oct 05, 2023, 1:49 PM CDT

Title: Potential Mirror Materials

Date: 10/5/2023

Content by: Zakki

Present: N/A

Goals: Find potential mirror materials to be used for design 1

Content:

- Reflective Privacy screen
    - 
    - This screen can be applied directly to a glass surface and is visible through one side but reflective through the other.
    - We can use this material to stick onto a small piece of glass inside the otoscope to allow for the viewer to see into the ear but also allow for a camera to see the area of interest.
    - One concern of this design is the clear difference in colors viewable by the operator.
    - Another concern could be the mirror fogging up when inside the ear.
- 2-way glass
    - 
    - This is very similar in function to the reflective privacy screen but it may provide more clarity in viewing.

Conclusions/action items:

These two mirror/glass products could be useful to us in making design one and prototyping but more research needs to be done to decide if these designs are viable or which design (if viable) will be the best to use.

2023/10/19 - Potential Webcam Choices

Zakki Mirza - Oct 19, 2023, 1:06 PM CDT

Title: Potential Webcam Choices

Date: 2023/10/19

Content by: Zakki Mirza

Present: N/A

Goals: Find a good webcam to record the visuals of the otoscope.

Content: https://photographylife.com/best-micro-four-thirds-lenses-11-of-my-favorites

This website has plenty of potential webcams with a variety of different designs:

- Small enough diameter to fit inside handle of otoscope
- Great camera quality- meant for photography
- Range of prices depending on how much or how little we want to spend

- $700

Conclusions/action items:

Decide with group if we want to use any of these camera's and whether or not we want to use other camera's.

2023/11/2 - Wire Reflective Cover

Title: Wire Reflective Cover

Date: 11/2/2023

Content by: Zakki

Present: N/A

Goals: Find a reliable material that can protect the exposed wires for the LED light and direct the light towards the prism for the user to be able to see the ear.

Content: We can use normal electrical tape to protect the exposed wires and reflective electrical tap to cone around the LED light to direct it towards the prism.

We need to finalize and choose the right type of tape based on what we need. We can decide by simply looking up "electrical light reflective tape" and looking at the choices shown below:

Conclusions/action items:

We need to decide what tape to buy and order it together then see if it works for our design.

2023/9/14-Client Questions

Zakki Mirza - Sep 14, 2023, 10:49 AM CDT

Title: Client Questions

Date: 9/14/2023

Content by: Zakki Mirza

Present: N/A

Goals: brainstorm questions for our client.

Content:

- What aspects of the handheld otoscope and video otoscope do you want to be included in the design?
- Is there a preference for how the handheld aspect is made (grip/orientation)?
- Will we have access to the video aspect of the otoscope or do we provide that?
- What materials are preferred for the handle if there is a preference?

Conclusions/action items:

Communicate with team and react accordingly to how our questions are answered and any new information we get.

09/13/23 Week 2 Research - Provided Articles on Testing and Medical Issues

Declan McHugh - Sep 22, 2023, 9:07 AM CDT

Title: 09/13/23 Week 2 Research - Provided Articles on Testing and Medical Issues

Date: 09/13/23

Content by: Declan McHugh

Present: Declan McHugh

Goals: Research provided articles to gain a better understanding of the project

Content: Research Articles and Notes

Design and Validation of a Three-Dimensional Printed Flexible Canine Otoscopy Teaching Model

This article covers a research study done on the effectiveness of using a 3D printed model to train veterinary students on using an otoscope on dogs. Various parameters were tested including dog aversion and the speed of discovery of various objects / medical issues in the ear. Although there was not a statistically significant change in the performance of the students, the students that used the model vs the ones that did not said that the model made them feel much more confident and was very helpful in their training.

The testing done for this study could be greatly affected by our product as our product would allow better evaluation of students' performances when using a regular lensed otoscope. Although the article does not explicitly state that video otoscopes were used in this study, if they were then they did not give practice for using lensed otoscopes and if they weren't then the researchers/teachers were not able to view what the student was seeing and therefore would have a hard time evaluating the students performance. Our otoscope would change this by allowing teachers to see what students see when using a lensed otoscope.

