

CS30700

Team 10: Product Backlog

Project Title: Rhythm

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Problem Statement:

Converting handwritten music sheets into a digital format that can be easily tested, customized, and shared with others is not an easily completable task. In order to facilitate this tedious task that may takes hours to complete, in comes Rhythm, Rhythm allows any music writer, new or seasoned, to be able to take a picture of music sheet, which will be automatically loaded and parsed into a digital music sheet. These sheets will open for easy customization, including changing and adding notes, in addition to previewing the music by playing the selected sheet with a selected instrument. While there are applications such as PlayScore that allow users to take an image of their scores and play the music, those applications do not allow users to convert handwritten music to a digital version nor do they allow users to edit the notes after upload.

Background Info:

Audience

Music writing is an ubiquitous task that has existed for a multiple of years. However, there are many nuances while writing music. Many music writers, new or accustomed, sometimes struggle with easily testing, customizing, and sharing their music due to the myriad number of steps. It is quite surprising that despite the huge target audience with anyone interested in music composition, existing options do not provide all the features to enhance the process of creating, composing, and editing music.

Similar Platforms

There are several existing technologies that allow users to take images of already composed music notes and automatically play them. For instance, PlayScore allows users to take an image of their printed scores to play the music; however, technologies such as these do not allow users to take pictures of handwritten compositions and convert them into digital formats. There are other applications such as GarageBand that allow users to choose instruments, play music, and create live music with those instruments; however, GarageBand does not allow users to enter notes to automatically play compositions.

Limitations

While many of these existing platforms are useful, some of their main limitations is that they do not allow users to take images of handwritten notes to convert to digital formats, nor do allow users to edit their compositions after they have been saved and play them at later times. There is not an application that is able to integrate all the steps of writing music. Our goal is to make a application that is intuitive, so that users will immediately be able to create, edit, and play compositions, all with one application. We want to create an application that combines many services that would ease the process of creating, editing, playing, and sharing music.

Functional Requirements:

New User Class

1. As a user, I would like to register my account using my email so that I would be able to save my information and recover my account later if needed
2. As a user, I would like to be able to edit my profile name/email so that I can make changes to my profile whenever I want
3. As a user, I would like an account recovery option by email so that I would be able to retain my account

Picture Taking Class

4. As a user, I would like to take pictures of sheet music using my phone camera, and have the image converted to a digital music sheet
5. As a user, I would like to be able to select pictures from my camera roll so that it can be converted into a digital version

Picture Conversion Class

6. As a user, I would like to convert my handwritten sheet music to a digital version through selection from my camera roll or taking pictures so that I can have a digital version

Editor Class

7. As a user, I would like to be able to view music sheets in their full digital format
8. As a user, I would like to be able to view compositions and their contents
9. As a user, I would like to be able to create compositions so that I add music to them later on
10. As a user, I would like to be able to delete compositions if I don't want them anymore
11. As a user, I would like to be able to delete music sheets from a composition if I find that the music sheets are not relevant to that composition
12. As a user, I would like to be able to name compositions for easy organization into libraries
13. As a user, I would like to be able to name music sheets for easy organization and classification
14. As a user, I would like to be able to add music sheets to compositions so that I can expand the compositions for multiple instruments
15. As a user, I would like to be able to remove music sheets from compositions to reduce the size of the compositions
16. As a user, I would like to be able to copy music sheets to the same or other compositions so that I can do more exploration with my music
17. As a user, I would like to be able to mark compositions as a duplicate to make it easy to classify duplicate compositions
18. As a user, I would like to be able to edit music sheets on the digital version for easy viewing and sharing rather than re-uploading music sheets

19. As a user, I would like to be able to add notes to music sheets and have them saved to look at later
20. As a user, I would like to be able to remove notes from music sheets to trim and edit the music
21. As a user, I would like to be able to move notes within a music sheets for easy editing and fine-tuning
22. As a user, I would like to be able to select an instrument for a single music sheet, so that instrument will be played when the music sheet is run
23. As a user, I would like to be able to play a single music sheet, so that I can be able to hear and edit my music for later purposes
24. As a user, I would like to play all music sheets in a single composition so that I know how all the music in the composition sounds

Social Class

25. As a user, I would like to be able to add other users as friends so that I would be able to share my music with them*
26. As a user, I would like to be able to remove users as friends*
27. As a user, I would like to be able to share my music sheets with friends so that they would also be able to enjoy them*
28. As a user, I would like to be able to share my compositions with friends so that they would be able to listen to the whole composition*
29. As a user's friend, I would like to be able to view my friend's compositions so that I would be able to give them constructive feedback
30. As a user's friend, I would like to be able to comment on my friend's compositions so that I would be able to provide them with constructive feedback*
31. As a user, I would like to be able to upvote, or downvote, comments*
32. As a user, I would like to be able to delete my own comments*

Export Class

33. As a user, I would like to be able to send music sheets as pdfs to my email, allowing me to print out my creations
34. As a user, I would like to be able to send entire compositions as pdfs to my email, for easy printing
35. As a user, I would like to be able to set the publicity of my compositions (public, private) to determine who can view my compositions*
36. As a user, I would like to be able to export music sheets as mp3s, so I can play my songs anywhere*
37. As a user, I would like to be able to export compositions as mp3s, so I can play my song compositions anywhere*

* (if time allows)

Non-Functional Requirements

Architecture and Performance

The front-end of the application will be developed using the React Native framework with Javascript. This will allow us to easily export our app to either iOS or Android. We are going to attach Redux to the front-end to make it simple for developers to access and change states of the app. We plan to use Flask for our back-end because it is easy to learn and extend. It also provides an out-of-the-box fast debugging tool which we can utilize. The Flask back-end will connect to our database that will be accessed using MySQL to save information, such as their registration information, compositions, and music sheets. We will also have a machine learning based image classification system for converting handwritten sheet music to digital sheet music using Python and machine learning frameworks and libraries, including Keras and Tensorflow. We will be separating our front-end and back-end. Separating the front-end and the back-end is an easily feasible task that will allow us to expand to other platforms in the future (web application). We are planning to use Jest for testing for React Native. We plan to use PyTests to create automated unit tests to ensure individual method functionality. To increase performance, we will run the conversion from music sheet to music on the back-end, alleviating the phone running our app from having large tasks. We would like to respond quickly, but depending on the music sheet and composition size, it may take longer to process and send the data.

Security

Security is important for Rhythm, since we will be saving user data. We will filter out requests in the back-end from the front-end to ensure we do not send any unwanted SQL requests. We will check response headers to ensure that proper authentication is provided from the front-end. We will provide Authentication keys that will be sent from the front-end to the back-end to validate the requests are coming from the react native app.

Usability

Our app will have a clean and intuitive interface, that will allow even new users to quickly pick actions and possibilities that they have at their disposal. We have a large number of customization features, so it is critical that we have an easy to understand interface to prevent users from getting overwhelmed. Luckily, many of the music sheet and composition options will be similar, limiting the number of new tools a user has to understand.

Hosting and Deployment

Since the front-end and the back-end are disjoint we can easily separate the deployment of them. The front-end of our application will be available for download on Github

Pages. The back-end will be deployed using AWS EC2 instance because it is an easy and secure hosting service. Because we are using AWS, our servers can be deployed 24/7, for a low cost.