

# **SOUND ODYSSEY**

*Requirements Specification*



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# Introduction (Purpose/Target Market, Scope)

## Purpose

The purpose of this document is to provide a comprehensive list of prioritised requirements and give an overview of the game architectural layers to the supervisor, group members, stakeholders and marking committee.

## Scope

This document includes details about both functional and nonfunctional requirements of high, medium and low priority at a high level. These requirements are grouped based on user interface, gameplay, storage, online, logging and miscellaneous. This document will also briefly summarise the purpose of the game through the game overview as well as outline the game architecture from front end, back end, storage and external dependencies.

This document will not go into depth about design or each requirements implementation in the game.

## Glossary

**Keyboard:** A keyboard used on PC for word processing, navigation and other functions that people use to operate a computer. This keyboard is can be used as an optional navigation method for in game menus.

**MIDI Keyboard:** A digital instrument that contains piano keys used in a similar role to an analogue piano. This can be used as a game controller for the game.

**Asset:** A resource eg. audio, graphic/image, font, level script, that included with the game.

**AMEB:** Australian Music Examination Board. Federated, privately funded corporation which provides a program of examinations for music, speech and drama in Australia.

## Game overview

**Sound Odyssey** is a space exploration themed music education game. It is primarily an offline, single player game supported on a Microsoft Windows (7 & 8/8.1) platform.

The purpose of the game is to educate people who are just starting or wanting to learn piano through a fun and engaging learning accompaniment. It will also enable experienced and intermediate pianists to practice and test their skills through challenging gameplay. The target market of this game includes people wanting to learn the piano as well as novice and beginner pianists.

There are multiple game modes that enhance the learning and gameplay experience of the software. These game modes would enable the player to practice and learn the new skills they learn throughout the game as well test their competency of using these skills. These game modes test their competency in a variety of ways including their fluency, accuracy, and reaction speed when playing the notes.

The testing components are based from components from AMEB exams to test the overall performance of the player's skills. The game modes also enable the player to use their newly learnt skills to challenge themselves through levels that are highly difficult to complete and would require a high substantial amount of experience with playing the piano to do so.

For users to obtain the most optimal learning and gameplay experience, a MIDI Keyboard of size 44 to 88 keys is required to play the game and get the full experience and use of the game. The MIDI Keyboard would be used as the primary game controller.

This software has the possibility to enable other instruments to be used as controllers for the game. The use of other instruments would allow players to expand their skills and learn as well practice the skills they learn with other instruments.

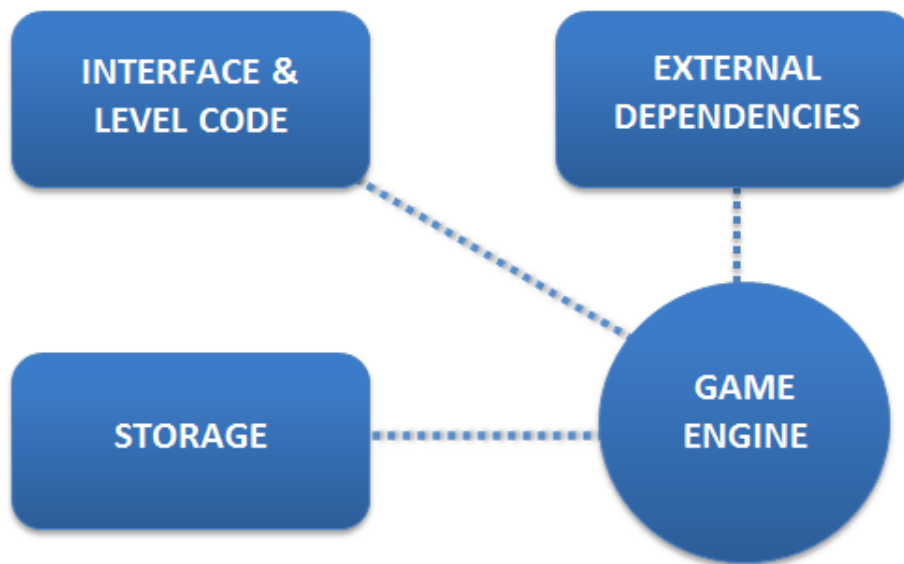
## Game Architecture

**INTERFACE & LEVEL CODE:** User Interface, Keyboard, Level & Menu Code

**GAME ENGINE:** Game Engine, Gameplay Controller, Event Handler, Storage Controller, File Director

**STORAGE:** User Data, Assets, Logs

**EXTERNAL DEPENDENCIES:** Libraries, Plugins



### Interface & Level Code

This consists of the MIDI keyboard and the user interface. The game interface will display the user menus, level menus and levels, gameplay and other visual features as well as audio feedback by communicating with the Game Engine. This user interface and level code allows the user to give input and interact with game output.

