

A Web-based Braille Translation for Digital Music Scores

Toshiyuki Gotoh
Yokohama National University
79-7 Tokiwadai Hodogaya-ku,
Yokohama, 240-8501, Japan
+81-45-339-4193

gotoh@sci.ynu.ac.jp

Reiko Minamikawa-Tachino
The Tokyo Metro. Insti. Medi. Sci.
3-18-22, Honkomagome, Bunkyo-ku,
Tokyo, 113-8613, Japan
+81-3-3823-2105

tachino-rk@igakuken.or.jp

Naoyoshi Tamura
Yokohama National University
79-7 Tokiwadai Hodogaya-ku,
Yokohama, 240-8501, Japan
+81-45-339-4161

tam@ynu.ac.jp

ABSTRACT

This paper proposes computer environment called **BrailleMUSE** that is a free Braille music translation server on the Internet. In experiments with expert Braille translators, translation errors occurred only at extremely slight frequency. Also, the **BrailleMUSE** has a mirror page to a music site showing about 4,000 digital scores. It was confirmed that the system provided Braille scores by working together with the music site. It is suggested that the system is suitable for practical use.

Categories and Subject Descriptors

H.1.2 [User/Machine Systems]: Human Factors, K.4.2 [Social Issues]: Assistive technologies for persons with disabilities, H.3.5 [Online Information Services]: Web-based services.

General Terms

Design, Human Factors.

Keywords

assistive technologies, universal access, Braille music score, MusicXML, Internet, machine translation.

1. INTRODUCTION

The Internet enables us to remotely access music as recorded sound and even music scores. However, visually impaired people cannot enjoy the benefits of the Internet on music scores. They need Braille scores based on Braille music notation using Braille cells invented by Louis Braille in the 19th century. The Braille scores are usually produced by expert Braille translators who have learned Braille music notation. As it is extremely time-consuming task for even an experienced translator to produce a Braille score, there are not enough Braille scores to meet the needs of visually impaired people.

Our work is motivated by reducing the information gap between sighted people and the visually impaired on music scores. Here we propose computer environment called **BrailleMUSE** (Braille MUsic Support Environment) to design to translate digital scores shown on the Internet into Braille scores and to enable users to freely download them.

Programs to automatically transcribe into Braille scores have been proposed using computer-based musical formats of MIDI, NIFF, and MusicXML. However, all their programs are used by stand-

alone. Users are not allowed to use them via the Internet. The programs have been developed for MIDI [1] and NIFF [2], [Toccatà 3]. Also, Dancing Dots has developed a Braille music translator GOODFEEL [4] using MusicXML with the collaboration of an independent notation program. In addition, DaCapo is an ongoing project to develop software packages that will allow translating ink printed notes through MusicXML to Braille notes and vice versa [5]. Moreover, young projects have begun to Braille translation using MusicXML recently.

2. WEB-BASED BRAILLE TRANSLATION

The preliminary goal of the system is to associate digital scores shown on the Internet with the corresponding Braille scores. The system assumes digital scores are mostly based on the MusicXML. The system provides free downloads of Braille scores so as to use them for personal purpose. Expert Braille translators judge whether revision is necessary for the downloaded Braille scores. If necessary, they may revise the Braille scores by themselves. The system intends to support expert Braille translators by cooperation with a web-based Braille translation, an upload manager for data management, and a web-site showing digital scores (see Figure 1). The system provides a mirror page linked to the Japanese music site which enables users to legally download about 4,000 digital scores [6]. In addition, the system has a digital score database of about 100 digital scores. Users select a music title in the mirror page or in the database, and the system accesses automatically the sites to download the digital score with the title. The system translates it into a Braille score. Users are able to download the translated Braille score.

Braille scores are produced based on Braille music notation that has signs and conventions with the same Braille cells as used in reading and writing sentences (see Figure 2). Braille music notation provides, as it were, a language system. However, Braille music notation is different from literary Braille and has its own syntax and abbreviations.

