Requirements and Specifications section

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II. System Requirements Specification

This section outlines the key functional and non-functional requirements, use cases, user stories, and traceability matrix for the gas analyser software. It provides a comprehensive overview of the system's goals, behaviours, and user interactions.

II.1. Functional Requirements

Each functional requirement is listed below with a detailed description, source, and priority level.

Functional Requirement	[FR-1] Variable Program Speed
Description	The system must be able to run through data at variable speeds.
Source	Client
Priority	Level 0 (Essential)

Functional Requirement	[FR-2] Data plotting
Description	The system must plot the gas voltage data and calculated information into a visual interface.
Source	Client
Priority	Level 0 (Essential)

Functional Requirement	[FR-3] Specifying data
Description	The system must allow the user to interact with the visual interface to narrow down data or manipulate it.
Source	Client
Priority	Level 0 (Essential)

Functional Requirement	[FR-4] Calculation Requirements
Description	The system must be able to calculate and plot a variety of information based off the various voltage inputs.

Source	Client
Priority	Level 0 (Essential)

Functional Requirement	[FR-5] Visual Requirements
Description	The system must be able display all the various calculated values in addition to the inputted gas voltages.
Source	Client
Priority	Level 0 (Essential)

Functional Requirement	[FR-6] Input Requirements
Description	The system must be able to take inputs of voltage data produced by the spectrometer in the form of CSV files.
Source	Client
Priority	Level 0 (Essential)

Functional Requirement	[FR-7] Snapshot Requirements
Description	The system must be able save snapshots of user specified intervals of the input data.
Source	Client
Priority	Level 0 (Essential)

Functional Requirement	[FR-8] Snapshot Exporting Requirements
Description	The system must be to hold a list of user defined snapshots in memory and be able to export them to a CSV file.
Source	Client
Priority	Level 0 (Essential)

Functional Requirement	[FR-9] Final Export Requirements

Description	The exported snapshots must be properly labelled with time stamps and additional client specified derived values.
Source	Client
Priority	Level 1 (Important)

II.2. Non-Functional Requirements

The non-functional requirements outline the system's operational qualities, such as performance, scalability, and security, to ensure it meets quality standards beyond core functionality. The details of non-functional requirements are given below.

Non-Functional Requirement		Description
[NFR-1] Performance		The system must have a low latency so that results can be seen close to real time
[NFR-2] Scalability		The system must be able to handle large CSV files as they are being produced in real time.
[NFR-3] Usability		The system must be easy for plant researchers to understand and must be in their scientific 'language'.
[NFR-4] Availability		The system must be able to operate continuously on hours' worth of experimental data.

II.3. Use Cases

The use cases describe common scenarios of user interactions with the system, explaining how various functional requirements are applied in specific situations. The use cases of the proposed are represented in use case diagram given in figure 1.

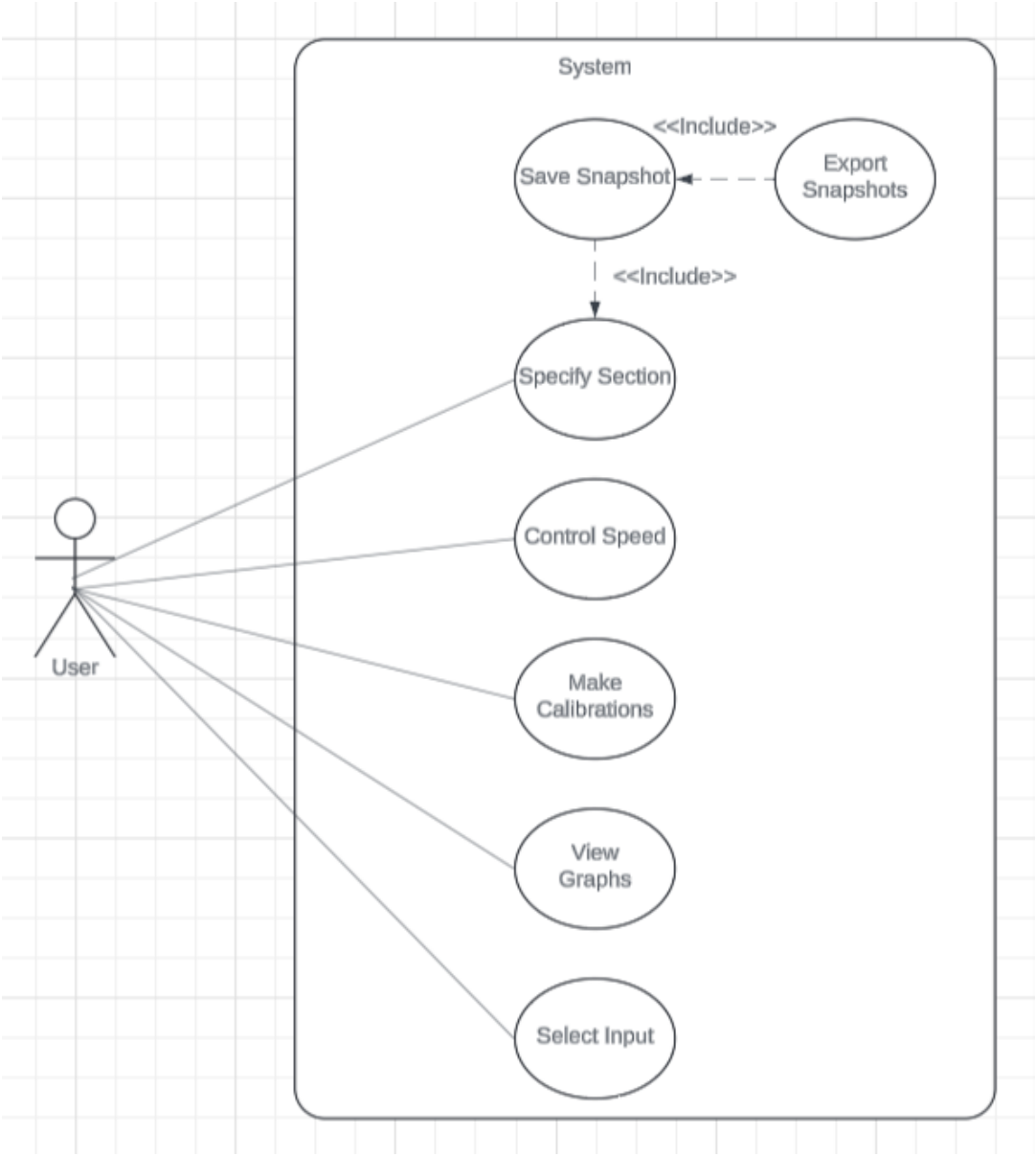

Figure 1: Use case diagram

The description of each use case is given below.

Use Case 1: Selecting an input file

Use Case	Selecting voltage input
Actors	User
Pre-condition	The system is running.
Post-condition	An input file has been selected.
Main Flow	- User runs the application. - User selects a file as input. - The system starts running the input.

Alternative Flow	- System rejects the input
Related Requirements	[FR-6] Input Requirements

Use Case 2: Viewing Graphs

Use Case	Viewing graphs
Actors	User
Pre-condition	The system is running an input.
Post-condition	Visuals of calculations are displayed.
Main Flow	- User runs the application. - User selects a file as input. - The system starts running the input. - The visuals of calculated values are displayed.
Alternative Flow	- If the input file is corrupted, empty, or the wrong file type, no visuals are displayed.
Related Requirements	[FR-6] Input Requirements [FR-5] Visual Requirements

Use Case 3: Making Calibrations

Use Case	Making Calibrations
Actors	User
Pre-condition	The system is running an input.
Post-condition	A user defined input is accepted
Main Flow	- User runs the application. - User selects a file as input. - The system starts running the input. - The user enters a calibration input.
Alternative Flow	- The user chooses not to input a calibration point.
Related Requirements	[FR-6] Input Requirements

Use Case 4: Controlling System Speed

Use Case	Controlling system speed
Actors	User
Pre-condition	The system is running an input.
Post-condition	The user specified speed is used by the system.

Main Flow	- User runs the application. - User selects a file as input. - The system starts running the input. - The user selects a specific speed. - The system uses the selected speed.
Alternative Flow	- The user does not choose a speed, so the default is used.
Related Requirements	[FR-1] Variable Program Speed

Use Case 5: Specifying Sections

Use Case	Specifying Sections
Actors	User
Pre-condition	The system is running an input.
Post-condition	The user specified section has been selected.
Main Flow	- User runs the application. - User selects a file as input. - The system starts running the input. - The user selects a specific section. - The section is selected.
Alternative Flow	- The user does not select.
Related Requirements	[FR-3] Specifying data

Use Case 6: Saving Snapshots

Use Case	Saving Snapshots
Actors	User
Pre-condition	The user has selected.
Post-condition	The selection has been saved as a snapshot.
Main Flow	- User runs the application. - User selects a file as input. - The system starts running the input. - The user selects a specific section. - The user chooses to save the selection as a snapshot.
Alternative Flow	- The user does not save a snapshot.
Related Requirements	[FR-7] Snapshot Requirements

Use Case 7: Exporting Snapshots

Use Case	Exporting Snapshots
Actors	User
Pre-condition	The user has saved at least one snapshot.
Post-condition	The snapshots have been exported to a file.
Main Flow	- User runs the application. - User selects a file as input. - The system starts running the input. - The user selects a specific section. - The user chooses to save the selection as a snapshot. - The user chooses to export the saved snapshots to file.
Alternative Flow	- The user has no snapshots to export.
Related Requirements	[FR-8] Snapshot Exporting Requirements

Give details of all the use cases in same manner.

II.4. User Stories

The following user stories describe specific actions a user can take in the system, detailing what the user wants to accomplish and why. Each user story specifies system behaviour clearly.

User Story US1: User Login

As a researcher/student I want to be able easily see what species of gasses are present in the sample.

Feature: Visual interface

Scenario: User views voltage data

Given the user has selected an input

When the system runs the data

Then the system will display the voltage data on a graph

User Story US2: Calibration

As a researcher/student I want calibration to be easy so that I can focus on the experiment instead of troubleshooting.

Scenario: User wants to input a calibration

Given the system is running on a data file.

When the user enters calibration inputs.

Then the system will become calibrated.

User Story US3: Selecting an input file

As a researcher/student I want to be able to upload CSV files to the system so I can see the species of gasses in the sample.

Feature: Inputting data

Scenario: Selecting a file as an input

Given the has selected an input file

When the file uploaded to the system

Then the system should begin running the input

User Story US4: Specifying a portion of the data

As a user, I want to be able to set boundaries on the full set of data so I can see values associated with that selection.

Feature: Selection creation

Scenario: Selecting

Given the system is running a file

When the user specifies a selection

Then the system will display data associated with the user defined selection

User Story US5: Saving and exporting snapshots

As a user, I want to be able to save selections with their associated data

Feature: Snapshot exporting

Scenario: creating a snapshot

Given the user has made a selection

When the user specifies a selection

Then the system will display data associated with the user defined selection

User Story US6: Setting system speed

As a user, I want to be able to set the speed of a program

Feature: System speed

Scenario: Setting the system speed

Given the system is running

When the user selects a speed

Then the system will start to process data at the selected speed

User Story US7: Viewing calculations

As a user, I want to be able see the plotted data of in the input

Feature: Visual interface

Scenario: Viewing graphs

Given the has ran some data

When user clicks on a graph to view

Then the system will show the plotted values related to the user's choice

II.5. Traceability Matrix

The table below maps functional requirements to their respective use cases and user stories. This ensures that all requirements are accounted for and linked to user scenarios.

Functional Requirement	Use Case	User Story	Priority
[FR-1] Variable Program Speed	Use Case 4: Controlling System Speed	US6: Setting system speed	Level 0
[FR-2] Data plotting	Use Case 2: Viewing Graphs	US6: Viewing calculations	Level 0
[FR-3] Specifying data	UC-1: Browse and Purchase	US4: Specifying a portion of the data	Level 0
[FR-4] Calculation Requirements	Use Case 2: Viewing Graphs	US7: Viewing calculations	Level 0
[FR-5] Visual Requirements	Use Case 2: Viewing Graphs	US7: Viewing calculations	Level 0
[FR-6] Input Requirements	Use Case 1: Selecting an input file	User Story US3: Selecting an input file	Level 0
[FR-7] Snapshot Requirements	Use Case 6: Saving Snapshots	US5: Saving and exporting snapshots	Level 0
[FR-8] Snapshot Exporting Requirements	Use Case 7: Exporting Snapshots	User Story US5: Saving and exporting snapshots	Level 0
[FR-9] Final Export Requirements	Use Case 7: Exporting Snapshots	User Story US5: Saving and exporting snapshots	Level 1