### Game Engine

The game engine is responsible for handling all elements of gameplay. They consist of modules like: physics simulation, graphics rendering, audio processing, MIDI I/O, computer keyboard I/O. The game engine also manages the handling and triggering of events. This also contains the gameplay logic as well as a means for coordinating the interacting systems. The game engine also handles the user data using storing and loading requests.

## External Dependencies

The external dependencies will include any libraries or plugins that are required to run this software.

## Storage

Will be responsible for storing all data that is used within the software. For example: Game assets like models and sound packs, user data, preferences, game levels etc.

## Constraints

The software and its requirements are limited by:

**Hardware** - The performance of the hardware is varied however a minimum hardware requirement is needed to enable the software to run as smooth as possible to give the complete learning and gameplay experience desired by the user (See User Manual for minimum hardware requirements). The game must be played with a MIDI compatible keyboard, if a user does not own a MIDI compatible keyboard they won't be able to play the game.

**Software** - The compatibility with multiple operating systems apart from Microsoft Windows is not possible, as well as older versions of Windows Vista and earlier. Only versions of Windows 7, 8 and 8.1 are able to consistently support the framework of the software therefore minimum software requirements are needed.

# Requirements Documentation

## Priorities:

- **Core** - Requirements which are to be implemented before any of the other priorities. These priorities have to be met for the project to succeed.
- **High** - Requirements which are to be met after the base implementations have been met. These will most likely be delivered.
- **Medium** - Requirements which provide extra support for the project. These requirements are to be implemented after the high priorities have been met and if there is ample time available for implementation.
- **Low** - The lowest priority items which we will only attempt if there is an excess of time and all the medium priorities have been met.

## Requirements Summary

### Integration Key:

Implemented / Integrated
Functional but not integrated
Possible extension

### CORE REQUIREMENTS:

ID	Requirement	Priority
F1.7	Saving and Loading progress	Core
F2.2	Interface Navigation with Mouse and Keyboard	Core
F3.1	MIDI Input Processing	Core
F3.3	Pausing/Suspending Gameplay	Core
F3.9	Level based Gameplay	Core
F3.10	Gameplay scoring	Core
F3.11	Core gameplay interactions	Core

### HIGH REQUIREMENTS:

ID	Requirement	Priority
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<b>F1.1</b>	Create User Profiles	High
<b>F1.2</b>	Storing User Profiles	High
<b>F1.3</b>	Storing level statistics	High
<b>F1.4</b>	Player progress tracking	High
<b>F1.5</b>	Level Feedback	High
<b>F1.8</b>	Capability for multiple user profiles	High
<b>F1.9</b>	Autosaving player's progress	High
<b>F3.4</b>	Menu Navigation	High
<b>F3.13</b>	Display Instructions visually/in text	High
<b>F6.4</b>	Teaching Musical Terminology	High
<b>N1</b>	Saving data quickly	High
<b>N3</b>	Loading and Initialisation Time	High
<b>N7</b>	Compatibility	High
<b>N9</b>	Ease of Use	High
<b>N10</b>	Look and Feel	High

#### MEDIUM REQUIREMENTS:

<b>ID</b>	<b>Requirement</b>	<b>Priority</b>
<b>F2.1</b>	Interface Navigation with MIDI Keyboard	Medium/Low
<b>F3.2</b>	Ship Customisation	Medium
<b>F3.5</b>	Create Custom Levels	Medium
<b>F1.6</b>	Storing Custom Levels	Medium
<b>F3.6</b>	Viewing and Playing Custom Levels	Medium
<b>F3.12</b>	Show Objective in text or visually	Medium
<b>F3.14</b>	Voice Instructions	Medium/Low
<b>F3.15</b>	Additional gameplay interactions	Medium
<b>F5.1</b>	Error Logging	Medium/Low
<b>F6.4</b>	Built-in help/glossary	Medium
<b>N2</b>	Query Processing Time	Medium
<b>N4</b>	Interface Response Time	Medium