A Novel Canine Otoscopy Teaching Model for Veterinary Students

This research article covers a very similar study to that of the first with similar results. The main difference is the difference in the model. In this study, the model used was a preserved dog ear canal which was preserved using the Enlady technique. Although this model is different from the first it can benefit in its teaching ability in many of the same ways as the first. Our lensed otoscope which allows for remote viewing of what the student is seeing will allow for better training evaluation with models like these and will allow teachers to provide feedback based on being able to see student performance from the student's perspective.

Karl Storz - Endoscopes for Small Animals

This article will also be covered in the competing products research section as it covers an introduction to a product as well as information about the biological and physiological characteristics of endoscope usage. This article shows the many different kinds of procedures that can be done with a surgical otoscope and what kind of medical problems one can help with. A surgical otoscope requires both a viewing port and a port for tools to enter through the device into the ear canal. This is similar to our need to fit both a lens and a camera if we decide to arrange them in line.

Conclusions/action items: Using the understanding gained from these articles research more applications of our otoscope's goal. Use the knowledge from these articles to generate client questions.

11/27/2023 Ear Canal Model

Declan McHugh - Dec 13, 2023

Title: 11/27/2023 Ear Canal Model

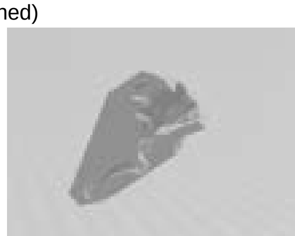
Date: 11/27/2023

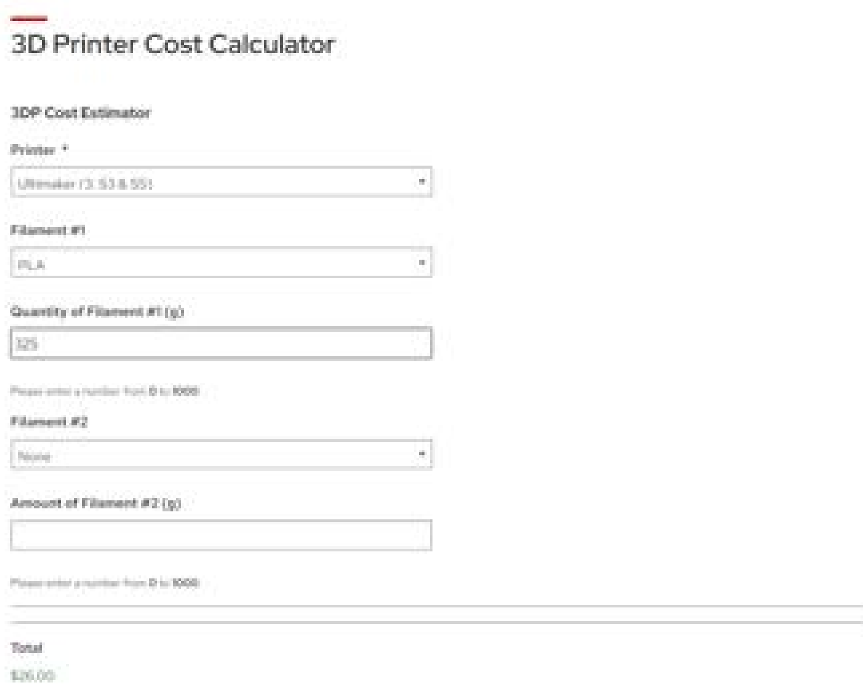
Content by: Declan McHugh

Present: Jose, Grace, Sam, Bobby, Myself

Goals: Create a model to determine if the expense of printing a model dog ear is worth it for the final presentation.

