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Construction and Implementation of Content-Based National Music Retrieval Model Under Deep Learning

Jing Shi, Nanchang Institute of Technology, China
Lei Liu, Luxun School of the Arts, Yan'an University, China*

ABSTRACT

This research mainly studies the construction and implementation of the content-based folk music retrieval model. Firstly, it studies the music automatic annotation method based on deep learning, and then proposes the tag conditional random field music automatic annotation method, and then constructs the music annotation depth neural network model combining a variety of music representation and attention mechanism. Finally, it analyzes the proposed folk music retrieval model the effectiveness of the cable model is verified and its performance is evaluated. The results show that in Glu module, Glu blocks had better performance in music annotation, and the music annotation results of each index in music hierarchical sequence modeling are better, which ensures the effectiveness of music annotation. Compared with other algorithms, the AUC tag score of the proposed method is the highest, which is 0.913; it can better model the mapping relationship between the audio features of music input to the text tag and has higher scores on all evaluation indicators.

KEYWORDS

Conditional Random Field, Deep Learning, Folk Music, Multi Label Classification, Neural Network, Retrieval, Self-Attention

In recent years, with the rapid development of internet technology and multimedia applications, many musical works are being uploaded to online digital music libraries (Müller et al., 2019). In the face of huge online music data, it seems like people could find any music suitable for them, but for ordinary users, it is becoming more and more difficult to conveniently find the music they want (Wang et al., 2020). Major digital music providers are now faced with the challenge of providing users with effective music recommendation and retrieval services.

The application of supervised machine-learning methods enables the automatic addition of descriptive labels to music. This technology can efficiently use large-scale music data to automatically add descriptive text labels to music based on the content of the music data, which improves the user's experiences with services such as retrieval and recommendation (Shen et al., 2019). However, the labels generated by automatic music-annotation technology often provide high-level semantic descriptions, which creates a significant disparity with low-level audio representation and poses challenges in the

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method's design, including feature representation and label association. This study aims to investigate effective models and algorithms for automatic music annotation, proposing a music-annotation method based on conditional random fields of music fragments. It aims to aggregate labels from all music fragments to achieve comprehensive music annotation.

Some scholars have used the general summarization algorithm previously applied to text and voice to summarize the projects in the music dataset and evaluated the summarization process of category II and multi-category music-classification tasks by comparing the accuracy of the summary dataset with the complete songs using human-oriented summaries, continuous segments, and original datasets. The results show that compared with the selected baseline, Grasshopper, LexRank, latent semantic analysis (LSA), maximal marginal relevance (MMR), and a centrality model based on a support set all improve the classification performance (Raposo et al., 2016). A local merging method of song feature vectors based on a general background model was proposed, which includes two local activation modes of feature vectors: histogram representation and binary vector representation. Experiments on three open music datasets show that the proposed method is effective in music similarity computation (Seo, 2018).

Other scholars applied MusicMixer to propose a topic modeling method for retrieving similar music clips (Hirai et al., 2018). The MusicMixer method mixes songs according to the similarity of audio by beat-frequency analysis and potential theme analysis of chromatic signal in audio. Furthermore, a method to represent audio signal is proposed to construct a topic model to obtain audio latent semantics. Experimental results show the effectiveness of the proposed latent semantic analysis method. Users can select a song from the list of songs suggested by the system to perform DJ mixing. An expert team developed a two-level accurate and fast query-by-example–based music information retrieval system by using feature-fusion technology and decision-fusion technology. In the first stage, a variety of recognizer sets will automatically identify the type of query; in the second stage, the similarity between the query and other content of the same query-type dataset is measured to find the target song, a genre-adaptive feature-extraction method is proposed, and the feature-fusion technology is used to fuse the features. The results show that the accuracy and retrieval time have been significantly improved (Borjian et al., 2018). Based on the above research results, this research will focus on the optimization of automatic music annotation and build a content-based folk-music retrieval model. The steps are:

1. Literature review: conduct a comprehensive review of existing research on content-based music retrieval and automatic music annotation using deep-learning techniques. Identify the strengths and limitations of current methods.
2. Data collection and preprocessing: collect a suitable dataset of folk-music recordings with associated tags or annotations. Preprocess the dataset by removing noise, normalizing audio levels, and segmenting songs into individual units.
3. Automatic music-annotation method: study and develop a deep learning–based automatic music-annotation method specifically tailored for folk music. Explore different techniques, such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and attention mechanisms, to effectively annotate music based on its content.
4. Tag conditional random field (CRF) method: propose and implement a tag conditional random field automatic music-annotation method. This method combines the power of CRF models with deep-learning techniques to improve the accuracy and reliability of music annotation.
5. Music annotation deep neural network model: construct a music-annotation deep neural network model that incorporates various music representations and attention mechanisms. The model should be designed to capture complex features and relationships between music audio input and text tags.
6. Experimental analysis: analyze and evaluate the effectiveness of the proposed folk-music retrieval model. Verify the performance of the gated linear unit (GLU) module and GLU blocks in music

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