<b>N5</b>	Input Response Time	Medium
<b>N6</b>	Level loading	Medium

**LOW REQUIREMENTS:**

<b>ID</b>	<b>Requirement</b>	<b>Priority</b>
<b>F3.7</b>	Gameplay without MIDI Keyboard	Low
<b>F3.8</b>	Gameplay with other instruments	Low
<b>F4.1</b>	Pairing Local Profiles with Online Accounts	Low
<b>F4.2</b>	Uploading and Downloading Custom Levels via Website	Low
<b>F4.3</b>	Uploading and Downloading Custom Levels via Game	Low
<b>F4.4</b>	Online Support	Low
<b>F6.1</b>	Mobile Support	Low
<b>F6.2</b>	Achievements	Low
<b>N8</b>	Additional Compatibility	Low

# Functional Requirements

## F1 Storage

<b>ID: F1.1</b>	<b>Requirement:</b> Create User Profiles	<b>Priority:</b> High
<b>Description:</b> Users should be able to create their own user profiles which enables the user to play the game with their created user profile and store the user data that corresponds with the user profile.		

<b>ID: F1.2</b>	<b>Requirement:</b> Storing user Profiles	<b>Priority:</b> High
<b>Description:</b> User profiles should be stored in User Data once the profile has been created as well as has been played with in the game.		

<b>ID: F1.3</b>	<b>Requirement:</b> Storing level statistics	<b>Priority:</b> High
<b>Description:</b> The game should store previous attempts and statistics of each level in the player's profile.		

<b>ID: F1.4</b>	<b>Requirement:</b> Player progress tracking	<b>Priority:</b> High
<b>Description:</b> The game must be able to track the user's progress of the Campaign mode through the user's profile data stored during run time.		

<b>ID: F1.5</b>	<b>Requirement:</b> Level Feedback	<b>Priority:</b> High
<b>Description:</b> The system should display a score summary screen after ending the level. The user must receive regular feedback to ensure they know that they are improving and becoming more experienced.		

<b>ID: F1.6</b>	<b>Requirement:</b> Storing custom levels	<b>Priority:</b> Medium
<b>Description:</b> Custom levels should be stored in a database. All data should be stored in an organised manner to allow for maximum efficiency.		

<b>ID: F1.7</b>	<b>Requirement:</b> Saving and loading progress	<b>Priority:</b> Core
<b>Description:</b> Users are able to save and load their progress throughout the Campaign mode.		

<b>ID: F1.8</b>	<b>Requirement:</b> Capability for multiple user profiles	<b>Priority:</b> High
<b>Description:</b> The database must be able to store at least 1 user profile. User profiles will be used to identify users. A user's data should store the usernames, game customisations, settings, high scores and statistics.		

<b>ID: F1.9</b>	<b>Requirement:</b> Autosaving player's progress	<b>Priority:</b> High
<b>Description:</b> The game will automatically save the player's progress after each level.		

## ***F2 User Interface***

<b>ID: F2.1</b>	<b>Requirement:</b> Interface Navigation with MIDI Keyboard	<b>Priority:</b> Medium/Low
<b>Description:</b> The user should be able to navigate through the interface of the game using the MIDI enabled keyboard.		

<b>ID: F2.2</b>	<b>Requirement:</b> Interface Navigation with Mouse and Keyboard	<b>Priority:</b> Core
<b>Description:</b> The user should be able to navigate through the interface of the game using a mouse and keyboard.		

## ***F3 Gameplay***

<b>ID: F3.1</b>	<b>Requirement:</b> MIDI Input Processing	<b>Priority:</b> Core
<b>Description:</b> The system must allow the player to use a MIDI keyboard to trigger game events.		

<b>ID: F3.2</b>	<b>Requirement:</b> Ship Customisation	<b>Priority:</b> Medium
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**Description:** The user should be able to customise their ship to their desire and would be able to use the customised ship in Campaign mode.

Customisation consists of both the visual representation of the ship and how it will affect the gameplay.

