Mass Spectrometer Interface

A Desktop Application for Reading Instrument Data

Cousins Photosynthesis Lab in the School of Biological Sciences at WSU



**Team Linnaea Borealis**

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Kyler Kupp, Erik Holtrop

# Introduction

When plants breathe, they take carbon dioxide (CO2) out of the air and replace it with oxygen (O2). Determining what affects plant’s respiration rate, or their breathing rate, is incredibly valuable data. These factors point backwards in time, reflecting causes for evolutionary trends, and forwards in time, providing opportunities to improve agriculture. We can use a mass spectrometer to measure this breathing rate. The mass spectrometer measures the amount of CO2 and O2 in the air, and so the respiration rate is the change in each of those.

The Cousins Photosynthesis Lab in the School of Biological Sciences at Washington State University uses one of these mass spectrometers. These instruments are complicated devices, requiring complex calculations for calibration. The lab uses proprietary software from the mass spectrometer’s manufacturer, but that software outputs massive amounts of data over the course of a multi-hour lab, most of which isn’t needed. This problem has been partially solved with the creation of a Python desktop application, but this application is not perfect. Our task is to improve this application. This application currently faces small bugs, and only works for one instrument. The application is also in process of a UI upgrade.

# Background and Related Work

Explain the domain and context in which you are trying to solve the project problem. You should describe the state-of-the-art for your project field and explain where your work fits in. You should demonstrate that you have read and understood what others in the field have done. This ensures you (1) know the state-of-the-art, (2) are not re-doing others work, and (3) know how you should make a contribution in the project domain. As you discuss each related work, make note of the contribution of that work. The related work may include books, research papers, white papers, online articles, open source repositories, etc. List the citations for the related work in the references section and cite them in this section.

In addition, describe the new technical knowledge and skills which you need to learn in order to complete this project.

# Project Overview

Describe your project problem in detail and summarize the project objectives.

Provide a detailed description of the goals and desired outcomes. You should discuss the intended outcomes of the project with your mentor and summarize them here.

This section should be detailed enough to show that your team has a clear understanding of the project objectives and outcomes. Please plan on having 1+ page text on “Project Overview”.

# Client and Stakeholder Identification and Preferences

Identify your clients and stakeholders (In CptS 421/423 your industry sponsor and mentor is your primary client, however many stakeholders also exist beyond the sponsoring company, mentor and co-mentor. A stakeholder is a person or role that is affected by the system that you will develop in some way, so even a description of any expected future users should be included.)

Briefly describe the needs and preferences of your clients and stakeholders.

Our client is the Cousins Photosynthesis Lab. This is a lab maintained by Washington State University, primarily through Dr. Asaph Cousins, a professor at WSU’s School of Biological Sciences. In this regard, the university is our client, and Dr. Cousins is their liaison. WSU’s primary interest is efficient and impactful research.

The most prominent class of stakeholders are the users of this lab. This includes Dr. Cousins, but also graduate students and postdoctoral researchers both currently and in the future. These researchers are our primary user class. They need our product to be usable, extendable, and powerful. Their experience with coding is variable but generally limited, and this has presented conflicts with previous iterations of this product. These clients could potentially benefit greatly from instructive usage manuals.

Another class of stakeholders is the plant biology academic community. The data processed by our product will likely directly or indirectly affect research created at the Photosynthesis Lab. This makes it incredibly important to ensure that our product preserves the accuracy of the data outputted by the lab’s mass spectrometers.

# Glossary

**WSU**: Washington State University

# References

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