AN ACCOMMODATING PIANO WHICH AUGMENTS INTENTION OF INEXPERIENCED PLAYERS

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Abstract: This paper introduces a piano performance system called "INSPIRATION", receiving rough keyboard input and translating it into musically correct performance in real time. This system changes the scale notes and chord notes, maintaining the performer's intention, expressed as the melody contour, the chord density, and the input timing. The system enables inexperienced players to play the piano as if he/she can play very well.

Key words: Music informatics, computer music, improvisation

1. Introduction

It is pleasant to play a music instrument. The pleasure of playing musical instruments can be classified as following; 1) self-expression by playing a musical instrument, 2) achievement of skill acquisition, and 3) interacting with each other through music [1].

Acquisition of musical knowledge or skill has been regarded as a primal objective of the music class of the public education. The artistic subjects have not contributed much to cultivate the way of self-expression [2].

Paying attention to this fact, composite subjects have been added in primary education recently, where some computer systems have been started to use in order to develop self-expression or creativity.

In this paper, we describe a piano performance system called "INSPIRATION", receiving rough keyboard input and translating it into musically correct performance in real time [3]. "INSPIRATION" changes

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the scale notes and chord notes, maintaining the performer's intention, expressed as the melody contour, the chord density, and the input timing. The piano performance is accompanied with the other music instruments. It enables inexperienced players to play the piano as if he/she can play very well. "INSPIRATION" has a nature of entertainment and can be used to enhance and externalize one s intention.

In Section 2, we describe the outline of "INSPIRATION". In Section 3, we describe the details of this system, self-expression and three performance modes. Finally, we describe the performance using this system in Section 4.

2. "INSPIRATION" Overview

The system is given music knowledge regarding available scales and chords. It also provides a function to distinguish melody sequence and chords, from player s input. It reads the player s intention represented by the input timing, the melody contour, and the chord density, which are not always musically correct, and translate them into musically correct performance in real time as shown in figure 1. "INSPIRATION" is implemented on MAX, a visual language for multimedia. We designed system as each touch may respond within 50ms. This time difference is hardly sensible for amateur piano players.

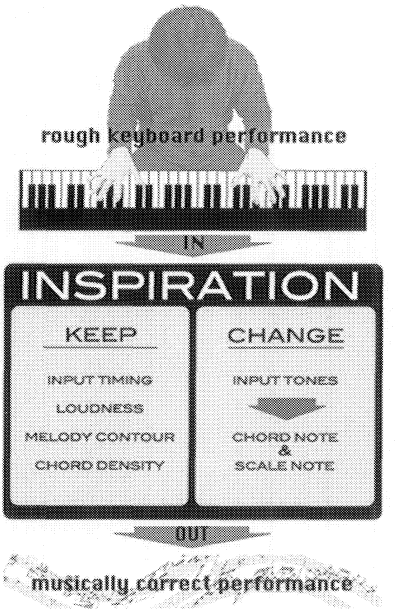

Figure1. The outline of this system

The following three modes are prepared as the players can enjoy different performance style.

a) Ornament performance toward an existing musical piece: **Pops style-mode**
b) Blues improvisation accompanied with typical 12-bar blues: **Blues style-mode**
c) Free performance accompanied with ambient music generated automatically: **Free style-mode**

2.1 Pops style-mode

The purpose in this mode is enjoying the improvisation in the existing musical piece. In this mode, the MIDI file of the existing musical piece is used as BGM. A player inputs a performance freely in the mood of as if he/she was a professional pianist completely according to the atmosphere of BGM. The inputted performance is changed into the musically correct performance according to the chord progression of a musical piece. Therefore, a player can experience the improvisation suitable for the musical piece easily.

2.2 Blues style-mode

The purpose in this mode is enjoying blues improvisation. The chord progression is automatically generated based on typical blues composition.

Moreover, the scale containing many blue notes is used, and a player can feel a blues feeling. Furthermore, in order to increase a blues feeling, the performance of brass, a base, and a drum is generated automatically simultaneously.

2.3 Free style-mode

In this mode, it is the purpose that a player enjoys improvisation as freely as possible.

