An Improvisation System for Disabilities based on Melody Creation with Gaze Control

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1   Introduction

We propose *JamSketch Eye*, which enables people with physical disability to improvise by drawing *melodic outlines* with their gaze. Melodic outlines are a non-symbolic melody representation that represents only the macro structure of melodies. Once the user draws a melodic outline by moving his/her gaze, the system immediately generates a melody according to the melodic outline. There have been attempts to use the gaze control for musical performance [1–3], but there have been no attempts to use the gaze control to draw melodic outlines. Because melodic outlines are a simple representation and do not require complex action nor expert knowledge, people with physical disability are expected to be able to draw melodic outlines by moving their gaze and play improvisation with our system even if they do not have musical expert knowledge.

2   System Overview

Once the system is launched, a piano-roll interface is displayed on the screen (Figure 1). The cursor (red-blue circle) on the piano-roll screen is synchronized with the coordinates of the user's gaze, which are estimated using the eye tracker. Once the cursor is moved by controlling the gaze, a melodic outline is drawn. Immediately thereafter, a melody is generated using a genetic algorithm (GA) according to the melodic outline given by the user.

The system consists of four modules are shown in Figure 2. *Gaze Coordinate Calculator* obtains the $y-$coordinates of the user's gaze from the eye tracker and sends them to *Main* every 1/60 sec. *Main* then sends them to *Melody Generator* to generate melodies. Melodies are generated with the GA-based method described in our previous paper [4]. Next, notewise expression parameters (onset deviations, durations, and dynamics) are estimated with Giraldo's method [5], then the melodies are performed.

Fig. 1. A screenshot of JamSketch Eye with a melodic outline (blue), generated melody (orange), and gaze position (circle).
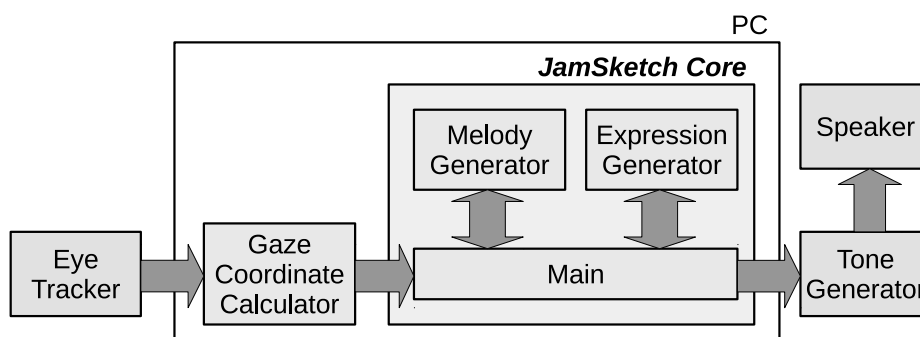

Fig. 2. Block diagram of JamSketch Eye

References

1. A. J. Hornof. The prospects for eye-controlled musical performance. In *Proc. of Int'l Conf. on New Interfaces for Musical Expression*, pages 461–466, 2014.
2. Illustrious. Duet for eyes, 2008. (last access: Jan. 2018).
3. Z. Vamvakousis and R. Ramírez. The eyeharp: A gaze-controlled digital musial instrument. *Frontiers in Psychology*, 7(906):1–14, 2016.
4. T. Kitahara, S. Giraldo, and R. Ramírez. Jamsketch: Improvisation support system with ga-based melody creation from user's drawing. In Proc. of Int'l Symp. on Computer Music Multidisciplinary Research, pages 352–363, 2017.
5. Sergio Giraldo and Rafael Ramírez. A machine learning approach to ornamentation modeling and synthesis in jazz guitar. *Journal of Mathematics and Music*, 10(2):107–126, 2016.