

# Analysis of MIDI music data using word2vec

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## Abstract

Currently, it is much in demand for similarity music searching. We have need to search my own favorite music from the enormous numbers of musics since the online sales and streaming music services have begun. However, the music summarization is difficult in comparison with the text one such as novels. It needs the enormous time and effort to decide their own favorite music by listening a large number of musics one by one. Therefore, various methods for automatic similarity music searching have been proposed, for instance, using frequency feature analysis and applying natural language processing(NLP) techniques.

On the NLP techniques, the music similarity has measured by distance among the feature vectors generated TF-IDF and so on. However, these music similarity has been taken out of context and order of the features.

In this study, we take notice of the context and order of NLP features in the musical sequences. We propose a method for measuring similarity between music with involvement of context information using word2vec. Word2vec is an implementation of the method for generating word feature vectors proposed T. Mikolov et.al. Mikolov's word feature vector is acquired in learning by neural network. Word2vec calculates co-occurrence probability between a word and its adjacent words. Thus, the word feature vectors obtained by word2vec will be a representation in what contexts the word was used. Word2vec can not be applied to music data for practical purposes. We have converted MIDI formatted music data into MML song data, and clipped out it to generate word like packets. These word like packets are called "music words" in this paper. Music words are generated by cutting into constant length MML song statements.

We have generated music words from two or three music song data, and obtained its feature vectors using word2vec. We have also analyzed a mixed music song data which is interpolated a part of another music sequence. As a result, the calculated feature vector sequences of each song data are able to placed in three dimensional Euclidean space separately by PCA.

Furthermore, we have proposed two similarity measures between music songs based on feature vectors calculated word2vec. Several music songs, that are classical, J-POP and Enka music songs, have been investigated by our similarity measures. It seems to be quite all right to consider that each song category have different music structure. Therefore, we can assume that the value of similarity measure between the music songs of the same category will be small. In the result, our minimum similarity measure can isolate music songs in a category from other categories.

Future challenge is about more efficacy method to generate music words, and considering about the length of adjacent words for learning by word2vec.