CS310: Computer Science Project

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Project Specification

An interactive web-application for music notation

Abstract

This document is the initial specification for the, currently nameless, interactive web-application intended to allow musicians to easily create and edit sheet-music. The background of the problem and the problem itself are presented here along with a list of aims and technical objectives, as they are currently understood. Furthermore, a provisional timetable of the entire period of software-development is proposed and relevent legal, social, ethical and professional issues are considered.

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1 Problem

1.1 Background

It is useful for musicians to create and edit sheet-music digitally, rather than with pen and paper, for exactly the same reasons as it is for writers and other designers. It makes the modifying, storing, expanding, sharing and copying of created work simple and quick to perform, to name but a few advantages. Historically, however, there have been various obstacles musicians have had to face when considering this option. For instance, most of the software currently available is expensive for the average user, with prices for some of the most powerful applications reaching as high as five or six hundred pounds and, although there are cheaper alternatives out there, they frequently offer deliberately less functionality.

All of this is acceptable for businesses or educational organisations (to whom the majority of the commercial applications are aimed at) but there are few options left for individual musicians who cannot justify spending so much money. There is a scarcity of free (even open-source) software that can offer an equivalently easy-to-use user-interface as some of the commercial software. A web-application that focusses on being easy to use, intuitively interactive and free will present individual users with a solution that allows them to perform simple score creation and modification for free, from nearly any computer in the world instantly.

1.2 Aim

To develop a web-application to allow musicians to easily and intuitively create and edit their own sheet-music online. It is important for this problem for the focus to be on the user-experience, which is to be as simple and intuitive as possible.

Core Features The system will aim to contain the following features:

1) User Accounts: Used by the system to store, and protect, the scores created by a user. Everything a user does with the system will be in the context of their user-account.

2) Musical score creation / modification: Including tools designed to make it easier (and less tedious) to manipulate sheet music

   - Group-selection of notes, allowing the user to apply the same modification to more than one note at a time.
   - Cutting, copying and pasting notes
   - Transposing notes

   Frequent backups should also be taken on the server so that, when the internet connection fails, the user can rely on there being a recent version of their work available when they next log in.

3) A basic number of notations supported:

   - All common note and rest types, positions and combinations (i.e. chords, ties)
   - All usual time and key signatures and cleffs
   - A selection of other ornaments usual in piano-arrangements

4) Musical score management: Allowing the user to

   - Create copies of scores associated with their account
   - Delete scores associated with their account
   - Download their scores from the server
   - Upload scores to the server

5) Printing: The ability for the user to print off their scores at their computer.

Optional Features If time allows, these are features which could also be implemented in the system:

1) A greater number of symbols supported
2) Lyrics supported in scores
3) Simple audio playback: Allowing the user to listen to an automatically generated performance of their score (near) instantly
4) More complex audio playback: More features could be implemented in the audio playback as time allows, such as:

   - Increasing the number of instruments available in the generated sound file.
   - Simulating a more realistic, flexable rhythm which attempts to sound more like a human performance.

5) A variety of notation styles: The user is given a variety of graphical styles to view and print their score in. Similar to the choice of font in word processing.
6) Enable the system to generate (and output) musical score files in a variety of formats (perhaps for use with other software)

1.3 Objectives

Following is a list of measurable tasks that need to be completed in order to complete the project. Most notable is the partitioning of the system into two sections: the server-side and the client-side. Although the two need to be fully compatable, they may be developed seperately.

1. Complete further analysis and research
2. Design system
3. Implement system
4. Make system available online
5. Test system (including usability tests)
6. Redesign, reimplement and retest system where required
7. Design and implement optional features in turn, as time allows

2 Methods

The work on this project is going to take place in several iterations. The first iteration shall contain the full analysis, design, implementation and testing for a complete system that encorporates all of the core features. Once that has been completed, a further iteration will take place for each optional feature that is added to the system. The choice of what optional feature to add next will be made towards the end of an iteration, and will depend on how many working hours are available before the project deadline.

2.1 Main Iteration

This iteration completely implements the core system. It is made up of several phases of development which need to be completed in order as later phases depend on the successful completion of earlier phases.

