Project Title: System Verification and Validation Plan for AortaGeomRecon

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1 Revision History

Date	Version	Notes
2023-04-30	1.0	First draft of VnV plan
Date 2	1.1	Notes

Contents

2 Symbols, Abbreviations and Acronyms

symbol	description
T	Test

(Lin, 2023b)

The following section provides an overview of the Verification and Validation (V&V) Plan for program AortaGeomRecon. This section explains the purpose of this document, the scope of the system, common definitions that are used in the document. Throughout this document, we refer to the terms that have been already explained in the document Software Requirements Specification for Program AortaGeomRecon.

3 General Information

3.1 Summary

AortaGeomRecon is tested for its segmentation module. The segmentation algorithm can be split into 3 parts, the descending aorta segmentation, the ascending aorta segmentation and the sagittal segmentation.

The descending aorta segmentation takes an original volume and a descending aorta centre coordinate as the inputs, and perform the segmentation on the volume, finally returns the result label volume indicate which voxel belongs to the descending aorta.

Smilarly, the ascending aorta segmentation takes an original volume, an ascending aorta centre coordinate, and the descending aorta segmentation result label volume as the inputs, and perform the segmentation on the original volume, finally returns the result label volume indicate which voxel belongs to the descending or ascending aorta.

Finally, the sagittal segmentation is used to fill in any missing voxel that is potentially belong to the aorta in the label volume.

3.2 Objectives

The main objective of the verification and validation is to ensure the segmentation algorithm correctness, while optimizing the algorithm for the readability and the efficiency. The segmentation algorithm has been tested with 6 samples and the results are verified by the domain experts. Continuous integration testing can ensure the software correctness for each modification of the existing code.

3.3   Relevant Documentation

Lin (2023a) Lin (2023b)

4   Plan

This section provides a description of the software that is being tested, the team that will perform the testing, and the milestones for the testing phase/

4.1   Verification and Validation Team

Name	Role description
Jingyi Lin	Design and implement testing modules.
Dr. Spencer Smith	Code review and provide test cases.

4.2   SRS Verification Plan

This section provides the functional requirements, the business tasks that the software is expected to complete, and the nonfunctional requirements, the qualities that the software is expected to exhibit.

4.2.1   Functional Requirements

The functional requirements have been already explained in the Software Requirements Specifications for Program AortaGeomRecon. As a reference, the names of the requirements are as follows:

- Input

- Region of Interest

- Output

- Visualization

4.2.2 Nonfunctional Requirements

Considering the use of this program in the research and academia nowadays, as well as keeping an eye on its future use in the medicine and clinical practice, the priority nonfunctional requirements are correctness, understandability, reliability, and usability. The usability Nonfunctional requirements are as follow:

- Interface

- 3D Rendering

4.3 Design Verification Plan

[Plans for design verification —SS]
[The review will include reviews by your classmates —SS]
[Remember you have MG and MIS checklists —SS]

4.4 Implementation Verification Plan

[You should at least point to the tests listed in this document and the unit testing plan. —SS]
[In this section you would also give any details of any plans for static verification of the implementation. Potential techniques include code walkthroughs, code inspection, static analyzers, etc. —SS]

4.5 Automated Testing and Verification Tools

[The details of this section will likely evolve as you get closer to the implementation. —SS]

4.6 Software Validation Plan

[If there is any external data that can be used for validation, you should point to it here. If there are no plans for validation, you should state that here. —SS]

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

Jingyi Lin. Module guide. https://github.com/smiths/aorta/blob/main/docs/Design/MG/MG.pdf, 2023a.

Jingyi Lin. System requirements specification. https://github.com/smiths/aorta/blob/main/docs/SRS/SRS.pdf, 2023b.

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]