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Online Music Style Recognition via Mobile Computing

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ABSTRACT

Music is a widely used data format in the explosion of internet information. Automatically identifying the style of online music in the internet is an important and hot topic in the field of music information retrieval and music production. Recently, automatic music style recognition has been used in many real-life scenes. Due to the emerging of machine learning, it provides a good foundation for automatic music style recognition. This paper adopts machine learning technology to establish an automatic music style recognition system. First, the online music is processed by waveform analysis to remove the noises. Second, the denoised music signals are represented as sample entropy features by using empirical model decomposition. Lastly, the extracted features are used to learn a relative margin support vector machine model to predict future music style. The experimental results demonstrate the effectiveness of the proposed framework.

KEYWORDS

Empirical Model Decomposition, Mobile Computing, Music Style Recognition, Relative Margin Support Vector Machine, Waveform Analysis

1. INTRODUCTION

With the rapid development of the Internet, people begin to have the opportunity to come into contacting with different music styles around the world and enjoy the pleasure brought by music (Kohut 2018). Although the music has some different expression ways in different countries or nations, the music has always been able to express people's thoughts, convey people's thinking (Stewart 2019). The music fully expresses its value in human life.

Up to now, there are countless kinds and quantities of musical instruments, such as guitar, piano, erhu, and cello (Zhao 2019). At the same time, the storage methods of music files are becoming diversification, including WAV files, MIDI files, MP3 files and WMA files (Fu 2021). Each file format has its own storage characteristics. WAV files are easy to generate and edit, but the compression ratio is not high. MIDI file has small size and storage space and is especially adapted for the needs of long time music. MP3 file is also a very common music format, which has high compression rate and poor sound quality.

The emergence of musical instruments and the diversification of music storage methods promote the formation of music genres (Ojanen 2020). The common music genres include jazz, classical, pop, hip-hop, rock and roll, etc. Recently, music information retrieval has become a new research topic, and a large number of researchers have studied this field (Murthy 2018). Because some users are only interested in one genre of music, music recognition and classification system can divide music

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into different genres. In this way, it is convenient for users to search and manage music in different periods of time, such as sports and rest. When the same song is sung by different people, the songs are different due to the different range, timbre and the performance of various musical instruments. Exactly extracting features of music leads to the low efficiency of music genre classification and recognition. With the deepening of a large number of research works, the music genre classification and generation will gradually develop in a better direction.

With the rapid development of music storage and computer technology, digital audio processing technology has been greatly improved (Gao 2019). Music processing software is also diversified, such as windows recorder, tools when buying a sound disc (Liang 2021). Speech recognition, text to speech conversion, speech compression coding and other technologies have gradually begun to use computer technology instead of manual completion (Lero 2019; Delić 2019). These methods are based on digital audio processing. In general, a piece of music is vectored. The features of the music are represented as a series of numbers to store and transmit. Different formats of music are finally represented in digital form, which makes the analysis of music become very simple and efficient by combining with the music processing software in the computer. At the same time, with the rapid development of computer technology, the accuracy of analyzing and processing music has been greatly improved, and the cost is reduced.

In the field of music style recognition, the most important thing is the extraction of related features and the selection of classifiers (Ghosal 2018). When selecting different music feature vectors for music style recognition, different classification results will be produced. At present, the commonly used features are tone, timbre, loudness etc. (Prince 2019) In order to improve the effect of style recognition, researchers have taken many methods, such as signal processing method (Wang 2019). These methods improve the effect of music classification to a certain extent. However, the feature extraction is still difficult under some special cases. In order to further improve the performance of music style recognition, it is necessary to deeply mine the internal association between music signals.

With the development of machine learning and deep learning in face recognition, speech recognition and image recognition, people gradually try to apply machine learning and deep learning to the field of music generation and recognition. The deep learning is widely used in storing and processing large amounts of data, such as recurrent neural network (Purwins 2019). However, we cannot get the data of the previous moment or earlier, which makes the effect of classification or the acquisition of music features, such as tone, timbre, loudness, rhythm, be inaccurate. This paper adopts a robust support vector machine to avoid the issue that training set needs massive samples in deep learning for online music style recognition. The flowchart of music style recognition is summarized as following figure.

Figure 1. The architecture of music style recognition