Phase 1 Analysis phase

1. Further analysis
   (a) Requirements analysis of core features: A document will be produced that details, without ambiguity, everything that the system will be expected to be able to do as far as core features are concerned.
   (b) Use-case analysis: Use-cases will be created to clarify exactly how the system should be responding from the point of view of each user
2. Research and decide on the development tool(s): Consider various ways of developing a solution to this problem and decide what will be used in this case.
3. Familiarise self with the chosen development tool(s): Spend some time researching the development tool(s) chosen.
4. Research graphics requirements: It has to be decided whether the graphics needed for the project have already been created and made available by someone else or whether they need to be drawn as part of this project

Phase 2 Design phase

1. Design client-side score editor
2. Design server-side software
3. Design test cases
4. Obtain/Create graphics: Following the decision made in the previous phase
5. Finalise structure of Final Report

Phase 3 Implementation

1. Code client-side score editor
2. Code server-side software

Phase 4 Testing

1. Perform test cases on system
2. Perform usability testing on system
3. Determine what bugs need fixing
4. Determine what needs changing about the design of the system

Phase 5 Refactoring

1. Implement and retest bug fixes determined in previous phase
2. Design, implement and test system changes determined in previous phase

2.2 Further Iterations

For each optional feature decided to be added to the system a new iteration will be initiated commencing of the following phases:

Phase 1 Research and Design phase

1. Research solutions to new problem (e.g. data structures and algorithms needed)
2. Analyse exact requirements of new feature
3. Design feature
4. Design new test cases for the increased functionality of the system

Phase 2 Implementation of new feature

Phase 3 Testing phase

1. Perform test cases on system
2. Fix bugs

These iterations will be largely untimetabled and will be attempted in accordance with the amount of time left available as the project progresses

3 Project Timeline

	Time Period	**Expected Stage of Development**
Term 1	Weeks 1-2	Project Specfication
Deadline	**Thursday Week 2**	**Project Specification submitted**
		Begin Main Iteration
	Weeks 3-4	Phase 1: Analysis
	Weeks 5-8	Phase 2: Design
	Week 9	Work on Progress Report
Deadline	**Monday Week 10**	**Progress Report submitted**
	Week 10 and over Christmas	Phase 3: Implementation
Term 2	Weeks 1-5	Continue Implementation
	Weeks 6-9	Phase 4: Testing
	Weeks 7-9	Prepare presentation
Over Easter		Phase 5: Refactoring
		Optional Iterations (as time allows)
		Work on final report
Term 3	Weeks 1-2	Work on final report
Deadline	**Thursday Week 2**	**Final Report submitted**

4 Resources

Hardware I will be using my own computer throughout the project life to develop all the code and development. A server that is compatible with my system will also need to be found if it is to be available on the internet. No further hardware will be needed.

Version Control Throughout the development process I will be using version control software to help manage the code and documentation. The repository will be located on a server seperate to the computer(s) I will be working on. This will allow me to quickly keep track of changes and to revert back to previous versions in the event of unexpected failures.

Backups Backups of the repository will be made to a removable storage medium regularly, so that a recent version may be restored in the case the server holding the repository fails irreparably. The server itself will take regular backups of itself so it should be reliable.

5 Legal, Social, Ethical and Professional Issues

Data protection At some point the system may be required to store personal information about a user and, if this happens, care will need to be taken to ensure the data protection act is adhered to. The system should obtain the user's permission to store personal data and it should not keep data that is not relavent. It should also promptly delete records as they become irrelevant.

Intellectual copyright The system will be storing original user creations and, as such, the users will own the intellectual copyright over what is stored. In order to be in keeping with the law, the system will have to make the user aware that they own what they create and they are allowing it to be stored on an external server. Appropriate terms and conditions should be agreed to by the user when they register for the website and reasonable measures will have to be taken to keep users' creations secure from unauthorised access.

Deliberate illegal actions by the user It may be possible for a user to use the system to break the law by recreating scores that are too similar to already copyright music. Although it is not the responsibility of the system to police this activity, it would be prudent to include a clause in the terms and conditions advising users not to use the system to break the law in any way and informing them that, in the event of a police investigation, the data held on the server would not be witheld from the authorities.