Content:

- Dog Ear Model
  - Training model for veterinary students reconstructed from CT scan
  - Preview 
  - Sketchfab. Sketchfab. Sketchfab. Published March 30, 2018. Accessed December 14, 2023. https://sketchfab.com/3d-models/canine-ear-trainer-e9644a7370b641e1aa1cfc7c523514f2#:~:text=This%203D%20model%20was%20designed,for%20examination%20or%20culture%20sampling
- Dog Ear Model Parts:
  - Part 1, Part 2 (STL files attached)
  - Image of edit to the ear canal 
- Analysis of Cost
  - rigid material
    - 26 dollars in materials fees from makerspace cost calculator



  - flexible / elastic material

- 65 dollars in materials

Conclusions/action items:

Determined that rigid material was not worth the price due to the size of the speculum and the angle within the ear canal. Flexible material would be more a the ear canal, however, price was determined to be too high for the model when compared to prototype materials cost, and instead a box model will be use

Declan McHugh - Dec 13, 2023, 7:48 PM CST

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part1.stl (1.27 MB)

Declan McHugh - Dec 13, 2023, 7:48 PM CST

Download

part2.stl (1.16 MB)

09/13/23 Week 2 Research - Competing Designs from Provided Articles

Declan McHugh - Sep 22, 2023, 9:23 AM CDT

Title: 09/13/23 Week 2 Research - Competing Designs from Provided Articles

Date: 09/13/23

Content by: Declan McHugh

Present: Declan McHugh

Goals: Research Competing Designs and use them to form Design Ideas

Content: Competing Designs Research

Karl Storz - Otoscopes for Small Animals

The Karl Storz surgical otoscope offers many features that regular handheld and non-surgical otoscopes do not have. These extra features are enacted through a variety of different exchangeable tools. This endoscope does not include a videoing functionality. However, it's ability to switch out many tools would mean that it would be fairly easy to use the design for this otoscope in the way it allows both a lens and an added tool into the eardrum. In addition to this our video otoscope design could be modified to be used a surgical otoscope like this one which would allow supervision of both students and veterinarians in the field when doing surgeries through a lensed otoscope.

Welch Allyn Veterinary Pneumatic Otoscope

The Welch Allyn Veterinary Pneumatic Otoscope is a very common and widely used lensed otoscope. Researching the design of this otoscope will help us to understand what we are starting with and need to modify in order to make it remotely viewable. The first thing of note when looking at this Otoscope is that it has an attachment point for a tube and bulb in order to increase air pressure in the ear canal for various medical tests viewing the reaction of the temporal membrane. If this is something that our client would like to view during testing we have to make sure to retain the air-tight seal of the otoscope around the cone as well as not interfering with the pneumatic system. The second thing of note for this otoscope is that the otoscope lens/head itself is completely separable from the handle which contains the batteries and charging structures. This means that if we would like to utilize the power system already in the otoscope we would need to find a way to create another connection to the battery or we would need to connect in the head of the otoscope which would introduce a more severe limiting factor of space. Lastly, the Welch Allyn Otoscope has many different interchangeable cone sizes which can help to give us a better idea of the range of space available in the ear and how much extra material we can add to the otoscope in the cone area.

Conclusions/action items: Form Design Ideas with current competing designs in mind

9/21/23 Week 3 Digital Otoscope Research

Declan McHugh - Sep 29, 2023, 9:55 AM CDT

Title: 9/21/23 Week 3 Digital Otoscope Research

Date: 9/21/23

Content by: Declan McHugh

Present: Declan McHugh

Goals: Research Digital Otoscopes to understand differences in use that would make switching to analog otoscopes difficult to better understand the motivation for product

Content: Research Notes

Traditional vs. Digital Otoscopy: 9 out of 10 Emergency Physicians Prefer the Wispr Digital Otoscope

The Wispr Digital Otoscope resembles a regular lensed otoscope at first glance but although it is the same shape as a lensed otoscope the lens has been replaced by a circular screen. The Wispr Digital Otoscope is a good example of what current video Otoscopes are like. They have a video screen attached at the top of a handle with a nozzle and camera for insertion into the ear canal. An interesting feature of this otoscope that we may be able to implement either on the otoscope or on our viewing port is the ability to plug in a USB stick to save pictures and videos from the camera. Our client mentioned that having screenshotting and video recording abilities is desired.
This article focused on the high preference for digital otoscopes among professionals. This is something that our client expressed to us as well. However, our motivation for creating an analog otoscope with better training abilities is not decreased by this fact. This is because many smaller practices that students will go to after graduation will not have the budget for digital otoscopes which can cost up to a couple thousand dollars. Therefore, their analog training will still be very valuable.

