

Lab 2 - Crossfade SRS Document Sections 1 and 2
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1. Introduction

1.1 Purpose

The purpose of this product specification document is to clearly define the features, functionalities, user requirements, and goals of the CrossFade application.

1.2 Scope

CrossFade shall alleviate the need for specialized tools and knowledge required to create sheet music or correct errors in automatically generated sheet music. CrossFade aims to assist individuals who are just entering the music field, while also increasing the speed at which more experienced individuals can correct common errors in sheet music.

1.3 Definitions, Acronyms, and Abbreviations

Convolutional Neural Network (CNN) - Deep learning algorithm that differentiates one image from another by assigning weights and biases to different aspects of the images. It is used in audio to differentiate different frequencies in a visual format.

Deep Learning - Subfield of machine learning which uses neural networks to solve complex problems. Learning comes directly from the data, instead of being hand-engineered by humans.

Keyboard - An electronic piano used to produce sound and MIDI information.

Monophony - A phrase of music in which only a single voice is played at a time.

Musical Instrument Digital Interface (MIDI) - A communications protocol used to connect physical and virtual music devices and instruments. MIDI files store note information which can be used to trigger instruments and devices.

MusicXML - A markup language format used to interchange and distribute digital sheet music.

Polyphony - A phrase of music in which more than a single voice is played at a time.

1.4 References

- Automatic Music Transcription and Ethnomusicology: A user study. (n.d.). Retrieved from <https://diva-portal.org/smash/get/diva2:1474663/FULLTEXT01.pdf>
- H. Takeda, T. Nishimoto and S. Sagayama, "Rhythm and Tempo Analysis Toward Automatic Music Transcription," 2007 IEEE International Conference on Acoustics, Speech and Signal Processing - ICASSP '07, Honolulu, HI, USA, 2007, pp. IV-1317-IV-1320, doi: 10.1109/ICASSP.2007.367320.
- Huang, Z., Jia, X., & Guo, Y. (2019, June 29). State-of-the-art model for music object recognition with Deep Learning. MDPI. Retrieved February 8, 2023, from <https://www.mdpi.com/2076-3417/9/13/2645>
- Jovanovic, J. (2015, February 2). How does Shazam work? music recognition algorithms, fingerprinting, and processing: Toptal®. Toptal Engineering Blog. Retrieved February 8, 2023, from <https://www.toptal.com/algorithms/shazam-it-music-processing-fingerprinting-and-recognition>
- Scarlato, L. L. (n.d.). Continuous media. Audio. Retrieved March 1, 2023, from <https://www3.cs.stonybrook.edu/~lori/classes/GUI/sound.htm>
- Solanki, A., & Pandey, S. (2019, January 30). Music instrument recognition using deep convolutional neural networks - International Journal of Information Technology. SpringerLink. Retrieved February 8, 2023, from <https://link.springer.com/article/10.1007/s41870-019-00285-y>
- Team Crystal. (2023, September 11). Lab 1 - CrossFade Product Description. Retrieved November 13, 2023 from <https://docs.google.com/document/d/1KBALA-nbNBSouQwCyfNUnTsXNXIrlHofMnIV8-SBhPg/edit>
- Zhang, X. (2022, March 11). Aided recognition and training of music features based on the internet of things and Artificial Intelligence. Computational intelligence and neuroscience. Retrieved February 8, 2023, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8933112/>

1.5 Overview

This product specification provides an overview of the necessary software and hardware elements CrossFade will utilize, a list of the key features of CrossFade, the various users CrossFade is intended for, the intended use, and any assumptions and dependencies CrossFade will utilize.

2 Overall Description

2.1 Product Perspective

CrossFade is composed of the following major components:

- Audio parsing and interpreting libraries: allows for the dissection of notes from audio input to be transcribed.
- Database instrument samples: provides training for the artificial intelligence algorithms used to determine which instruments are being played.
- MusicXML support: allows for translation to and from a format commonly used to portray musical information.
- State-of-the-Art Artificial Intelligence: provides the ability to determine instruments being played and make adjustments to music to prevent common errors that may occur during transcription or translation processes if other software is used.

2.2 Product Functions

The major functions of CrossFade include the following:

- The ability to transcribe music from a passed MIDI file
- The ability to transcribe music from a passed audio input
- The ability to determine if there are errors present in a MusicXML file that has been automatically transcribed by a third-party software
- The ability to review the identified errors and make corrections as needed

2.3 User Characteristics

CrossFade is designed for the use of the following individuals:

- Composers: individuals creating music to share or provide with another party.
- Musicians: individuals playing music who wish to share creations or interpretations of different musical selections.
- Music Educators: individuals who wish to assign tasks to students regarding musical creation or sharing.
- Independent Creators: individuals who wish to create and share music who may have little knowledge or experience regarding musical notation or composition.

2.4 Constraints

N/A

2.5 Assumptions and Dependencies

N/A