<b>ID: F3.3</b>	<b>Requirement:</b> Pausing/Suspending gameplay	<b>Priority:</b> Core
<b>Description:</b> The user should be able to pause the game.		

<b>ID: F3.4</b>	<b>Requirement:</b> Menu Navigation	<b>Priority:</b> Core
<b>Description:</b> The user should be able to navigate back through the menu.		

<b>ID: F3.5</b>	<b>Requirement:</b> Create Custom levels	<b>Priority:</b> Medium
<b>Description:</b> A player should be able to create custom levels by selecting topics they want to be tested as well specify what components to produce the level. There will be parameters in which to change the visual experience of the level.		

<b>ID: F3.6</b>	<b>Requirement:</b> Viewing and playing custom levels	<b>Priority:</b> Medium
<b>Description:</b> A user should be able to view and play all local and custom levels.		

<b>ID: F3.7</b>	<b>Requirement:</b> Gameplay without MIDI Keyboard	<b>Priority:</b> Low
<b>Description:</b> A user should be able to play the game with mouse and keyboard.		

<b>ID: F3.8</b>	<b>Requirement:</b> Gameplay with other instruments	<b>Priority:</b> Low
<b>Description:</b> A user should be able to play the game with other instruments.		

<b>ID: F3.9</b>	<b>Requirement:</b> Level based gameplay	<b>Priority:</b> Core
<b>Description:</b> A user should be able to play a level in the game successfully with a MIDI Keyboard.		

<b>ID: F3.10</b>	<b>Requirement:</b> Gameplay scoring	<b>Priority:</b> Core
<p><b>Description:</b> The game must assess how well the player is achieving the objective of the level.</p> <p>The objective of the level could be:</p> <ul style="list-style-type: none"> <li>● Demonstrating a particular musical concept.</li> <li>● Demonstrating a particular musical technique.</li> <li>● Demonstrating a particular examination component (as per AMEB syllabus)</li> </ul>		

<b>ID: F3.11</b>	<b>Requirement:</b> Core gameplay interactions	<b>Priority:</b> Core
<p><b>Description:</b> The game must be capable of at least the following:</p> <ul style="list-style-type: none"> <li>● Match each note based on: <ul style="list-style-type: none"> <li>○ Velocity</li> <li>○ Pitch</li> </ul> </li> <li>● Detect fluency of a series of notes</li> <li>● Detect accuracy of the notes played</li> <li>● Display the feedback through a visual representation when a note has been played and matched.</li> <li>● Display visual representations when the player successfully completes a level.</li> </ul>		

<b>ID: F3.12</b>	<b>Requirement:</b> Show Objective in text or Visually	<b>Priority:</b> Medium
<p><b>Description:</b> The game is to display the objective of a level either in text or as a visual representation.</p>		

<b>ID: F3.13</b>	<b>Requirement:</b> Display Instructions visually/in text	<b>Priority:</b> High
<p><b>Description:</b> The game must be display instructions on how to play the game either in text or as a visual representation.</p>		

<b>ID: F3.14</b>	<b>Requirement:</b> Voice instructions	<b>Priority:</b> Medium/ Low
<p><b>Description:</b> The game must have instructions that can be relayed to the player in audio.</p>		

<b>ID: F3.15</b>	<b>Requirement:</b> Additional gameplay interactions	<b>Priority:</b> Medium
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**Description:** The game must be capable of:

- Detecting expressive techniques such as tremolo (quickly repeating the same note in succession)
- Analysing performance details such as tempo (speed) differences between expected notes and input

#### ***F4 Online***

<b>ID: F4.1</b>	<b>Requirement:</b> Pairing local profiles with online accounts	<b>Priority:</b> Low
<b>Description:</b> Users should be able to set up an online account and pair their local profile to that account.		

<b>ID: F4.2</b>	<b>Requirement:</b> Uploading and Downloading custom levels via website	<b>Priority:</b> Low
<b>Description:</b> Users should be able to upload and download custom levels by the website.		

<b>ID: F4.3</b>	<b>Requirement:</b> Uploading and Downloading custom levels via game	<b>Priority:</b> Low
<b>Description:</b> Users should be able to upload and download custom levels in game.		

<b>ID: F4.4</b>	<b>Requirement:</b> Online Support	<b>Priority:</b> Low
<b>Description:</b> Users should be able to play online with friends as well as communicate and meet other players, share custom games online, share content and compare high scores.		