DIGITAL MACROVIEW™ VETERINARY OTOSCOPE

It does not appear uncommon from this product and others that digital otoscopes often have cords protruding from them or are held in a way where the base of the otoscope is directly where the analog viewing port would be on a typical otoscope. This is interesting because while other digital otoscopes use the space previously used by the practitioner an analog and digital combined otoscope, like the one we are designing, would not be able to use this space. One solution is to reflect the light to a different viewing port so this space can be used, while another is to try and use the limited space around the otoscope to capture a digital image whether in the ear canal or in the otoscope handle.

Conclusions/action items:

10/05/2023 Week 5 Camera Specifications Research

Declan McHugh - Dec 13, 2023, 6:36 PM CST

Title: 10/05/2023 Week 5 Camera Specifications Research

Date: 10/05/23

Content by: Declan McHugh

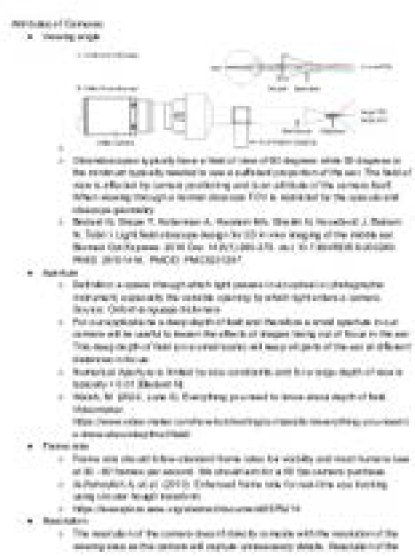
Present: Declan

Goals: Research Camera attributes

Content: Research pdf

Conclusions/action items: consider areas of research when purchasing camera

Declan McHugh - Dec 13, 2023, 6:37 PM CST



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10_05_2023_Week_5_Camera_Specifications_Research.pdf (207 kB)

9/21/23 Week 3 Simple Camera Design Ideas + Design Research Notes

Declan McHugh - Sep 22, 2023, 10:18 AM CDT

Title: 9/21/23 Simple Camera Design Ideas + Design Research Notes

Date: 9/21/23

Content by: Declan McHugh

Present: Declan McHugh

Goals: Draw up Simple Design ideas for Camera positioning and start thinking about what research is necessary to create design ideas for the other aspects of the otoscope.

Content: Simple_Design_Drawings_9-21-23.pdf

Conclusions/action items: Research Bluetooth, Monitors, Electrical Engineering aspects of using the same battery power for Bluetooth and camera as flashlight

Declan McHugh - Sep 22, 2023, 10:16 AM CDT

Download

Simple_Design_Drawings_9-21-23.pdf (969 kB)

9/28/23 Week 4 Otoscope Nozzle Attachment Draft

Declan McHugh - Sep 29, 2023, 1:28 PM CDT

Title: 9/28/23 Otoscope Nozzle Attachment Draft

Date: 9/28/23

Content by: Declan McHugh

Present: Declan McHugh

Goals: Continue to learn how to use SolidWorks through following tutorials and then apply it to creating a specialized specula 3D print

Content: Drawing from Solidworks Draft

Conclusions/action items: Make a working print from a SolidWorks part

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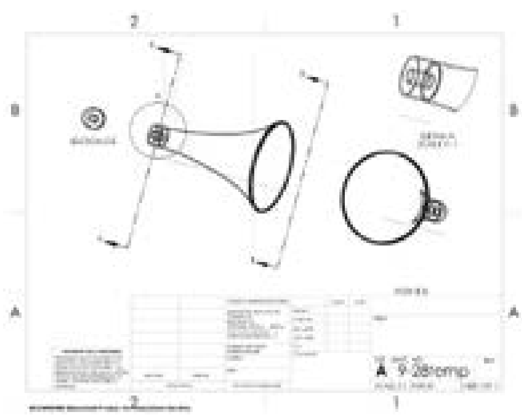
Declan McHugh - Sep 29, 2023, 1:29 PM CDT



