Microscope Slide Scanner

Date: 9/27/24

Client: Teri Stewart
Advisor: Dr. James Trevathan
Team: Lia Lejonvarn (Team Leader)
Amanda Kothe (Communicator and BSAC)
Hamad AlDhaheri (BPAG)
Xavier Snider (BWIG)

Problem statement

The team has been tasked with finding a more efficient way to scan microscope slides using digital scanning. The client's department already has a scanner but it takes a while to scan one slide and the images are not of the best quality. Therefore, we must find a way to enhance the user quality of their digital scanner as well as the images themselves. The department has also asked our team to create software capable of housing the images. This project will benefit multiple labs who send in slides for processing including the primate lab and SMPH.

Brief status update

The team has come up with three preliminary designs and evaluated them to come up with a final design that they will pursue. The design matrix with all three designs is attached at the end of this report.

Difficulties / advice requests

The team is having difficulties fully understanding what the use of deconvolution would look like. This can be solved by continuing to research the topic.

Current design

Materials and expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										

									$0.00	
									$0.00	
Category 2										
									$0.00	
									$0.00	
								TOTAL:	**$0.00**	

Major team goals for the next week

1. Create preliminary presentation
2. Practice presentation
3. Continue researching the current design

Next week's individual goals

- Amanda:
    - Continue doing more research on deconvolution
    - Work on the preliminary presentation
- Lia:
    - Start working on the preliminary presentation
    - Continue researching deconvolution
    - Practice presentation
- Xavier:
    - Begin work on prelim presentation
    - Practice Prelim
- Hamad:
    - Working on preliminary presentation
    - Researching more regarding the deconvolution design
    - Research more regarding the microscope slide scanner's imaging criteria

Timeline

Task	Sep			Oct				Nov				Dec		
	13	20	27	4	11	18	25	1	8	15	22	29	6	11
Project R&D														
Empathize														
Background…														
Prototyping														
Testings														
Deliverables														

Progress Reports	X	X	X											
Prelim presentation														
Final Poster														
Meetings														
Client	X	X												
Advisor	X	X												
Website														
Update	X	X												

Filled boxes = projected timeline
X = task was worked on or completed

Previous week's goals and accomplishments

- Amanda
  - Started on preliminary designs
  - Continued researching
  - Continued communicating with client to better understand her needs
- Lia:
  - Finished PDS
  - Started working on preliminary designs
  - Continued researching
- Xavier:
  - Finish PDS
  - Upload to website and canvas
  - Continued researching
- Hamad:
  - Developed a preliminary design
  - Continued researching

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Amanda	9/26/2024	Design matrix Meeting with advisor	2	2	4
Lia	9/26/2024	Design matrix Meeting with advisor	2	2	4
Xavier	9/26/2024	Design matrix Meeting with advisor	2	2	4
Hamad	9/26/2024	Design matrix Meeting with advisor	2	2	3

Microscope Slide Scanner Design Matrix

Design Criteria	Design #1: Automatic Slide Glider		Design #2: Deconvolution		Design #3: AI Image Improvement	
Accuracy (30)	3/5	18	4/5	24	4/5	24
Feasibility (25)	4/5	20	4/5	20	2/5	10
Useability (20)	4/5	16	4/5	16	3/5	12
Speed (10)	3/5	6	2/5	4	3/5	6
Cost (10)	3/5	6	5/5	10	5/5	10
Manufacturability (5)	4/5	4	5/5	10	4/5	8
Total (100)	70		84		70	

Criteria:

Accuracy: This criteria refers to the accuracy of the finished product. This is the most important criteria as the client wants the slide image to be improved as much as possible.

Feasibility: The design must be feasible to make during the semester, and must be able to be used in the clients lab.

Useability: The finished design needs to be easy for the client to use and understand.

Speed: The client mentioned that they would like the speed of the scans to be improved if possible, however it was not the most important improvement that needs to be made.

Cost: The client has given a budget for the project.

Manufacturability: The design must be able to be replicated.

Design #1: Automatic Slide Glider

This design scored in the mid range for accuracy due to the need to stitch many photos together, leaving room for error. It received a higher score for feasibility due to our previous and existing knowledge of the skills and techniques required to build the required mechanism. As well as this, we believe that this would benefit the clients needs by perfecting a method she herself has previously tried. Useability also scored higher because while the slide will move and have photos taken, someone must be responsible for properly changing, focusing, and running the scans. Speed received a middle range score as well as the mechanism wouldn't be able to quickly take photos. Cost received a middle range rating due to the materials/motor required to move the slide around, compared to fully algorithmic options. Lastly it

scored highly in manufacturability due to its small, simple design that could be mass produced and recreated exactly the same every time.

Design #2: Deconvolution

This design scored the highest in accuracy and tied for first in feasibility and useability. Therefore, it was scored as our winning design. We gave it a higher score in the aforementioned areas because there are highly developed programs out there that have been successful in improving the image quality of cytology scans. This also makes it feasible to produce since our task will be utilizing these programs in an easier to use interface for our client. This design did score low on speed, however, since it requires the use of different z axis images which takes a while to collect and for the algorithm to process. This would also be a very low cost option earning it the highest score in that category since the only materials needed would be storage. It is also a very easy to reproduce product since it is all software based.

Design #3: AI Image Improvement

This design was thought of to be a competing design however after taking a look at it through different lenses in our design criteria it did not score the highest amongst our project ideas. Despite its strong accuracy to our clients needs, it has the negative aspect of slow processing and continuous use that could hinder our overall clients experience with the finished product. Additionally it was not feasible for the group to make since the level of knowledge regarding programming AI is missing.