Bilkent University

Department of Computer Engineering

Senior Design Project

Rythmus

Project Specifications Report

Berk Baltacı, Cihan Can Kılıç, Kerem Tayhan,Emir Yavuz

Supervisor: Fazlı Can

Jury Members: Erhan Dolak, Tağmaç Topal

1. Introduction

As the world starts to recognize the horsepower behind A.I. and machine learning, a way to integrate it with music has been on the mind of many programmers and musicians. Musicians and music enthusiasts can use our tool Rythmus to create melodies and variations. This report aims to detail our project and the ways we will aim to achieve our goal.

1.1 Description

Rhytmus will be fed large quantities of MIDI data of certain artists and thus offer a way to recreate variations of the input data while allowing the manipulation of certain attributes of the desired piece such as the key of the piece, the used scales, the tone of the piece, etc… The project will work on two stages

1.1.1 The Analysis Stage

The program will first process heaps of data presented as MIDI. So the actual first step will be collecting large quantities of MIDI data and storing them in a database. It will, in turn, start to look for common patterns in the piece such as the chords used, if the chords are used as arpeggios, and if so in which way the arpeggios are used. The program should also be able to isolate the instruments used and single them out. By doing this over perhaps all of the pieces of the composer, our tool will start to recognize the musical patterns of the artist.

1.1.2 The Recreation Stage

The program, after having analyzed large quantities of the said data and after having recognized the composing patterns of the artist will now be able to recreate a variation of the pieces of the artist. Let's say that a composer has written a piece and requires a certain melody in a certain BPM, in a certain Time Signature, in a certain Key, and in a certain Scale to finish their piece. The composer, while using Rythmus will be able to pick these attributes manually in order to create a melody that will fit their piece in general. Rythmus will not be used as a way to replace composers but rather as a tool that composers can use.

1.2 Constraints

1.2.1 Economic Constraints

- If the program uses a high amount of database, it needs a database program
- The programming part does not need any cost because the programming tools license is free for the students.
- The users do not need to pay for the program because it will be free to use

1.2.2 Environmental Constraints

- The program will be a web application therefore if the user has any internet source he or she can use the program.

1.2.3 Social Constraints

- The user can create the music therefore, the program should be easy to use.

1.2.4 Political Constraints

- The program does not include any political issues.
- The program also does not have any discrimination when choosing the music

1.2.5 Ethical Constraints

- The application will not use a microphone or camera therefore, it will not need any ethical issues for the user.
- The program uses music composition and can have a copyright issue if the music company has the copyright of the composition.

1.2.6 Health and Safety Constraints

- The music program can be helpful for a person's mental health because music makes people feel better. [1]

1.2.7 Manufacturability Constraints

- The program will be a web application.
- The program will need some payment for the compositions if the music company has a copyright on that music.
- There should be a wide range of music databases.

1.2.8 Sustainability Constraints

- The program will be used without any maintenance, however, when a new style of music is added to the global market the database of the program needs to be changed.

1.3 Professional and Ethical Issues

There are several concerns regarding professional and ethical issues involving the development of Rythmus.

The main concern of developing Rythmus is the fact that it can seem as an alternative to composers. This is not the case with Rythmus as it is rather of a tool for composers than an option instead of composers. However, the app also includes a copyright risk between the originated rhythm and the new rhythm. The artist of the originated rhythm will have the right to copyright the new rhythm.

2. Requirements

2.1 Functional Requirements

- The user should be able to upload lots of MIDI data.
- The user should be able to convert audio files into MIDI data
- The user should be able to feed data that is viable to be converted to MIDI
- The user should have access to a keyboard. (not necessarily a MIDI keyboard)
- The user should be able to sign in to their account

2.2 Non-functional Requirements

2.2.1 Usability

- UI and UX should be user-friendly in terms of simplicity.
- Users shouldn’t need any technical knowledge about music theory.

2.2.2 Scalability

- Servers should be able to handle large amounts of data transactions and the application should handle the situation well in terms of UX when there are more transactions than the servers can handle.

2.2.3 Speed and Compatibility

- The application shouldn’t keep the user waiting for too long while communicating with the databases or running the algorithms which would cause serious harm to the UX.
- Also, the application should keep its speed above a certain level for devices that don't have high-performance hardware.

2.2.4 Maintainability and Availability

- The application should be designed in a way that it’s easy to maintain and update and the software should be documented well so that the availability time doesn’t suffer much from maintenance.

2.2.5 Reliability

- Any failure or bug shouldn’t cause data corruption for either side of the application which is the user and server.
- The application should provide the expected outputs without getting affected by the device’s hardware, internet connection speed, etc.

- The application shouldn’t kill itself when it encounters a failure. Instead, it should inform the user and keep running.

3. References

1. Psychologies, “The science behind why Music makes us feel good,” *Psychologies*, 18-Mar-2022. [Online]. Available: https://www.psychologies.co.uk/music-makes-you-feel-better/. [Accessed: 17-Oct-2022].