

Melody Changing Interfaces for Melodic Morphing

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Abstract. We have developed several applications based on the Generative Theory of Tonal Music utilizing the melodic morphing method. Since multiple melodies generated by the morphing method have similar musical structures, the global structure of the melodies does not change when a portion of one melody time axis is replaced by another. When developing the apps, we used dial-based and grid-based interfaces for switching melodies. In this paper, we present the results of a comparison of the two interfaces conducted with 30 users.

Keywords: Melody switching interface, Melodic morphing method, Generative Theory of Tonal Music (GTTM), Dial-type interface, Grid-type interface

1 Introduction

We have developed several applications using a melodic morphing method based on the Generative Theory of Tonal Music (GTTM) [1, 2]. In the GTTM, a time-span tree is a binary tree in which each branch is connected to each note (Fig. 1). The branches of a time-span tree are connected closer to the root than those connected to structurally important notes.

The main advantage of time-span trees is that they can be used to reduce notes. Specifically, reduced melodies can be extracted by cutting a time-span tree with a horizontal line and omitting the notes connected below the line. In melody reduction with GTTM, these notes are essentially absorbed by structurally more important ones.

We previously proposed a melody-morphing method that applies this reduction (Fig. 2) to generate a melody that is structurally intermediate between two input melodies[3, 4]. This is done by combining two melodies after executing the reduction on their respective time-span trees.

Since multiple melodies generated by the morphing method have similar musical structures, the global structure of the melodies does not change when a portion of one melody time axis is replaced by another. When developing apps with the melodic morphing method, we used dial-based and grid-based interfaces for switching melodies. In this work, we present the results of a comparison of the two interfaces conducted with 30 users.



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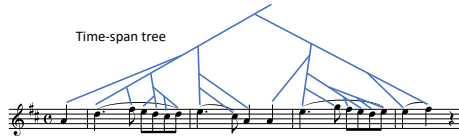


Fig. 1. Time-span tree.

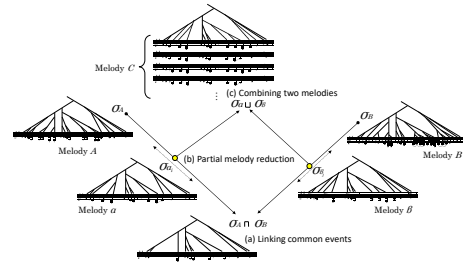


Fig. 2. Melodic morphing method.

2 Applications for Melodic Morphing Method

ShakeGuitar The ShakeGuitar (Fig. 3(a)) and ShakeGuitarHD (Fig. 3(b)) apps change the morphing level according to the speed at which the iPhone or iPad is shaken [5]. For the morphing input, we utilize the basic melody of “The Other Day I Met a Bear” and the melody of a guitar solo played with the same chord progression. The unique feature here is that not only interpolation of the two melodies but also extrapolation is performed [6]. With the extrapolation, we can generate an intense guitar solo with more notes than the original. When the iPhone is held stationary, a basic melody is played, and the faster the iPhone is shaken, the more intense the melody becomes.

ShakeGuitar and ShakeGuitarHD both feature a grid mode with time on the vertical axis and morphing level on the horizontal axis. The morphing level can be changed by touching the grid. In ShakeGuitarHD, the guitar is animated to swing up and down, and the width of the swing changes according to the morphing level. The morphing level also changes depending on how fast you swipe your finger up and down on the swinging guitar.

Melody Slot Machine We developed the Melody Slot Machine, a research demonstration device, to promote the melodic morphing method. With this application, the performer’s movements can be viewed on a Pepper’s ghost display (Fig. 4(a)). Melody segments are displayed on a dial, and the melody to be played can be switched by rotating the dial (Fig. 4(b)). We exhibited the Melody Slot Machine at an international conference shortly after it was developed, but the COVID-19 pandemic made it difficult to conduct further demonstrations in person [7–9]. We therefore adapted the Melody Slot Machine for the iPhone so that people could experience it simply by downloading the app.

Melody Slot Machine for iPhone Figure 5 shows a screenshot of the Melody Slot Machine iPhone app [10]. The horizontal axis is time, and each dial displays a melody segment in musical notation (Fig. 5(a)). By swiping up and down on each dial, you can switch between the segments. Due to the limited screen size of the iPhone, only four melody segments can be viewed simultaneously, and the currently playing segment can be viewed by automatically scrolling left as the musical piece progresses (Fig. 5(b)).

