DCMI: A Database of Chinese Musical Instruments

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ABSTRACT

In its long history, there have been more than 2,000 Chinese musical instruments in China, they play an important role in Chinese musicology. However, many of these musical instruments are not known to the public. In this work, we present a multimedia database of Chinese musical instruments, which has been constructed and will be continuously enriched by the authors. This database includes, for each instrument, text descriptions, images, audio clips of basic and special playing techniques, music clips, videos of craft process and recording process, and acoustic analysis materials. Motivation and selecting criteria of the database are introduced in detail. Potential applications based on this database are discussed.¹

KEYWORDS

Chinese musical instruments, multimedia database, audio recording dataset

1 INTRODUCTION

1.1 Background

Chinese musical instruments are the physical embodiment of Chinese traditional music culture, and an important part of the splendid Chinese traditional culture. Establishing a multimedia database of Chinese musical instruments is of great significance. It not only provides authoritative and reliable fundamental data support for the creation, performance, theory, education, popularization and research of Chinese music, but also is a platform for people around the world to understand Chinese traditional musical instruments from various perspectives. Such database should collect audio, video, text and images of Chinese musical instruments with special emphasis on audio data, other types of data act as auxiliary information.

1.2 Related Works

Research on Chinese musical instruments databases first appeared in museology. From 2009 to 2011, MIMO (Musical Instrument Museums Online) [1] created the world's largest freely accessible database of musical instruments. In China, an instrument database called "China National Music Instrument Digital Museum" was jointly established by the Central Conservatory of Music, Huazhong University of Science and Technology and Huazhong Normal University [2]. These data are only used as a supplement to the existing museum archives. Another type of musical instrument databases have emerged in the area of music information retrieval (MIR) [3-7]. In these datasets, western musical instruments occupy the greatest proportion, most of the audio clips are only a few seconds long, which is often inadequate for researchers. Previous projects which is specifically for research include "Standard Library of Chinese Musical Instruments" and "Acoustic and Spectrum Analysis of Chinese Musical Instruments" [8].

1.3 Motivation

Research into Chinese musical instruments occupies an indispensable position in Chinese music research, however, a comprehensive and high-quality Chinese instrument database for researchers has not yet appeared. Therefore, a unified standard and highly professional database is of great necessity,

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the establishment of such a database is of great significance to the in-depth study of Chinese music culture.

2 DESCRIPTION OF THE DATABASE

Apart from the instruments from the same origin that resemble in both sound and appearance, there are almost 800 different instruments in China. In DCMI, we select 200 typical musical instruments with regional representativeness. In this part, we detail the construction and characteristics of DCMI (http://47.90.12.82).

2.1 Database construction

To construct a high-quality database, especially high-quality sound, criteria for every aspect have to be carefully considered. In this part, we give special emphasis on types of musical instruments, recording environment and devices, players and recording contents.

DCMI include Chinese orchestral instruments, such as erhu, pipa, ruan and Chinese Opera accompaniment instruments like banhu, jinghu. Instruments of ethnic minorities are not yet included.

To perfectly exhibit the instrument sounds and the delicate playing skills which represent the characteristics of Chinese traditional musical instruments, we perform recording and acoustic measurements in a fully anechoic room. As seen in Fig.1, B&K free field microphones installed on 3/4 spherical stent with diameter of 3M are setup to record Ruan and Zheng..

The sound of an instrument is a result of playing behaviour. Therefore, the players to record should be proficient in musical playing, with standardized skills acknowledged by authorities instead of personalized skills, such that typical sounds of the corresponding musical instrument can be generated. In our work, the players are professional players with high level skills. Moreover, the physical and psychological status of the player should be in normal condition.

In DCMI, recording contents include open string (for string instruments) or lowest tone (for wind instruments) for different dynamics including forte, mezzo forte and piano, scales, playing techniques and music clips. During acoustic analysis process, the open string or lowest tone is used to determine the stability of intonation. Playing on different dynamics embodies consideration of the influence of dynamics on timbre. Scales are used to determine the range of the instrument and playing techniques provide samples for acoustic analysis of effect on sound blend.

2.2 Characteristics of DCMI

2.2.1 Completeness. First, musical instruments included in the database cover all basic types of the Hornbostel-Sachs taxonomy, i.e., chordophones, idiophones, membranophones and aerophones. With regards to the content, all recorded sounds are carefully labelled in detail, including pitch, playing technique, record location, and players, etc.



Figure 1: Recording environment of Ruan and Zheng

2.2.2 Multi-functionality. DCMI is a multimedia database of Chinese musical instruments with comprehensive information of each instrument. It contains not only the basic information (Hornbostel-Sachs taxonomy, materials, performance way, period) and text introduction, but also high-fidelity audio recordings, instrument images from different angles, videos of craft process and recording process.

3 CONCLUSIONS

In this paper, we present a multimedia database of Chinese musical instruments (DCMI). Contents and characteristics of the database are introduced and considerations of musical instruments selection, recording environment and devices, players and recording contents are discussed.

In future work, we will further extend the database to cover more Chinese musical instruments. We also plan to formulate the standard of musical instruments of ethnic minorities and reformed instruments, and to provide more data support for all related research communities.

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