Four-part Writing Machine Requirements Document

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8. **Introduction**
   1. **Purpose of Document**

The purpose of this document is to describe the requirements needed to create a four-part harmony machine that checks if user has written their SATB melody correctly. Other non-functional requirements like UI design and constraints are described in this document.

* 1. **Intended Audience**

Intended audience for this document is mainly for the program creator and his advisor. When program is fully developed, this document may be edited and be intended for mainly musicians that are learning how to SATB and/or musicians who want to create melodies but forgot the rules.

* 1. **Project Scope/Description**

The scope of the project is to create a fully functional music notating program that will allow the user to create their very own SATB melody while in line with the harmony rules. Users should be able to access the software by downloading a repository from GitHub. The project will implement quarter notes, half notes, whole notes, any simple meter for rhythm. It will not implement compound meters. The project will allow users to select from a variety of chords, but no modern chords will be available for choosing. The project will aim to have no budget with everything being free open-source code that can be found online and visual studio to build.

* 1. **Project Goals**
* The project will allow the user to create up to eight measures worth of melodies in SATB form.
* The project will check if the user has any four-part rules broken.
* The project will check if the user has entered a roman numeral first, they must have the correct notes in that chord in the correct key signature.
* The project will check if the user has entered notes first, the roman numeral must be correct according to the notes.
* The project will check if the user has gone out of range for any parts.
* The user will be able to check their work when they have a melody in mind.
* The project should reduce stress for anyone using it to learn or to review rules of theory.

1. **Requirements Scope**
   1. **Functional Requirements**

Functional Requirements are the project’s requirements to function properly. These are essential features that must be implemented first before all other requirements. These are not limited to correct logic and non-faulty functionality. Without a functioning product, the product is a failure. These should carry a fit criterion that is measurable. Once the requirement is implemented, the solution should be tested and determine if it fits in that requirement.

* 1. **Non-Functional Requirements**

Non-Functional Requirements are properties of a project that must be implemented that make the project easier to use and efficient to use. These are not limited to performance and user friendliness. These functions are just as important as the functional requirements for the success of the project. As in functional requirements, fit criterion is needed because for non-functional requirements, the user should be able to mess with the interface in a certain number of minutes.

* 1. **Constraints**

Constraints are “roadblocks” that hinder the progress of the project. They are not limited to time, knowledge, research, and/or platform support. Knowledge and research are the biggest issues as the skill level of the student developing this project is classified as intermediate.

1. **Functional Requirements**
   1. **Drag notes based on time signature.**

* **Description:** Based on what the user picked for their time signature (no compound meter), logic will be used to not allow users to enter less than or more than the correct beats per measure. Attempting this will result in the user to not be able to compose a melody properly.
* **Rationale:** This requirement exists to promote simplicity and not overcomplicate the project and overwhelm the user.
* **Fit Criterion:** Musicians shall be able to compose a standard SATB melody.
  1. **Build chords based on key signature.**
* **Description:** The key signature will be the foundation of what the chords will be in the four-part harmony. The chord must be written based on the key signature that is selected.
* **Rationale:** Logic will be implemented to not allow non-related chords to be in key signatures. Requirement exists to create music that is suited for novice musicians to mid advanced.
* **Fit Criterion:** Musicians shall be able to determine what chords belong to a specific key.
  1. **Check if notes have gone out of range.**
* **Description:** Soprano, Alto, Tenor and Bass parts in four-part harmony have specific ranges. The user will not be able to go out of range when working on specific part of the harmony.
* **Rationale:** Musicians should already know that SATB have a certain range.
* **Fit Criterion:** The project will highlight the notes that have gone out of range.
  1. **Enter roman numerals based on chords built.**
* **Description:** When the user has built their chord, they must assign that chord a roman numeral of some sort. The roman numeral may be inverted. Logic will be used to check if the notes of the chords match the roman numeral of the key signature. It will also check for inversions as well. No applied chords allowed. Users should be able to click a checkbox that will allow automated roman numerals or enter roman numerals manually.
* **Rationale:** After musicians have composed their melody, they should be able to perform a roman numeral analysis.
* **Fit Criterion:** Time may vary on how quickly musicians accomplish this because of varying theory knowledge.
  1. **Highlight to users if they have incorrect chords based off key signature and/or roman numerals.**
* **Description:** If the users have notes in a chord that do not match the key signature and/or roman numeral they selected, the program will mark the wrong note and prompt the user to correct.
* **Rationale:** Requirement exists if the user wants to manually enter the roman numerals for practice for themselves.
* **Fit Criterion:** Once the roman numerals have been placed, the program will identify errors, then the user can correct the errors by recognizing and figuring out what the error is.
  1. **Correct users if they have incorrect roman numerals based on chords written.**
* **Description:** If the user has a correct chord, but incorrect roman numeral, the program will mark the roman numeral and prompt the user to correct it.
* **Rationale:** Requirement is present if the user wants to manually place roman numerals.
* **Fit Criterion:** Once roman numeral analysis is complete, musicians should immediately see their errors and correct them.
  1. **Correct users if they have any four-part harmony rules broken.**
* **Description:** If the user has any rules of four-part harmony broken (i.e., parallel fifths, octaves, leading tone etc.) , the program will mark the error made and prompt the user to correct it.
* **Rationale:** Requirement exists for the user to see the general rules of four-part writing. These rules must never be broken.
* **Fit Criterion:** Once the program has been run, the program shall display the errors and the user will be able to fix them.

