Introduction

Our aim is to develop an interactive learning tool that visually demonstrates the behaviors and uses of key algorithms and data structures, herein referred to as Professor Alberton’s Algorithmic Adventures. This document will inform the developers and stakeholders about the applications goals, design and core requirements.

Glossary

Realm – Each of the categories of algorithms and data structures have been assigned to one of the following distinct realms: Sorting, Drawing, Data Structures, Game Theory and Greedy.

GUI (Graphical User Interface) –Application output as represented for the user.

MVC (Model View Controller) – An architectural pattern designed to separate the GUI from the data.

State Driven Design – The data the application software has access to at any given time is represented by a program state.

Notes on terminology - This document contains references to several commonly known algorithms and data structures and it is expected the reader has a reasonable understanding of what is meant by terms such as binary tree, heap, stack, Conway’s Game of Life and so on.

Application Overview

Professor Alberton’s Algorithmic Adventures is an interactive demonstration and learning tool, targeted at secondary and tertiary students. Its primary objective is to demonstrate the functionality of key algorithms and data structures in a way that is entertaining and engaging.

Professor Alberton’s Algorithmic Adventures will have a menu driven interface via which the user will be able to visit a particular realm. A subsequent themed interface will lead them to a selection of several relevant algorithms or data structures, which can then be explored.

Each algorithm or data structure will have a background or history, followed by a visual demonstration with accompanying pseudo code, and finally a related game or interactive demonstration.

Games and interaction will make up the core focus of the application and will be aimed at developing some fundamentals skills required to fully understand the practical use of algorithms and data structures.

Application Structure

The internal structure of the application will combine elements of MVC and state driven design. This will allow for prototyping design methodology, due in part to the separation of interface and data that MVC informs, and inherently modular nature of state driven architecture.

The GUI will listen for actions, which are subsequently passed to and handled by the controller. The controller then changes the program state (for example from displaying menu to demonstrating Quick Sort), which then has exclusive access to the relevant data, which in turn updates the view and displays the output/listens for the next action.

Actions don’t always lead to a change in program state. Inserting data into a binary tree for example, will update the model directly, rather than altering the program state.

Changes

Accesses

Updates

Action

Changes

State

Model

Controller

View

Requirement Specifications

Priorities

Critical: Requirements that offer core functionality

Essential: Requirements that are integral to meet the overall project objectives.

Desirable: Requirements that provide non-essential functionality, but would enhance the experience.

Stretch: Requirements that provide non-essential functionality, but will only be considered should all other requirements be met.

Key

The following key codes the requirements.

General Requirements GA1-G

Sorting GA1-S

Sorting Stretch Goals GA1-STS

Drawing GA1-DR

Data Structures GA1-DS

Data Structures Stretch Goals GA1-STDA

Game Theory GA1-GA

Greedy GA1-STGR

Non-functional Requirements GA1-NF

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| Requirement #: GA1-G1 | Requirement Type: Functional | | Use Case #: |
| **Description:** Menu driven GUI | | | |
| **Rationale:** The application should be navigable via a menu driven GUI | | | |
| **Fit Criterion:** All program features and accessories should be easily identifiable and accessible via a GUI | | | |
| **Dependencies:** N/A | | **Rank of Importance:** Critical | |

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| Requirement #: GA1-G2 | Requirement Type: Functional | | Use Case #: |
| **Description:** Language agnostic demonstrations | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** The algorithms are explained and demonstrated with language agnostic pseudo code | | | |
| **Dependencies:** N/A | | **Rank of Importance:** Critical | |