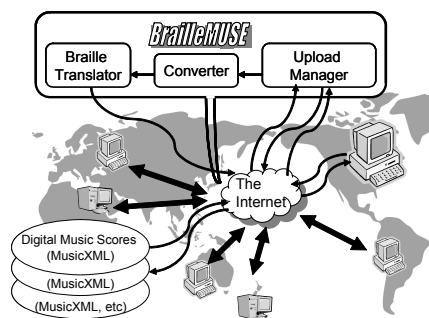


Figure 1. System concept of the BrailleMUSE.

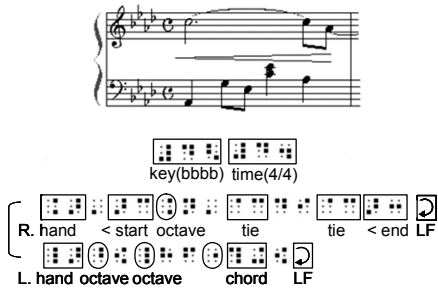


Figure 2. A sample of Braille music scores.

3. SYSTEM ARCHITECTURE

The system is implemented by web-based configuration with JAVA technology (see Figure 3). A MusicXML document specified on a user's web browser passes to the Braille translator through a servlet and an obtained Braille score is displayed on the user's web browser. The system enables the user to download it for personal use. For the mirror page linked to the music site, an upload manager is prepared to legally download digital scores.

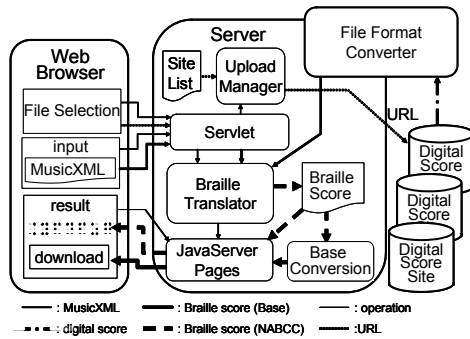
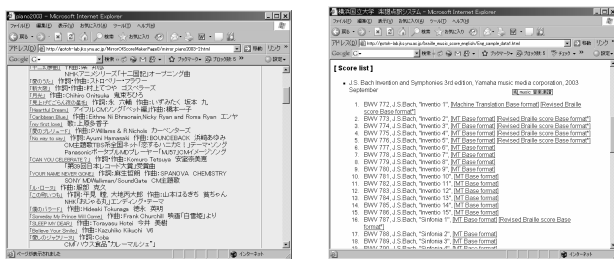


Figure 3. Web-based configuration.

4. TRIAL USE AND DISCUSSION

System interfaces to the mirror page of the Japanese music site and to the digital score database are shown in Figure 4, respectively.

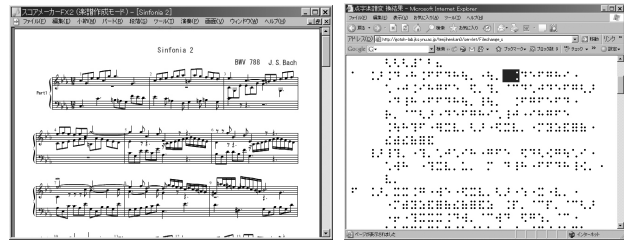


(a)The mirror page of the music site (b) The digital score database

Figure 4. System interfaces for digital scores.

The system enables to translate MusicXML documents of scanned music sheets by using music software. In our trial experiments, it was confirmed that converted MusicXML documents included convert errors. The Braille scores were tested with the cooperation of the expert Braille translators to check whether there were

translation errors. Figure 5 shows an example of music sheets and the obtained Braille score by the system.



(a) A music sheet by J. S. Bach (b) The resultant Braille score

Figure 5. The music used in the experiment.

As MusicXML documents were revised on convert errors in the music site and the digital score database, translation errors occurred at slight frequency. In case of scanning music sheets, translation errors and conversion errors occurred at the almost same slight frequency. The trial web-based Braille translation English version has been available at the page [7][8]. The total number of processing of the Japanese page and the English page is about 340 a month. Trial use suggests that the Braille translator may be suitable for practical use.

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