

Introduction of a Performer-friendly Electronic Music Stand

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Abstract

A method is described for improving not only performer's load such as turning page on playing music by using foot switch, but also allowing performances even in dark venues, and allows easy storage and management of sheet music. Furthermore simultaneous instructions increase efficiency of rehearsals and music classes. These functions drastically will change the style and structures of sheet music since 16 century. This equipment has realized based on several patents, advices of professional musician with thousands of test trials since in 2000.

Keywords : Electoronic Score, foot-switch, score-renewal time, score-renewal ratio

1. Introduction

Since 16 century, performers have become accustomed to the rules and conventions of music notation and techniques for expressing the composer's intentions by sublimating musical notes into artistic expressions. Musicians and composers have rigidly adhered to this style of notation right up to the present day, and may well continue to do so into the future. In this study we analyze the various problems associated with paper sheet music, and we introduce a performer-friendly electronic music stand we developed to make things as easy as possible for the performer.

2. Comparison with conventional systems

The problems of conventional paper-based sheet music include the following:

Inconvenience for performers :

- The performer has to stop playing when

turning pages

- The act of turning pages diverts the player's attention
- Sheet music becomes worn and grimy over the years
- Pages make an annoying noise when they are turned
- Sheet music is difficult to keep organized
- It cannot be used in the dark (due to problems caused by reflections in stage lighting).

3. System configuration

To resolve these problems while retaining a comprehensive set of conventional sheet music functions, we used a tablet PC (A Hitachi FLORA-ie 55mi with a 400 MHz Transmeta Crusoe CPU running the Midori Linux operating system) as shown in Fig. 1 in which it is possible to write and delete arbitrary memos on sheet music (shown on the screen), and we developed software to implement these functions. We also set ourselves the goal of implementing advanced sheet-music functions such as the following :

- (1) Various page-turning schemes

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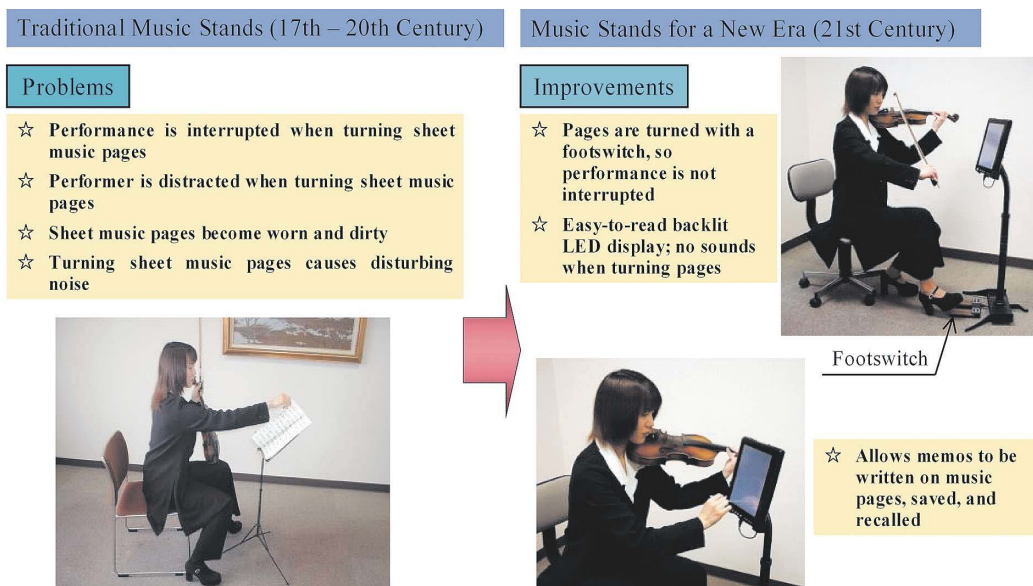


Fig. 1 How to Use an Electronic Music Stand

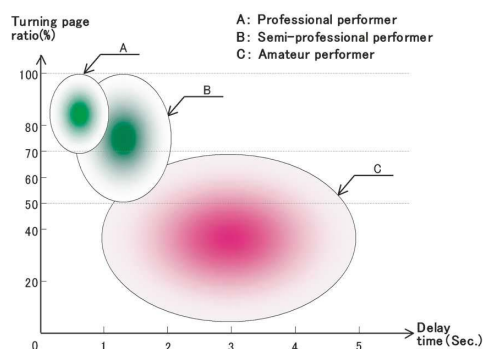


Fig. 2 Performer's ability to operate with a page refresh ratio and delay time.

involving the use of a foot switch, hand switch or touch switch. (2) Support for the writing, storage and reading of sheet music. (3) A backlit display to allow performances to be made in the dark. (4) A page-turning scheme based on time delays and variable page refresh ratios. (5) Easier management of sheet music content. (6) The ability to send page-turning commands and conductor's comments to multiple performers at the same time. (7) A scheme for splitting

sheet music content (i.e., converting a full score into part scores) and sending it out.

Also, Fig. 2 shows an example of the equipment configuration we used to achieve these aims.

4. The load on performers and the timing of page-turning

In a preliminary study, we built a prototype of our system and subjected it to trials in order to determine how much of the screen to refresh initially when turning a page (the page refresh ratio), and how long to leave the remaining parts at the bottom of the screen before they are also updated (the refresh delay time). These trials were performed with the cooperation of the Hitachi Group Symphony Orchestra and specialist musicians. The results are shown in Fig. 2. Although it is generally difficult to quantitatively express the ability of performers, the

classes A, B and C in this figure broadly correspond to A: professional musicians or music teachers working in music education, B: semi-professional musicians such as members of amateur orchestras and music college students, and C: beginner-level players who have only been learning an instrument for a few years, or who are studying from music practice books and the like. As these results show, performers with greater ability are able to operate with a larger page refresh ratio and require a correspondingly smaller refresh delay time. Performers with less ability preferred smaller page refresh ratios and tended to prefer longer refresh delay times. This means that as musicians become more professional their sight reading ability improves, and they can read further ahead in the sheet music.

5. A page-turning scheme based on an estimation method

Fig. 3 shows how the page refresh ratio relates to the updating of the displayed music.

To set up the page-turning function, the presses the “Preferences” button whereupon the screen shown in Fig. 3 is displayed. A relatively accomplished performer might

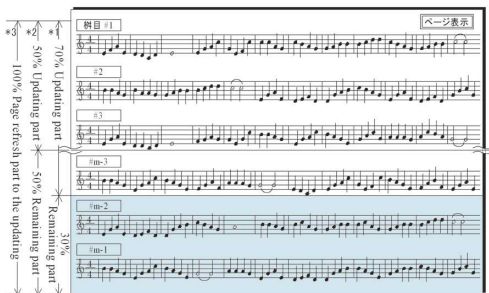


Fig. 3 Score page refresh sample



Fig. 4 Piano performing

choose a page refresh ratio of 70% and a refresh delay time of 1 second. With these settings, turning the page by, for example, pressing a foot switch will cause the upper 70% of the screen to be refreshed immediately with the contents of the next page of music, while the remaining 30% will be updated after a 1-second interval. These settings can be freely varied between 50–100% and 0–5 seconds depending on the proficiency of the performer.

As an enhanced model of this system, we have also held a piano recital using two of these devices as shown in Fig. 4.

6. Conclusion

The results of this study should not only revolutionize the way in which musical performances are made, but should also have a large effect on the four-centuries-old traditions of producing and editing sheet music.

In this study we have concentrated on developing a stand-alone electronic music stand. In the future, we aim to make it possible to control multiple devices at the same time as described above, and to optimize this function for particular applications.