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| Requirement #: GA1-G3 | Requirement Type: Functional | | Use Case #: |
| **Description:** That each demonstration has graphics and animations that are relevant and engaging | | | |
| **Rationale:** Essential to fulfil the overall project objective | | | |
| **Fit Criterion:** Graphics and animations present | | | |
| **Dependencies:** N/A | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-G4 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactivity | | | |
| **Rationale:** An interactive approach to the learning process is integral to the overall project objective | | | |
| **Fit Criterion:** That a game, or interactive demonstration is present for each of the algorithms or data structures present in the application. | | | |
| **Dependencies:** N/A | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-S1 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history/development of the quick sort algorithm | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history/development of the quick sort algorithm into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S2 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the quick sort algorithm in context | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the quick sort algorithm in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S3 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the quick sort algorithm | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for the quick sort algorithm alongside a an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S4 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate quick sort | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate the quick sort algorithm in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-S5 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history/development of the bubble sort algorithm | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history/development of the bubble sort algorithm into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S6 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the bubble sort algorithm in context | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the bubble sort algorithm in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S7 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the bubble sort algorithm | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for the bubble sort algorithm alongside a an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S8 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate bubble sort | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate the bubble sort algorithm in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-S9 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history/development of the selection sort algorithm | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history/development of the selection sort algorithm into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S10 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the selection sort algorithm in context | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the selection sort algorithm in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S11 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the selection sort algorithm | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for the selection sort algorithm alongside a an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S12 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate selection sort | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate the selection sort algorithm in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-S13 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history/development of the insertion sort algorithm | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history/development of the insertion sort algorithm into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S14 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the insertion sort algorithm in context | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the insertion sort algorithm in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S15 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the insertion sort algorithm | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for the insertion sort algorithm alongside a an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-S16 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate insertion sort | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate the insertion sort algorithm in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1GA1 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on game states via the farmer and the goat game | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history/development of the farmer and the goat problem into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA2 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the farmer and the goat problem | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the farmer and the goat problem in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA3 | Requirement Type: Functional | | Use Case #: |
| **Description:** Represent the farmer and the goat problem in terms of states | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show the winning and losing states alongside a demonstration of the farmer and the goat problem | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA4 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate the farmer and the goat | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate the farmer and the goat problem | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1GA5 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on game states via the water buckets game | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history/development of the water bucket game | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA6 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the water bucket game | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the water bucket problem in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA7 | Requirement Type: Functional | | Use Case #: |
| **Description:** Represent the water bucket problem in terms of states | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show the winning and losing states alongside a demonstration of the water bucket problem | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA8 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate the farmer and the goat | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate the water bucket | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1GA9 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on game states via the tower of Hanoi game | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history/development of the tower of Hanoi | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA10 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the tower of Hanoi game | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the tower of Hanoi problem in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA11 | Requirement Type: Functional | | Use Case #: |
| **Description:** Represent the water bucket problem in terms of states | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show the winning and losing states alongside a demonstration of the tower of Hanoi problem | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-GA12 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate the tower of Hanoi | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate the tower of Hanoi | | | |
| **Dependencies:** GA1-G1 to GA1-Gn | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1GA13 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the rules of Conway’s game of life | | | |
| **Rationale:** A good way demonstrate states and rules | | | |
| **Fit Criterion:** Successfully show how game of life works | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-GA14 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate Conway’s game of life in action | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows Conway’s game of life in action | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-DA1 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of the heap structure | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of Heap structure’s into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA2 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the Heap structure in context | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the heap structure in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA3 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the heap structure | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for heap structure’s alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA4 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate heap structure’s | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate Heap structure’s in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| --- | --- | --- | --- |
| Requirement #: GA1-DA5 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of the stack structure | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of stack structure’s into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA6 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the Stack structure in context | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the stack structure in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA7 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the stack structure | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for stack structure’s alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA8 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate stack structure’s | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate stack structure’s in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-DA9 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of the queue structure | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of queue structure’s into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA10 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the queue structure in context | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the queue structure in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA11 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the queue structure | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for queue structure’s alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA12 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate queue structure’s | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate queue structure’s in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-DA13 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of the tree structure | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of tree structure’s into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA14 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the tree structure in context | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the tree structure in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA15 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the tree structure | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for tree structure’s alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-DA16 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate tree structure’s | | | |
| **Rationale:** Desirable to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate tree structure’s in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-STS1 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of bogo sort | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of bogo sort into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| Requirement #: GA1-STS2 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate bogo sort in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows Bogo sort in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| Requirement #: GA1-STS3 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for bogo sort | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for bogo sort alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STS4 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate bogo sort | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate bogo sort in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STS5 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of radix sort | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of Radix sort into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STS6 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate radix sort in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows radix sort in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STS7 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for radix sort | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for radix sort alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STS8 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate radix sort | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate radix sort in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STDA1 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of arrays | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of Arrays into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STDA2 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate arrays in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the arrays structure in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STDA3 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate arrays | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate arrays in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STDA5 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of the lists structure | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of Lists structure’s into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STDA6 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate the lists structure in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows the lists structure in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STDA7 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for the lists structure | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for lists structure’s alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STDA8 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate lists structure’s | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate lists structure’s in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR1 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of branch & bound | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of branch & bound into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR2 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate branch & bound in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows branch & bound in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR3 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for branch & bound | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for branch & bound alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR4 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate branch & bound | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate branch & bound in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR5 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of divide & conquer | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of divide & conquer into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR6 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate divide & conquer in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows divide & conquer in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR7 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for divide & conquer | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for divide & conquer alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR8 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate divide & conquer | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate divide & Conquer in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR9 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of merging | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of Merging into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR10 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate merging in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows merging in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR11 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for merging | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for Merging alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR12 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate merging | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate merging in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR13 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of shortest job first | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of Shortest Job First into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR14 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate shortest job first in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows shortest job first in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR15 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for shortest job first | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for shortest job first alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR16 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate shortest job first | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate Shortest Job First in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR17 | Requirement Type: Functional | | Use Case #: |
| **Description:** Educate user on the history of a-star | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate the history of a-star into the application | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR18 | Requirement Type: Functional | | Use Case #: |
| **Description:** Demonstrate A Star in context | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully integrate a demonstration that shows a-star in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR19 | Requirement Type: Functional | | Use Case #: |
| **Description:** Show pseudo code for a-star | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** Successfully show pseudo code for a-star alongside an algorithm demonstration | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-STGR20 | Requirement Type: Functional | | Use Case #: |
| **Description:** Interactive game or activity to demonstrate a-star | | | |
| **Rationale:** Suited to the overall project objective | | | |
| **Fit Criterion:** The application will integrate an activity or game to demonstrate a-star in context | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Stretch | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF1 | Requirement Type: Look and Feel | | Use Case #: |
| **Description:** Distinct and varied visual design for each realm | | | |
| **Rationale:** Provide interest and clarity to the application structure for users | | | |
| **Fit Criterion:** Design different visual elements for each realm | | | |
| **Dependencies:** GA1-G3 | | **Rank of Importance:** Desirable | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF2 | Requirement Type: Look and Feel | | Use Case #: |
| **Description:** Sound effects for menu navigation | | | |
| **Rationale:** Assists in useability and users perception of responsiveness | | | |
| **Fit Criterion:** The application will play appropriate and consistent sounds during menu navigation that reinforce the functionality | | | |
| **Dependencies:** GA1-G1 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-NF3 | Requirement Type: Look and Feel | | Use Case #: |
| **Description:** Music / ambient audio | | | |
| **Rationale:** Adds to the feel of the user experience | | | |
| **Fit Criterion:** The application will play realm-specific background music/sounds that complement the visual design | | | |
| **Dependencies:** GA1-G3 | | **Rank of Importance:** Desirable | |