Sound is only a player's performance. Moreover, the chord progression used as the base for shifting a pitch is automatically generated by algorithm. In order to smooth relation of chord progression, the dominant motion, a functional motion, a chromatic motion, etc. are taken into consideration. A player can control the timing for changing a chord by pedal operation.

3. System Specification

In this chapter we describes the "INSPIRATION".

The tones arranged on the keyboard have a function respectively. There are the tone which can be constituted as a melody, the tone which can be constituted as a chord, the tone which can express a feeling of tension, etc. And arrangement on a keyboard of these functions of tone changes variously with change of a chord.

In original piano improvisation, a player needs to understand the function of tone, and arrangement on a keyboard beforehand. Furthermore, the skill that can actually choose it immediately on a keyboard is needed. If the player does not have this skill, he cannot carry out self-expression about elements, such as strength and a rhythm. This is one of the causes that make improvisation difficult.

This system aimed at enabling it to enjoy self-expression freely by mitigating this player's burden. These are fundamental procedures.

a) Single tone input is shifted into a scale note, and two or more tones input are shifted into a chord tone.
b) Difference of the pitch before being shifted, after being shifted is suppressed to the minimum.
c) Up-and-down motion of the pitch of input tone is always maintained.
d) The loudness of input tone is always maintained.
e) The number of tones inputted simultaneously is maintained.

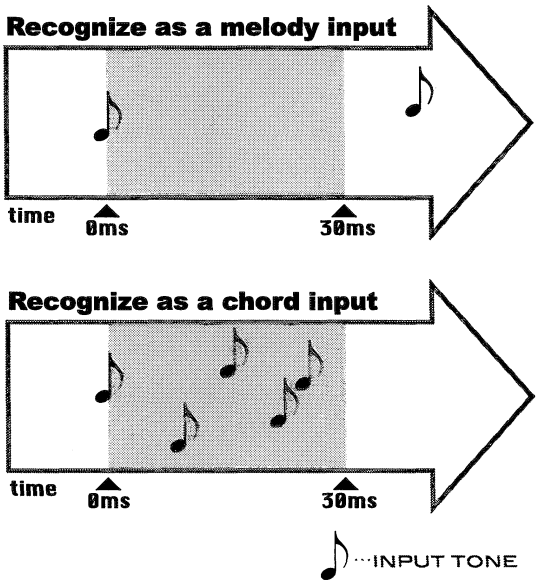

Figure 2. Recognition of a melody input or a chord input

Furthermore, "INSPIRATION" provides the following functions for the user who wants to enjoy a more complicated performance expression.

f) The function shifted into the chord including a tension note assembled by the professional piano position. Professional piano position is a style that arranges a tension note and a chord note within whole tone, and is put in a chord tone from the upper and lower sides. This style can bring out the effect of a tension note to the maximum extent.
g) The function shifted into the approach chord to the original chord. An approach chord can give the feeling of momentary modulation and can advance smoothly to the original chord and yet.
h) The function shifted into the approach note including a blue note and an avoid note. Approach notes are all the tones except a chord note and a tension note, and it is effective to use it as a passing tone. In this system, a player can use an avoid note and a blue note as approach notes.

In order to provide a familiar user interface, we assigned the functions on black or white keys. Generally, black keys are mapped to special and exceptional usage.

In addition, in this system, the single tone input or two or more tones input is judged with the number of the tones, which crowded within 30ms. Fig. 2 shows this processing.

By using "INSPIRATION" equipped with the above functions, a user can perform the following self-expression style.

a) Performing a melody.
b) Performing a chord.
c) Controlling the pitch of sound as much as possible.
d) Controlling the loudness of tones.