#### ***F5 Logging***

<b>ID: F5.1</b>	<b>Requirement:</b> Error Logging	<b>Priority:</b> Medium/ Low
<b>Description:</b> The game must store logs when an error has occurred during the run time of the game.		

## F6 Miscellaneous

<b>ID: F6.1</b>	<b>Requirement:</b> Mobile Support	<b>Priority:</b> Low
<b>Description:</b> A user is able to use some features of the game through a mobile device i.e. using a mobile device as a display for the game.		

<b>ID: F6.2</b>	<b>Requirement:</b> Achievements	<b>Priority:</b> Low
<b>Description:</b> The game should have achievements for the user to aim for and promote strong playability.		
There will be different tiers of achievements:		
<ul style="list-style-type: none"><li>• Basic: Includes completing a set of levels, completing all levels in campaign / Odyssey mode.</li><li>• Intermediate: Includes scoring higher than medium scores for all game modes and demonstrating techniques and expressional skills similar to AMEB Piano Grades 1-4.</li><li>• Advanced: Includes scoring higher than the highest scores for all game modes and demonstrating techniques and expressional skills similar to AMEB Piano Grades 5-8.</li></ul>		

<b>ID: F6.3</b>	<b>Requirement:</b> Built-in help/Glossary	<b>Priority:</b> Medium
<b>Description:</b> The game should possess a built-in help function or glossary that is extensible.		

<b>ID: F6.4</b>	<b>Requirement:</b> Teaching musical terminology	<b>Priority:</b> High
<b>Description:</b> The game must teach the player terminology that is used in music especially in sheet music.		

# Non Functional Requirements

<b>ID: N1</b>	<b>Requirement:</b> Saving data quickly	<b>Priority:</b> High
<b>Description:</b> Data should be saved in less than 3 seconds.		

<b>ID: N2</b>	<b>Requirement:</b> Query processing time	<b>Priority:</b> Medium
<b>Description:</b> The average processing time for queries must not take over 1 second.  A query could include: <ul style="list-style-type: none"><li>• Request for user data such as score and duration of time spent during a level and statistics of that level (eg. how well a particular concept was shown).</li><li>• Request for a particular asset such as a level described by the concept that it covers.</li></ul>		

<b>ID: N3</b>	<b>Requirement:</b> Loading and initialisation time	<b>Priority:</b> High
<b>Description:</b> The game must load all of its assets and ready for input at the main menu for the first time after installation in at least 15 seconds with no user data. The game must load all of its assets and ready for input at any other given time after first initialisation in at least 12 seconds.		

<b>ID: N4</b>	<b>Requirement:</b> Interface response time	<b>Priority:</b> Medium
<b>Description:</b> When a menu option is pressed, the acknowledgement of the input should be shown in less than 0.1 seconds.		

<b>ID: N5</b>	<b>Requirement:</b> Input processing time	<b>Priority:</b> Medium
<b>Description:</b> The acknowledgement and processing time of the input of the MIDI Keyboard should be less than 0.25 seconds.		

<b>ID: N6</b>	<b>Requirement:</b> Level loading	<b>Priority:</b> Medium
<b>Description:</b> The system must load a level within 15 seconds.		



<b>ID: N7</b>	<b>Requirement:</b> Compatibility	<b>Priority:</b> High
<b>Description:</b> The game must run and execute on at least Windows 7,8.1 and 10.		

<b>ID: N8</b>	<b>Requirement:</b> Additional Compatibility	<b>Priority:</b> Low
<b>Description:</b> The game must run and execute on Mac and Linux OS		

<b>ID: N9</b>	<b>Requirement:</b> Ease of use	<b>Priority:</b> High
<b>Description:</b> The interface of the game should have a high degree of usability, however this cannot be measured through quantitative analysis. Usability is often a subjective quality, which would mean that numerical data would be misleading. Qualitative analysis and interpretation of user feedback during testing is therefore required to determine if this requirement is met.		

<b>ID: N10</b>	<b>Requirement:</b> Look and feel	<b>Priority:</b> High
<b>Description:</b> Both the interface and gaming environment will be consistent across all areas of the game. The menu, controllers and game should feel familiar towards the user allowing for easy navigation and smooth gameplay.		