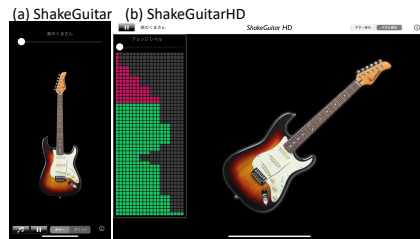


Fig. 3. Screenshot of ShakeGuitar.

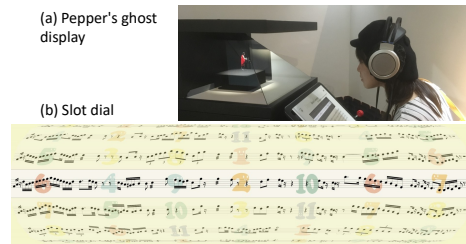


Fig. 4. Melody Slot Machine.

The dial changes for the entire musical piece are displayed in a grid at the bottom of the screen, corresponding to the numbers written on the dials. Swiping up from the bottom of the grid display brings up the full-screen grid (Fig. 5(c)), and users can touch it to change the selected grid. The change in the grid is linked to the dial, and the melody is played reflecting the change. Swiping down terminates the full-screen grid, and the dial appears again. When the iPhone is shaken up and down, each dial is shuffled to generate a new combination of melodies (Fig. 5(d)).

Melody Slot MachineHD Figure 6(a) shows a screenshot of Melody Slot MachineHD, in which the symbols represent changes in melody variations [11]. For example, the musical note symbol means that the same variation will continue, and the cherry symbol indicates that the variations will change one after another.

Pressing the mode-switch buttons on the left and right of the screen displays the grid tile screen, and you can check and change the variations in the entire song (Fig. 6(b)). If you use the grid to change the combination of variations, the symbols on the slot screen will also change accordingly.

The performer screen is displayed by pressing the mode-switch buttons or holding the iPad vertically (Fig. 6(c)). This display shows a performer playing new combinations of melodies determined by the slots or grids. Short interpolation video clips of the performer generated by AI are sandwiched into recorded videos of an actual performer, so the performer moves seamlessly.

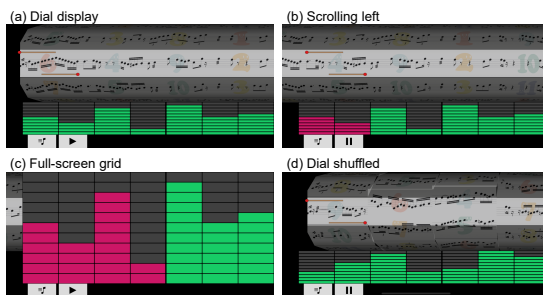


Fig. 5. Melody Slot Machine iPhone app.

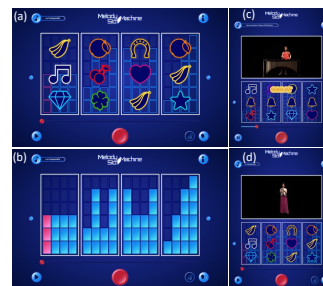


Fig. 6. Melody Slot MachineHD.

3 Experimental Results

We launched the Melody Slot Machine iPhone app in May 2021 and Melody Slot MachineHD in March 2022. As of July 2023, they have downloaded 657 times. After launching the app ten times, users are presented with a message inviting them to complete a questionnaire regarding its usability. The following is a portion of the questionnaire.

Q1: Which was easier to operate, the dial screen or the grid screen?

Q2: Which was more enjoyable to operate, the dial screen or the grid screen?

Thirty responses were received, 20 people said that the dial type was easier to operate and more enjoyable than the grid type.

4 Conclusion

In this work, we compared several interfaces that change the melody of applications using a melodic morphing method based on the Generative Theory of Tonal Music. Our findings showed that more people found the dial-type interface easier and more enjoyable to operate than the grid-based one.

In the app version of the Melody Slot Machine, the dials on the iPhone were musical notations and on the iPad they were symbols, but we plan to make it possible to switch between the two types of dials on both devices.

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