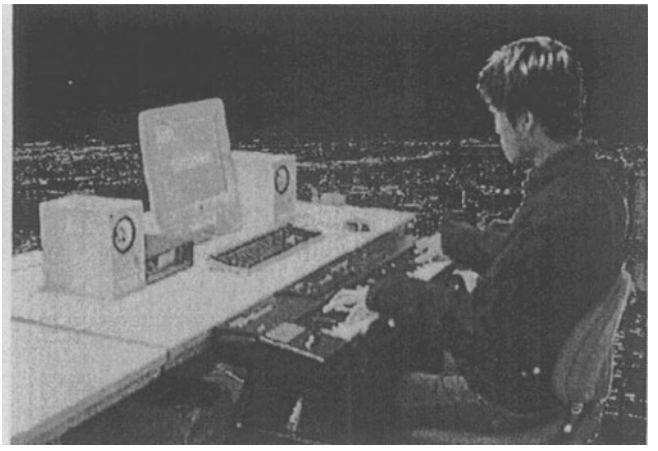

Figure3. Improvisation by using this system

e) Controlling the up-and-down motion of a melody.
f) Controlling the number of composition sound of a chord as much as possible.
g) Performing a chord with a feeling of tension.
h) Giving an accent with performing the chord of another key momentarily.
i) Feeling a blues feeling.

4. Performance

Fig.3 shows one scene using "INSPIRATION". A video playing "INSPIRATION" is available from the following URL.

— http://media.sys.wakayama-u.ac.jp/~s025062/inspire01.html

The user input and the performance translated by this system are shown in Fig. 4. The sound example shown in Fig. 4 is available from the following URL.

— http://media.sys.wakayama-u.ac.jp/~s025062/inspire02.html

It illustrates "INSPIRATION" generates musically plausible phrases.

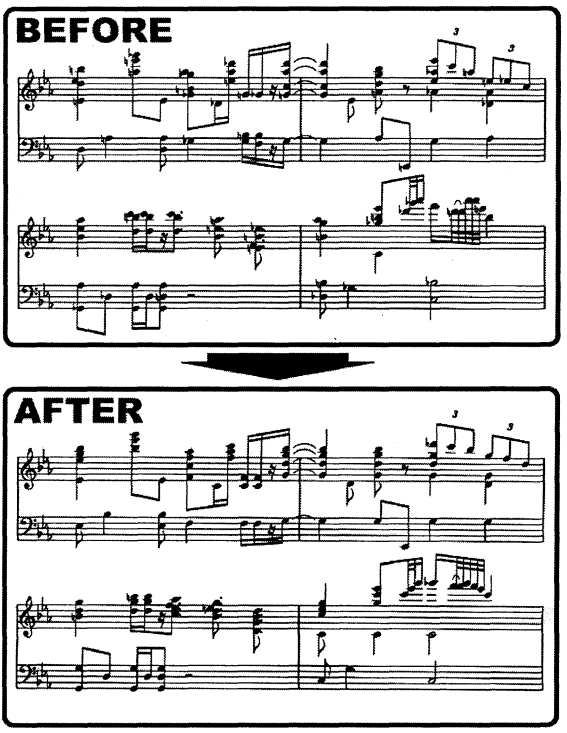

Figure 4. The performance before and after being changed

We carried out a simple experiment regarding usability of "INSPIRATION". These are part of comments from those who played "INSPIRATION".

Non-experienced student: *"I am an amateur and I know little about music theory. I first experienced delight of music improvisation."*

A beginner: *"My hands motion was reflected well in the performance. It responded quit naturally."*

An experienced player: *"I was a little confused, when the pitch was staying at the same position, even though I was playing ascending melody."*

The trouble pointed by an experienced player result from that the system tries to replace wrong notes to musically correct notes. This is one of the revision points of the future work.

In an experiment some audience took an amateur player for an experienced player. From this view, "INSPIRATION" may be used as an elegant party trick.

5. Conclusion

In this paper, we described a piano performance system, receiving rough keyboard input and translating it into musically correct performance in real time. This system changes the scale notes and chord notes, maintaining the performer's intention, expressed as melody contour, chord density, input timing. The system enables non-experienced piano player as if he/she can play very well.

"INSPIRATION", on which users externalize their mind and test freely, serves as a creativity tool. For future works, we would like to provide SMF-input function in order to utilize spread music especially for the ornament mode, and various responses to the input melody contour.

We also would like to carry out usability evaluation of "INSPIRATION" at primary school, and also test effects regarding brain-activation for aged people.

Acknowledgment

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