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| Requirement #: GA1-NF4 | Requirement Type: Useability | | Use Case #: |
| **Description:** The application must be accessible | | | |
| **Rationale:** We must provide a level of accessibility appropriate to our intended users | | | |
| **Fit Criterion:** The product shall be easy for secondary/tertiary students to use with no assumed prior knowledge | | | |
| **Dependencies:** GA1-G1 to GA1-G4 | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-NF5 | Requirement Type: Useability | | Use Case #: |
| **Description:** Ensure GUI is intuitive and easy to navigate | | | |
| **Rationale:** Ready access to the content will make the application more engaging | | | |
| **Fit Criterion:** The product shall be easy for secondary/tertiary students to use with no assumed prior knowledge | | | |
| **Dependencies:** GA1-G1 | | **Rank of Importance:** Essential | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF6 | Requirement Type: Useability | | Use Case #: |
| **Description:** The application is fun and engaging | | | |
| **Rationale:** A game-like approach to learning makes the process more entertaining | | | |
| **Fit Criterion:** The application will be interactive and feature colourful imagery and sounds | | | |
| **Dependencies:** GA1-G3 & GA1-G4 | | **Rank of Importance:** Essential | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF7 | Requirement Type: General | | Use Case #: |
| **Description:** The application will be educational | | | |
| **Rationale:** Integral to the overall project objective | | | |
| **Fit Criterion:** The application will impart knowledge through a combination of text, diagrams and interactive features | | | |
| **Dependencies:** GA1-G2 & GA1-G4 | | **Rank of Importance:** Essential | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF8 | Requirement Type: Performance | | Use Case #: |
| **Description:** Responsive interface | | | |
| **Rationale:** Unresponsive interfaces detract from the user experience and should be avoided | | | |
| **Fit Criterion:** User interactions will result in immediate visual and/or aural feedback | | | |
| **Dependencies:** GA1-G1 & GA1-G4 | | **Rank of Importance:** Essential | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF9 | Requirement Type: Performance | | Use Case #: |
| **Description:** Scale content appropriately for different resolutions | | | |
| **Rationale:** Scalability ensures a high quality image for a wide range of users | | | |
| **Fit Criterion:** The imagery and typefaces used in the product must be scalable to accommodate a range of screen resolutions | | | |
| **Dependencies:** GA1-G3 | | **Rank of Importance:** Desirable | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF10 | Requirement Type: Performance | | Use Case #: |
| **Description:** Algorithm performance | | | |
| **Rationale:** Visual elements will add computational overheads so algorithms need to be efficient | | | |
| **Fit Criterion:** Ensure all algorithms execute efficiently in terms of number of operations | | | |
| **Dependencies:** N/A | | **Rank of Importance:** Essential | |

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| Requirement #: GA1-NF11 | Requirement Type: Operational | | Use Case #: |
| **Description:** Provide support for popular desktop operating systems | | | |
| **Rationale:** Important to ensure the environment required to use our product is available | | | |
| **Fit Criterion:** Create binaries for Windows and OSX | | | |
| **Dependencies:** N/A | | **Rank of Importance:** Critical | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF12 | Requirement Type: Operational | | Use Case #: |
| **Description:** Support suitable input devices for the user | | | |
| **Rationale:** Commonly available hardware allows for a wider userbase | | | |
| **Fit Criterion:** Design the application to use keyboard and mouse | | | |
| **Dependencies:** GA1-G1 & GA1-G4 | | **Rank of Importance:** Essential | |

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| --- | --- | --- | --- |
| Requirement #: GA1-NF13 | Requirement Type: Legal | | Use Case #: |
| **Description:** Product should be G rated | | | |
| **Rationale:** Application is to be used by secondary students | | | |
| **Fit Criterion:** Keep all content within the bounds of the G classification as set out by the Australian Classification Board | | | |
| **Dependencies:** GA1-G2 to GA1-G4 | | **Rank of Importance:** Essential | |