1. **Non-Functional**
   1. **Personalization Requirements**

* **Description:** The project is using most of the personalization from Muse Score, which is the source of the project.
* **Rationale:** Requirement exists to allow users’ experience with the product to be top quality.
* **Fit Criterion:** The user will be able to customize from Muse Score’s library within 5 minutes of using Muse Score.
  1. **Learning Requirements**
* **Description:** The finished product should be easy to use. If the user is not familiar with music notation software, they can infer by hovering over the buttons they have.
* **Rationale:** Requirement exists to allow user to get familiar with the program.
* **Fit Criterion:** They can learn within 5 minutes of using the program.
  1. **Understandability Requirements**

* **Description:** The finished product will be a music notation device programmed for SATB form.
* **Rationale:** Requirement exists so that whoever uses it knows that it is a SATB writing device.
* **Fit Criterion:** Within 3 minutes of using this product, the user should realize it is a music notation device for SATB form.
  1. **Accessibility Requirements**
* **Description:** The user should be able to access this program with a modern computer. They need the programming platform to run this project as it will not be public.
* **Rationale:** Requirement exists to make it where the project is accessible to anyone who has the source code.
* **Fit Criterion:** Depending on their technological background, accessing this project may take 20-30 minutes.
  1. **Convenience Requirements**
* **Description:** If the user has the project on their own device, they should be able to access it without the presence of internet. They will also be able to write their melodies as soon as the project is launched.
* **Rationale:** Requirement exists because many users would like to just open the software package and start using it right away.
* **Fit Criterion:** Once users have downloaded/pulled the source code successfully, then can being working on their melodies within 5 minutes.
  1. **Performance Requirements**

* **Description:** The program must have efficient runtimes because a bad program that can timeout is bad for the user.
* **Rationale:** Requirement exists mainly for programmer because the way they implement it can affect the users. It also exists to encourage users to have a modern device that can handle programs.
* **Fit Criterion:** Once users have program installed, depending on their device, times will vary while running.
  1. **Release Requirements**

The project will be kept private and property of its creator and the institution. When the product is more developed, the project will be launched publicly.

1. **Interface Requirements**
   1. **Ease of Use Requirements**

* **Description:** The product should be easy to use to musicians without much technical experience because it is notating music on a device.
* **Rationale:** The learning curve should be low as it is a user-friendly program.
* **Fit Criterion:** The user should be able to start notating within their first 30 minutes of using the product.
  1. **Aesthetics Requirements**
* **Description:** The product should have the buttons for notes in one place, time signature in one place, etc.
* **Rationale:** By having an appealing interface, the user will navigate the notation software with ease. With quality aesthetics in the program, it should be very easy for the user to navigate the tool.
* **Fit Criterion:** The user should be able to navigate within 10 minutes of usage.

1. **Constraints**
   1. **Solution Constraints**

* **Description:** The solution of the project will take place in C++. However, not only C++ will be used, other factors like QT and JavaScript will play a role in compiling the project as one. Also, C++ logic can be difficult.
* **Rationale:** This requirement exists so that the programmer does not do anything extraneous or out of scope of he is trying to accomplish.
* **Fit Criterion:** When the programmer successfully starts, to implement the solution should take around 1 year.
  1. **Schedule Constraints**
* **Description:** The project timeline will take approximately 12-14 months in designing, building, and testing. The project designer may have other events occur during the 12-14 months. The designer is not uninterrupted during the time, so time must be managed well.
* **Rationale:** This requirement exists to keep track/focus for the programmer
* **Fit Criterion:** Depending on how his schedule is, some deliverables may take longer than others.
  1. **Platform Constraints**
* **Description:** The project will not be able to support mobile devices. It can only support laptop and desktop platforms that have the required applications and accounts to access the source code of the project. Mobile support may be designed in the future.
* **Rationale:** This requirement exists so that the programmer does not get carried away during the limited time to complete this project.
* **Fit Criterion:** Upwards of an extra year may be required to create mobile support.
  1. **Extension Constraints**
* **Description:** As mentioned above, the four-part notation project will not include compound meter, applied chords, and non-related chords based on key signature.
* **Rationale:** This requirement exists so if the programmer does have extra time, he can implement them as bonus features.
* **Fit Criterion:** The extra extensions will take upwards of 3 extra months.

1. **Pending Approval**

This document is written in partial fulfillment of CSCI 497, Senior Project Design and is a prerequisite for CSCI 498, Senior Project Construction.

Approval of this document is pending. Once corrections to this document are made, this section will be approved to being construction of project. Changes will be made if necessary.