A miniature microscope for fluorescence imaging

Client: Prof. Matthew Merrins
Advisor: Professor Jeremy Rogers
Team:

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Problem Statement: An affordable miniature fluorescence microscope needs to be developed the excitation source should be an LED with a wavelength of 430nm and filters will be required to filter 470 nm and 535 nm light.

Last Week's Goals: Figure out client's design specifications and perform background research

Summary of Team Role Accomplishments:

- John discovered multi-bandpass optical filters and did background research on intensity of light emitted from fluorophores
- Kadina: Read the journal article Professor Merrins shared with the team. It explains how their specific lactate sensor (Laconic) works.
- Kaitlyn: Updated team website with new problem statement.
- Zach: BSAC had a productive meeting discussing the design selection process, mentorship, and course offerings

Summary of Design Accomplishments:

- Team met with client and determined the design specifications
- Team met and completed the PDS
- Team created Design criteria and developed 4 design ideas

This Week's Goals/Individual Goals:

Kaitlyn: My goal this week is to take the questions answered by our client and do further research based on the new information. In addition I want to start looking up general parts that we can use for our project.

Kadina: My goal this week is to research epi-fluorescent microscopes more thoroughly. I also want to look up some prices for materials to help us decide which design is the cheapest.

Zach: My goal this week is to look more at solenoid and motor specifics to determine their viability for moving our filter set-up and to look more at the physical set-up of the entire system.

John: My goal this week is to complete the design matrix, continue to develop a list of parts and cost of parts, and finally begin the mid semester deliverables

Project Difficulties:

Same Challenges:

- N/A

New Challenges:

- Need to determine if we should collimate light from the source to the sample and/or collimate emitted light to the detector.
- How would we go about collimating light
- What's the difference between exciting the sample with LEDs versus a Laser besides the fact that Lasers have a narrower bandwidth
- How will we focus the image
- Do we need a 10x eyepiece for 200x Magnification? How would we go about attaching a camera to a 10x eyepiece.
- How sort of exposure time do we need for each wavelength? In other words should the 470 nm wavelength be exposed longer to the camera than the 535 nm? What type of parameters would we look at to solve this issue? Does fluorescence lifte time play a role?
- Is there software that can differentiate between 535 and 470 at the same time with one camera?

Tasks Completed by Team Members:

Kaitlyn: Helped team complete PDS, did more research on FRET and client background. Started making a list of potential ideas for parts to purchase.

Kadina: I read an article that Professor Merrins gave us. I research competing patents and other similar designs. I also filled out some paperwork and information for team meetings as well as those with the client.

Zach: Completed PDS, evaluated some preliminary design ideas, determined some possible mechanical set-ups for the microscope.

John: John, along with the team, completed PDS, developed design matrix criteria and design ideas. Also did research into optical filters.