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9-28temp.pdf (78.4 kB)

10/19/2023 Week 7 Solidworks Design

Declan McHugh - Dec 13, 2023, 7:28 PM CST

Title: 10/19/2023 Week 7 Solidworks Design

Date: 10/19/2023

Content by: Declan McHugh

Present: Declan McHugh

Goals: get closer to having a printable design

Content:

- Problems:
  - Embossing cylinder from the same line of rotation as the overall specula leads to an obtrusion inside the specula that would mess with the light from inside the otoscope as well as user viewing
  - Extracting CAD elements from accurate STL model of specula
  - The curvature of the specula modeled using the Bezier curve with the Solidworks feature
    - Wikipedia Contributors. Bézier curve. Wikipedia. Published December 13, 2023. Accessed December 14, 2023. https://en.wikipedia.org/wiki/B%C3%A9zier_curve
  - Solidworks help from solidworks guide and maker space
    - *INTRODUCING SOLIDWORKS*. https://my.solidworks.com/solidworks/guide/SOLIDWORKS_Introduction_EN.pdf

Conclusions/action items:

Continue working on the design to learn how to use CAD software for future projects. A printed version of the design may be used to showcase the original design idea.

9/14/23 Week 2 - Client Questions for Client Meeting

Declan McHugh - Sep 22, 2023, 8:34 AM CDT

Title: 9/14/23 Week 2 - Client Questions for Client Meeting

Date: 9/14/23

Content by: Declan McHugh

Present: Declan McHugh

Goals: Generate Questions for the Client for an upcoming Client meeting

Content: Questions for Client

What is the preferred method for submitting invoices?
How long will it take for us to get a response on proposed materials purchases?
Does this solution need to be replicable to be an add-on to multiple otoscope brands or will it be a different otoscope just for training or both?
Where / when will we get the aforementioned materials? (Handheld otoscope, video otoscope, images of structures, and current simulations available)
Does the video otoscope have a built-in screen or an external screen?

What aspects of the handheld otoscope and video otoscope do you want to be included in the design? (not my original question)
ex.
Does it need to be wireless?
What additional mass can be added to the otoscope until it hinders its use? <= (my expansion questions)

In what condition will the device be stored?
Is there an acceptable delay for the video otoscope or does the viewing need to be live?
How distanced is the distanced observer? (Are they in the same room, in an adjacent room, on the other side of the planet?)
Is it preferred that the video feed is observed from a permanent monitor or viewed from any device (computer/phone, etc.)?
Are there any limitations to methods of transporting video? (ex. Can we use a cord, wifi, Bluetooth, GSM?) Are there any reasons not to use any of these?
When it is stated that the student needs to use a regular otoscope does that mean the student must be using an otoscope with a lens or can the student look at a digital screen?

Conclusions/action items: Not all of these questions will be asked of the client. Talk to the team before the client meeting and determine what we already know and what we should ask / how we should ask it.

10/19/2023 Week 7 Prototyping Team Meeting

Declan McHugh - Dec 13, 2023, 7:20 PM CST

Title: 10/19/2023 Week 7 Prototyping Team Meeting

Date: 10/19/2023

Content by: Declan McHugh

Present: Sam Tan, Grace Boswell, Declan McHugh, (later on) Jose

Goals: Prototype with new materials from most recent purchase order and decide on next steps

Content:

- Worked with reflective material to brainstorm the Design 1 layout
    - Noticed negative impact on reflection from the light behind the viewer (in final prototype to be covered by user's head while using the otoscope
        - Noted that the otoscope head should be impervious to stray light
    - Originally purchased reflective material doesn't work well on it due to the bending of the material
        - Slightly improved by the addition of solid material taped onto the material (clear plastic)
        - Solid mirror-like material would be better for our uses
        - Tube made by Sam demonstrates the multiple viewing angles created by reflective film
- Made purchase order for new digital otoscope for testing
    - otoscope was cheap to test for differences in reflective materials' interaction with light and the human eye vs a camera
    - will likely not be the final camera used
    - Purchase order email attached:

Conclusions/action items:

We will wait to receive the camera and test different materials from the camera's point of view. Research is needed on different reflective materials as the reflective film bends light too much.

