

BeClappy Software Design Document (SDD)



BeClappy

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Overview

The objective of “BeClappy” is to provide an easy and fun way for kids to practice rhythms and track their progress. Kids often practice rhythms by listening to a physical instructor, then the kids often execute that rhythm back to the instructor, often done through clapping. It’s an effective way to keep kids engaged, learn a new skill to aid in music instruction, and practice mnemonics for memory retention. By creating a software application, we can improve upon this method of learning rhythm by incorporating features to detect accuracy and track progress, while also providing a way for children to practice on their own.

Problem

It is difficult for children to learn their musical lessons through a traditional paper book. It is frustrating, uninteresting, and not customizable. There is a need for an interactive educational application that allows you to learn rhythms that is more entertaining than reading a rhythm book. We aim to solve this problem by making music lessons and practice enjoyable and efficient for child learners, their parents, and instructors with the BeClappy application.

Solution

The BeClappy application is an interactive educational application that allows you to learn rhythms, customize them, and track your progress. Through this easily downloadable application, users can tap to “clap” mnemonic phrases already in the application, add their own rhythms, and save their progress. These mnemonic phrases are proven to help with faster learning, and longer memory retention. The practice mode allows users practice as many times

as desired to perfect the accuracy of the selected rhythms. To promote competition and challenge the student, the challenge mode allows users to earn rewards based on their increased accuracy on longer versions of the rhythms and progress to master more difficult rhythms. Feedback is provided throughout use of the application and allows parents and instructors an accurate pulse to see the child's progress and assist in their success. "BeClappy" is sure to easily clap connections between music, rhythm, education, fun, and families for musical success.

Implementation

Storage of Rhythms

- Enum Note {WHOLE, HALF, QUARTER, EIGHTH, SIXTEENTH} is globally accessible
- Specific rhythms are stored as a List of Notes. The storage of rhythms are such that they are exactly one measure long in a 4/4 time signature.

Accuracy Feedback

BeClappy provides feedback for each individual clap, as well as for the user's attempt at the rhythm as a whole, by comparing timestamps of claps to the expected times.

First, an array of expected clap times is generated by converting the rhythm (stored as Notes) to doubles that represent a time offset. Conversion is done using the set tempo and a map of Notes to their relative duration. For example, if the rhythm is Quarter, Eighth, Eighth, Quarter, Eighth, Eighth and the bpm = 60, then ExpectedClapTimes = [0, 1, 1.5, 2, 3, 3.5].

When the user is in play mode, the first detected clap is considered to be at time 0, and each clap following has a time relative to the first clap. The time of the detected clap is compared to that of the nearest *unattempted* (unrated) expected clap (determined through a binary search on ExpectedClapTimes). A rating is then assigned based on the criteria described below.

For individual claps, possible ratings are represented as an Enum with values of {AWESOME, GREAT, GOOD, EARLY, LATE, and MISSED}.

Individual Clap Ratings are determined as follows:

If $|clapTime - expectedTime| \leq 0.1 \Rightarrow$ AWESOME

If $|clapTime - expectedTime| \leq 0.2 \Rightarrow$ GREAT

If $|clapTime - expectedTime| \leq 0.3 \Rightarrow$ GOOD

If $clapTime < expectedTime - 0.3 \Rightarrow$ EARLY

If $clapTime > expectedTime + 0.3 \Rightarrow$ LATE

If no clap attempt detected or both neighboring expected claps already attempted \Rightarrow MISSED

For feedback on entire rhythms, the following criteria is used: If all notes were clapped within +/- 0.1 seconds of expected time, feedback is AWESOME; if all notes were clapped within +/- 0.2, feedback is GREAT; all within +/- 0.3, feedback is GOOD, TRY AGAIN otherwise. Essentially, the lowest rating from the individual ratings is the result for the entire rhythm. Average is not used to avoid accidentally rewarding for the wrong rhythm. For example, perfectly clapping QEEQEE when expected rhythm is EEQEEQ, 4 of the claps would line up with expected clap times - awarding 4 'AWESOME' for timing 4 claps correctly and 2 'LATE' for the second and fifth claps. However this rhythm is not a match of the other rhythm - something an average would not detect - taking an average would result in 'GREAT'. Thus, lowest individual rating is used.

Stars are then awarded as followed:

AWESOME -> 3

GREAT -> 2

GOOD -> 1

TRY AGAIN -> 0

Instructions

Rhythm Selection/View Progress

1. Select rhythm (displayed using its mnemonic name) by clicking on it on the rhythm map
2. View progress by seeing number of stars lit up next to each rhythm (mnemonic name)

Practice Mode

1. Select a desired rhythm to be practiced
2. Listen to the rhythm and view on the screen as circles or notes
3. Tap the rhythm heard/seen
4. Receive accuracy feedback on each attempted note, as well as feedback on the whole rhythm
5. Repeat and practice as many times as you like or select a different rhythm to practice

Challenge Mode

1. Select a desired rhythm to perform
2. Listen to a longer, repeated version of the rhythm and view on the screen as circles or notes
3. Tap the rhythm heard/seen, repeated for multiple measures
4. Receive accuracy feedback on each attempted note, as well as feedback on the whole rhythm
5. Receive stars based on the overall rating, and view high score for each rhythm on the map
6. Repeat as many times as you like or select a different rhythm

Customization

1. Select the gear icon on any page to be taken to the settings page
2. While in the settings page
 - a. Adjust the volume
 - b. Add Rhythm
3. Add Rhythm
 - a. Type the name of the mnemonic phrase in the text box at the top of the screen labeled “Add mnemonic phrase”
 - b. Tap the desired rhythm on the screen and press “Done”
 - c. View a visual representation of the detected rhythm. If it is not the desired rhythm, repeat step b
 - d. Click the “Save button”
 - e. Return to the Settings page

Source Code and Documentation

Source code: <https://github.com/jkunzmann41/BeClappy>

Documentation: <https://you.stonybrook.edu/323beclappy/>