Project Title: System Verification and Validation Plan for Measuring Microstructure Changes During Thermal Treatment

Team #30, ReSprint
Edwin Do
Joseph Braun
Timothy Chen
Abdul Nour Seddiki
Tyler Magarelli

November 2, 2022

1 Revision History

Date	Version	Developer - Notes
Oct 31	1.0	Edwin Do - Added section 4 for V&V Plan
Nov 2	1.0	Edwin Do - Added more content to section 4

Contents

List of Tables

[Remove this section if it isn't needed —SS]

List of Figures

[Remove this section if it isn't needed —SS]

2   Symbols, Abbreviations and Acronyms

symbol	description
T	Test
SRS	Software Requirements Specifications
VS	Visual Studio
UWP	Universal Windows Platform

[symbols, abbreviations or acronyms – you can simply reference the SRS (Author, 2019) tables, if appropriate —SS]

This document ...

3 General Information

3.1 Summary

3.2 Objectives

3.3 Relevant Documentation

Author (2019)

4 Plan

In this section of planning, it will outline our approaches to cover the requirements outlined in various areas such as the SRS document, Hazard analysis document, our implementation and design. Tools that will be used for automated unit testing and linting will also be introduced.

The following topics will be covered:

- The verification and validation team along with their respective responsibilities

- Our approach towards the SRS Verification plan

- Our approach towards the Design Verification plan

- Implementation verification plan

- Any testing and verification tools we plan to use

4.1 Verification and Validation Team

Below is a table outlining the members of the Verification and Validation team along with their respective responsibilities. Note that the listed responsibilities are only used as a guideline, responsibilities can shift between team members on a as-per-needed basis.

Table 1: Team and Responsibilities

Team Member	Role Name	Responsibilities
Edwin Do	Software and SRS Tester	Ensures that all requirements are valid and verified under the scope of software capabilities in this project and the SRS
Timothy Chen	Software Tester	Ensures that all requirements are met and verified under the scope of software capabilities in this project
Tyler Magarelli	Software Tester	Ensures that all requirements are met and verified under the scope of software capabilities in this project
Joseph Braun	Hardware Tester	Ensures that all requirements are met and verified under the scope of hardware capabilities in this project
Abdul Nour Seddiki	Hardware Tester	Ensures that all requirements are met and verified under the scope of hardware capabilities in this project
Dr. Hatem Zurob	Supervisor	Ensures that all requirements are valid and meets the expected result

4.2   SRS Verification Plan

To verify our SRS, our team intends on revisiting the SRS document on a bi-weekly basis to verify that the requirements are up to date and in sync with the project goal. This will also allow us to cover any newly discover risks or hazards which will also be reflected in the Hazard Analysis document. Any new changes within the two week window will be noted and discussed at the end to see if additional changes to the SRS document would be necessary. At each bi-weekly review, the team also plans on using the SRS checklist as a guideline throughout the meeting.

In addition, the team will use ad hoc feedback from reviewers such as classmates from our 4GA6 Capstone class as well as instructor, supervisor and teaching assistants. This will act as a supplementary addition if any element of the SRS is out of date or missing.

4.3   Design Verification Plan

Our plans to verify our design document includes using the MIS checklist and reviews from our classmates. The MIS checklist will help our team ensure that the design logic helps us meet the requirements specified in the SRS document and cover any hazards or risks outlined in the Hazard analysis. The team will conduct an internal design review, by going over all the outlined requirements, risks and hazards and verifiying that the design does not contain any logical flaws to the best of our abilities.

In addition, the team will use the feedback from reviewers such as classmates from our 4G06 Capstone class as well as instructor, supervisor and teaching assistants. This will help further assist our team to ensure that the design is free from any logical flaws and is able to help meet the outlined requirements.

4.4   Implementation Verification Plan

Throughout the development phase of this project, the team will use GitHub Issues and pull requests to implement various features. Each pull request will require at least two other team members to inspect and review the code ensuring that it meets the requirement and design discussed. A pipeline can also be implemented in GitHub to ensure that the build in the main branch is

always stable. Unit tests will also be used to ensure that the implementation of the product is verified.

4.5   Automated Testing and Verification Tools

The final product will be an Universal Windows Platform (UWP) application built using Microsoft Visual Studio (VS) in C# and XAML.

Majority of the project's testing will be conducted within VS. For unit testing, the team will use the built-in features of Unit Test Applications in VS to create unit tests projects and units tests.

Code coverage tests is also covered within the suite of tools available within VS. The team will be able to create testing suites and unit tests for the VS project. The team also plans on using the results of the code coverage tests to identify which portion of the project's code not covered by our tests. Uncovered blocks of code can be colour-coded to signify to the developer that no current test covers that block of code. Other metrics such as number of lines covered, % of a block covered will be summarized per code coverage project to help indicate where more testing efforts are needed.