Declan McHugh - Dec 13, 2023, 7:20 PM CST

Amazon Purchase Order - Digital Otoscope for Testing

Download

Digital_Otoscope_Purchase_Order.pdf (313 kB)

10/11/2023 Week 6 Preliminary Deliverables Team Meeting

Declan McHugh - Dec 13, 2023, 7:07 PM CST

Title: 10/11/2023 Week 6 Preliminary Deliverables Team Meeting

Date: 10/11/2023

Content by: Declan McHugh

Present: All

Goals: Finish Preliminary Report for submission

Content:

- Preliminary Report
  - Polish Preliminary Report for Grammar
  - Edited abstract for clarity
  - Fixed design matrix for errors
  - Design drawing added to Preliminary Report

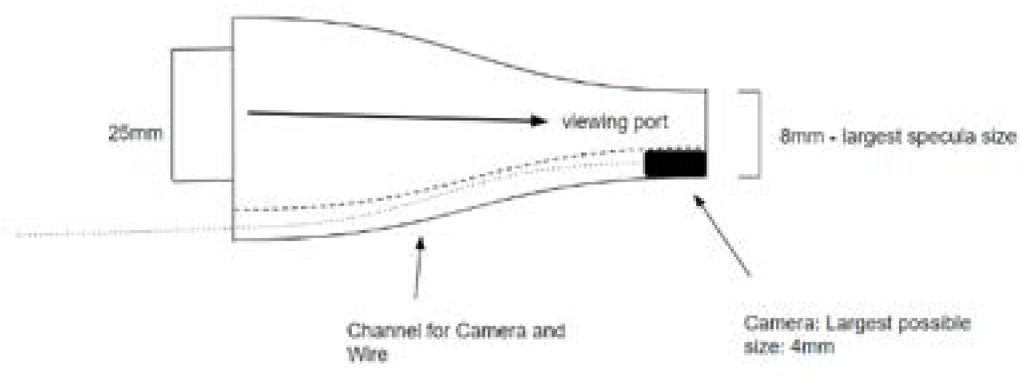

Figure 7: Design Drawing of Hidden Camera Design [14]

- Updated Lab Archives
  - Make dating consistent between all files
  - Decide on a titling pattern (added extra research folder for organization)
- Uploaded Preliminary Report to Website (BWIG)

Conclusions/action items:

Update Preliminary Report as fabrication proceeds to make construction of Final Report easier. Use the advice of advisor from advisor meeting on Preliminary Report to edit report In the future.

2014/11/03-Entry guidelines

John Puccinelli - Sep 05, 2016, 1:18 PM CDT

Use this as a guide for every entry

- Every text entry of your notebook should have the **bold titles** below.
- Every page/entry should be **named starting with the date** of the entry's first creation/activity, subsequent material from future dates can be added later.

You can create a copy of the blank template by first opening the desired folder, clicking on "New", selecting "Copy Existing Page...", and then select "2014/11/03-Template")

Title: Descriptive title (i.e. Client Meeting)

Date: 9/5/2016

Content by: The one person who wrote the content

Present: Names of those present if more than just you (not necessary for individual work)

Goals: Establish clear goals for all text entries (meetings, individual work, etc.).

Content:

Contains clear and organized notes (also includes any references used)

Conclusions/action items:

Recap only the most significant findings and/or action items resulting from the entry.

2014/11/03-Template

John Puccinelli - Nov 03, 2014, 3:20 PM CST

Title:

Date:

Content by:

Present:

Goals:

Content:

Conclusions/action items: