SE 4G06: Software Requirements Specification
Measuring Microstructure Changes During Thermal Treatment

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This document describes the software requirements for the capstone project of measuring microstructure changes of samples during thermal treatment. The template for the Software Requirements Specification (SRS) is a subset of the Volere template.

1 Project Drivers

1.1 The Purpose of the Project

The purpose of this project is to assist the Department of Materials Engineering in measuring the changes to a material's microstructure during thermal treatment. By doing so, the resistivity of the sample can be measured at different thermal levels. The goal is to be able to collect the data at necessary sampling rate and incorporate the use of Windows GUI.

1.2 The Stakeholders

1.2.1 Developers

The Developers will be responsible for the design, development, and documentation throughout. They will be utilizing the existing lab equipment, computer for the duration of this project. Developers will also use the feedback from the client to deliver the final product.

Table 1: **Revision History**

Date	Developer	Notes/Changes
Sept 25	Edwin Do	Revision 0 - Initial commit
Oct 5, 2021	Edwin Do	Adopt Volere template + Add content
Oct 5, 2021	Timothy Chen	Added to Non-Functional Requirements
Oct 5, 2021	Timothy Chen	Added to Reflection

1.2.2 The Client

The Client for this project is the Department of Materials Engineering and the Computing and Software Department at McMaster University. More specifically, Dr. Zurob, Dr. Smith and TAs of 4G06 who will be the ones to evaluate, review and provide feedback on the project throughout the development process.

1.2.3 The Customers

The Customers for this project are anyone who will be conducting research or require data that measures the microstructural changes of materials under various thermal treatment.

1.2.4 Other Stakeholders

This project has no other stakeholders.

1.3 Mandated Constraints

1.3.1 Solution Constraints

Description: The GUI will run on Windows operating system
Rationale: The application is a Desktop application. The lab computer that has the capability to connect to other required lab equipment currently runs on Windows.
Fit Criterion: Users can successfully install and open the application on a supported Windows operating system.

Description: The sampling rate of the equipment to the GUI will be at least 100 times per second
Rationale: According to Dr.Zurob, this is the minimum sampling rate needed to see any meaningful data
Fit Criterion: The equipment samples the data at 100 times per second and the GUI accurately reflects the measurements

1.3.2 Off-the-shelf Software

No off-the-shelf software is required for this project.

1.3.3 Anticipated Workplace Environment

The software and equipment will be designed for the expected environment of a lab. The reason is that the lab equipment and computer is needed for the software to run successfully and should not be easily accessible outside of campus.

1.3.4 Schedule Constraints

The deadline for the final product is the March 20 2023. There will be other milestones during the development process that must be accomplished throughout. This will be outlined in our Github milestones.

1.3.5 Budget Constraints

At this point, there is an estimated budget of $1000. This may change as the team determines what additional equipment is needed to work with the lab equipment.

1.4 Naming Conventions and Terminology

- **JavaScript**: Scripting language used to create and control dynamic content.

- **HTML**: Standard markup language for creating web pages.

- **CSS**: Style sheet language for structuring and styling HTML web page.

- **Windows**: A popular operating system used by many users.

- **Product/Software/Application**: Refers to the final deliverable of this capstone project.

- **User**: The person who will be interacting/ using the application.

- **Electron**: JavaScript framework used to develop Desktop applications.

1.5 Relevant Facts and Assumptions

1.5.1 Facts

ADD TEXT HERE

1.5.2 Assumptions

ADD TEXT HERE

1.5.3 User Characteristics

An assumption made about this project is that the users will have the necessary knowledge to safely operate the necessary lab equipment. This is required to collect the data and display it on the GUI. The user is also assumed to have general working knowledge of how to install and open a windows application, as well as the use of a mouse and keyboard input. Another assumption is that the user is literate in English.

2 Functional Requirements

2.1 The Scope of the Work and the Product

ADD TEXT HERE
The scope of the work is to complete the development of the product with the features requirements outlined in this document.

2.1.1 The Context of the Work

ADD TEXT HERE

2.1.2 Work Partitioning

Table 2: Work Partitioning

Event Number	Event Name	Input	Output
1			
2			
3			
4			

Table 3: Work Partitioning - Description

Event Number	Description
1	
2	
3	
4	

2.1.3 Individual Product Use Cases

UC-1: Description of Use Case

Related Requirements: FR1, FR2, FR3
Initiating Actor:
Actor's Goal:
Participating Actors:
Pre-conditions:
Post-conditions:
Flow of events for main success:
$\rightarrow$ 1. Use right arrow for input
$\leftarrow$ 2. Use left arrow for output
Flow of events for Extensions:
Additional events (extension)
$\rightarrow$ 1. Use right arrow for input
$\leftarrow$ 2. Use left arrow for output

2.2 Functional Requirements

FR1. The system shall ...

FR2. The system shall not...

FR3. Once the system samples..

3 Non-functional Requirements

3.1 Look and Feel Requirements

NFR-L1. The product shall feel simple to use.
Fit Criterion: Survey should reflect 90 percent of users should feel like the product is uncomplicated to use.

NFR-L2. The product shall be in English only. Fit Criterion: The language used throughout the product will be in English.

3.2 Usability and Humanity Requirements

NFR-U1. Users with no prior experience with the product should be able to use it.
Fit Criterion: 90 percent of new users will be able to complete each task successful within 1 minute.

NFR-U2. Product shall have a straightforward interface allowing for quick modification to parameters with ease.
Fit Criterion: The time between the user thinking about modifying a parameter to changing it in the interface should be no longer than 5 seconds.

NFR-U3. Product shall help the user accurately make modifcation and avoid mistakes.
Fit Criterion: The total rate of mistakes made by the user should be no more than 1 percent over 4 months uses of the product.

NFR-U4. Users shall not need to remember how to interact with the product.
Fit Criterion: User will be able to use the product accurately within 5 second after 12 hours of not interacting with the product.

NFR-U5. The product shall conceal detail structures and caluations from the user.
Fit Criterion: The product will not show any caluations used for producing output based on the user's parameters.

NFR-U6. The capacity of the product shall not be large.
Fit Criterion: The product will be no more than 8 GB.

3.3   Performance Requirements

NFR-P1. The product shall be able to read 100 samplings/s.
Fit Criterion: The rate of reading will be measured and the rate determined by the measurement shall be 100 or more samplings/s for 95 percent of the time. Readings will be no less than 98 samplings/s.

NFR-P2. Changes to the parameters will be reflected in the product within 1 second of the user's input.
Fit Criterion: The product will reflect changes given by the user within 1 second for 95 percent of the time. The changes will take no longer than 2 seconds to show in the product.

NFR-P3. The product shall read measurements accurately to 3 decimal places.
Fit Criterion: The measurements will be accurate to 3 decminal places 100 percent of the time.

NFR-P4. The caluations and data displayed shall be accurate to 2 decimal places.
Fit Criterion: Displayed data provide to the user will be accurate 100 percent of the time.

NFR-P5. When the user is using the product, it shall be up and running 99 percent of the time.
Fit Criterion: The product will be up and running for at least 99 percent of the time during the durarion of the tasks set by users.

3.4   Operational and Environmental Requirements

NFR-O1. Product should accept inputs from keybroad and mouse.
Fit Criterion: Keyboard and mouse connected to the computer will be able to interact with the product.

NFR-O2. Product shall be able to be installed with ease by a user with no prior experience with the product.
Fit Criterion: 90 percent of surveys from user with no prior experience should indictate the installation was simple.

NFR-O3. Releases occur at least once every 6 months.
Fit Criterion: The team will make a release with minor bug fixes and new features if needed at least once every 6 months.

3.5 Maintainability and Support Requirements

NFR-M1. Major bugs or issues brought up by the user shall be handled within 72 hours of receiving it.
Fit Criterion: Bugs or issues will be handled by developers within 48 hrs and will be escalated after so it can be resolved by 72 hour mark.

NFR-M2. Product shall work on Window 7 and Window 10 operating systems.
Fit Criterion: The product will be installed on both operating systems and have there functions verified.

NFR-M3. Product shall be expected to work on the computers in the lab.
Fit Criterion: The product will be installed and used as expected on the lab's computer.

3.6 Security Requirements

NFR-S1. The product shall prevent modifcations or injections of measurements.
Fit Criterion: The product will only allow users to read measurements and deny any attempts to change it.

NFR-S2. Only authorized users are allowed to modify concealed caluations settings and/or parameters.
Fit Criterion: Users who have clearance will have access to modify certain caluations and parameters.

3.7 Cultural Requirements

NFR-C1. The product must not include any graphics or terms that may be considered offensive or inappropriate to the user.
Fit Criterion: To measure this, a usability survey will be conducted to evaluate the graphics and terms on a scale of 1-10. Above 70% of the surveys returning with a score of 8 will be considered successful.

3.8 Legal Requirements

N/A

3.9   Health and Safety Requirements

NFR-H1. ADD TEXT HERE

NFR-H2. Colours and graphics used in the application should take into account users who may be prone to seizures.
Fit Criterion: There should be no animations that simulate flashing/ flickering (i.e change of brightness or colour at a rapid rate). There should also be no static optical illusions that may simulate amy flashing/ flickering.

NFR-H3. Colours should not be too bright, causing potential harm to users eyes.
Fit Criterion: Colours of GUI should be checked to ensure it does not simulate extra light. Example: colours that include the words 'bright,' 'flashy' or 'neon'.

3.10   Installability Requirements

NFR-I1. Product requires a Windows computer with the necessary ports to connect to the lab equipment.
Fit Criterion: Run the installation file and install the application successfully. Open the application to see if the readings from the lab equipment are reflected correctly.

4   Project Issues

4.1   Open Issues

ADD SOME TEXT HERE

4.2   Off-the-Shelf Solutions

The application will use Electron, a JavaScript framework that allows developers to create cross-platform compatible desktop applications. Since the use cases of this project are more specialized, there are not many existing solutions available on the market.

4.2.1 Ready Made Components

The application will use existing libraries in Electron to further support the communcation with any equipment in the lab.

4.3 New Problems

A potential problem from our product that may arise is the user's ability to learn the software.

4.3.1 Potential User Problems

This product introduces a new learning curve for the user to use the application. To minimize this problem, the product will be implemented with a quick start guide and developers will design a user friendly interface.

4.4 Tasks

ADD STUFF HERE

4.5 Migration to the New Product

N/A

4.6 Risks

A risk to this project is that the current lab computer uses Windows 7 as its operating system. Although Electron has compatiblity with Windows 7, there appears to be a few issues in the past on GitHub. In the case that it does not work, the operating system will have to be upgraded to Windows 10 and the compatibility with the lab equipment is uncertain. Additionally, McMaster University had notified the Department of Materials Engineering that Windows 7 is no longer supported but since the lab computer does not require any network connections, it has remained running Windows 7. This poses a future risk of the operating system being forcefully upgraded.

Another risk is that the lab equipment does not offer the necessary sampling or is not compatible with the lab computer.

4.7 Costs

The largest estimated cost of this project is time. It will require both the developers and the client's time to work and evaluate the project throughout. Additional expense may be added if additional or new lab equipment is required.

4.8 User Documentation and Training

A main README file will be created and documented for information such as installation, system requirements, and available features. An additional safety document will also be created for users, before using any of the lab equipment.

4.9 Waiting Room

ADD STUFF HERE

4.10 Ideas for Solutions

ADD MORE STUFF

5 Appendix

N/A

5.1 Symbolic Parameters

- SAMPLING_RATE_PER_SECOND = 100

5.2 Reflections

Q1: What knowledge and skills will the team collectively need to acquire to successfully complete this capstone project?

Q2: For each of the knowledge areas and skills identified in the previous question, what are at least two approaches to acquiring the knowledge or mastering the skill? From the identified approaches, which will each team member pursue, and why did they make this choice?

Response

Timothy - We need to acquire the knowledge and skills on developing a Window application using the Electron as the framework. One of the main requirements from the supervisor is that it has to work on Windows operating system. In my experience through Co-op and school work, I have yet to interact with Window applications. This knowledge will hope us meet the requirements set by the supervisor as well as learning a new technical skill.

There are a few approaches to acquiring this knowledge. The first way would be to look for blogs from other developers and learn from there examples. The second way would be to watch and read tutorials online. The third way would be to read the documentation and conduct research. Lastly, we could also learn by trial and error. The approach I will be taking will be watching and reading tutorials online as they will be able to explain concepts in a simpler form with visual aids. This will help me gain knowledge in this concept and make it a skill I can gain from this project.