Using Visual Studio's IDE extensions, the team plans on using SonarLint and CSharpier as its linter and formatting tool for C# respectively.

4.6   Software Validation Plan

To verify that the software will work as intended and designed, the team will use the sample data provided by Dr. Zurob and see if the results are within a reasonable margin of error. This sample data is obtained from a collection of existing materials with known results. If the actual results are outside a reasonable range, then the team shall conclude that the results are not valid.

5 System Test Description

5.1 Tests for Functional Requirements

[Subsets of the tests may be in related, so this section is divided into different areas. If there are no identifiable subsets for the tests, this level of document structure can be removed. —SS]

[Include a blurb here to explain why the subsections below cover the requirements. References to the SRS would be good. —SS]

5.1.1 Area of Testing1

[It would be nice to have a blurb here to explain why the subsections below cover the requirements. References to the SRS would be good. If a section covers tests for input constraints, you should reference the data constraints table in the SRS. —SS]

Title for Test

1. test-id1

   Control: Manual versus Automatic

   Initial State:

   Input:

   Output: [The expected result for the given inputs —SS]

   Test Case Derivation: [Justify the expected value given in the Output field —SS]

   How test will be performed:

2. test-id2

   Control: Manual versus Automatic

   Initial State:

   Input:

   Output: [The expected result for the given inputs —SS]

Test Case Derivation: [Justify the expected value given in the Output field —SS]

How test will be performed:

5.1.2 Area of Testing2

...

5.2 Tests for Nonfunctional Requirements

[The nonfunctional requirements for accuracy will likely just reference the appropriate functional tests from above. The test cases should mention reporting the relative error for these tests. —SS]

[Tests related to usability could include conducting a usability test and survey. —SS]

5.2.1 Area of Testing1

Title for Test

1. test-id1

    Type:
    Initial State:
    Input/Condition:
    Output/Result:
    How test will be performed:

2. test-id2

    Type: Functional, Dynamic, Manual, Static etc.
    Initial State:
    Input:
    Output:
    How test will be performed:

5.2.2 Area of Testing2

...

5.3 Traceability Between Test Cases and Requirements

[Provide a table that shows which test cases are supporting which requirements. —SS]

6 Unit Test Description

[Reference your MIS and explain your overall philosophy for test case selection. —SS] [This section should not be filled in until after the MIS has been completed. —SS]

6.1 Unit Testing Scope

[What modules are outside of the scope. If there are modules that are developed by someone else, then you would say here if you aren't planning on verifying them. There may also be modules that are part of your software, but have a lower priority for verification than others. If this is the case, explain your rationale for the ranking of module importance. —SS]

6.2 Tests for Functional Requirements

[Most of the verification will be through automated unit testing. If appropriate specific modules can be verified by a non-testing based technique. That can also be documented in this section. —SS]

6.2.1 Module 1

[Include a blurb here to explain why the subsections below cover the module. References to the MIS would be good. You will want tests from a black box perspective and from a white box perspective. Explain to the reader how the tests were selected. —SS]

1. test-id1

Type: [Functional, Dynamic, Manual, Automatic, Static etc. Most will be automatic —SS]

Initial State:

Input:

Output: [The expected result for the given inputs —SS]

Test Case Derivation: [Justify the expected value given in the Output field —SS]

How test will be performed:

2. test-id2

   Type: [Functional, Dynamic, Manual, Automatic, Static etc. Most will be automatic —SS]

   Initial State:

   Input:

   Output: [The expected result for the given inputs —SS]

   Test Case Derivation: [Justify the expected value given in the Output field —SS]

   How test will be performed:

3. ...

6.2.2 Module 2

...

6.3 Tests for Nonfunctional Requirements

[If there is a module that needs to be independently assessed for performance, those test cases can go here. In some projects, planning for nonfunctional tests of units will not be that relevant. —SS]

   [These tests may involve collecting performance data from previously mentioned functional tests. —SS]

6.3.1 Module ?

1. test-id1

   Type: [Functional, Dynamic, Manual, Automatic, Static etc. Most will
   be automatic —SS]

   Initial State:

   Input/Condition:

   Output/Result:

   How test will be performed:

2. test-id2

   Type: Functional, Dynamic, Manual, Static etc.

   Initial State:

   Input:

   Output:

   How test will be performed:

6.3.2 Module ?

...

6.4 Traceability Between Test Cases and Modules

[Provide evidence that all of the modules have been considered. —SS]

References

Author Author. System requirements specification. https://github.com/...,
2019.

7　Appendix

This is where you can place additional information.

7.1　Symbolic Parameters

The definition of the test cases will call for SYMBOLIC_CONSTANTS. Their values are defined in this section for easy maintenance.

7.2　Usability Survey Questions?

[This is a section that would be appropriate for some projects. —SS]

Appendix — Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Lifelong Learning. Please answer the following questions:

1.

2.