CODED MELODIC CONTOUR MODEL

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ABSTRACT

This paper describes submitted programs to the Symbolic Melodic Similarity task of the MIREX 2011. These programs consider algorithms to retrieve musical pieces in a database that are similar to the query based on symbolic melodic similarity. They are based on coded melodic contour model that assumes that the melodies can be represented by combination of typical melodies. The process is divided into two parts: (1) music in the DB consists of coded contours that represent typical melodic contours and (2) melodic contours of the query consist of coded contours. The programs use the geometric contours that are approximated to the melodic contour and the coded contours that are clustered from all the geometric contours in the DB.

1. INTRODUCTION

The abundance algorithms to find similar music considered melody, rhythm, harmony, etc. Among these, melody is the most important element to find similar music [2]. Thus, this work focuses on retrieving similar melodies. So, purpose of this work is retrieving musical pieces in a database that are similar to the query. The proposed algorithm can be extended to real world music (PCM data) by concatenating with melody extraction system [3].

Most previous approaches to melodic similarity are based on the string matching of individual notes [4, 5]. Other research focuses on the sequential characteristics of melodic similarity based on n-grams [6, 7] or the geometric representation of a melody [8, 9]. Most of these previous methods focus on calculating the absolute distance or the similarity between two music pieces. However, similarity is the relative concept: music similarity depends on the set of properties of music pieces that are used in determining their similarity or dissimilarity [1]. For example, when the ground truth of melodic similarity is obtained, median ranks which can be changed by a set of properties of music pieces are used [10]. Thus, the relative characteristics of melodic similarity should be considered the relative melodic similarity. With this in mind, the following characteristics are considered in this paper.

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1. Sequential characteristics or melodic contour: Most people have a relative sense of pitch, so a melodic contour is more important than its absolute pitch.

2. Transposition and tempo invariance: It is hard to cognize variation of melodic similarity due to key or tempo change, so, transposition and tempo invariance must be secured.

3. Relative melodic similarity: Melodic similarity, which is with respect to the query, depends on all of the music pieces in the DB, because similarity is relative: retrieving similar music pieces, whole ones should be considered.

This paper is organized as follows. Section 2 introduces a concept of the coded melodic contour model. Section 3 explains characteristics of two programs. In Section 4, we evaluate it. Finally, Section 5 concludes this paper.

2. CONCEPT OF THE CODED MELODIC CONTOUR MODEL

This section introduces the the concept of music generative model. Figure 1 shows the structure of music that we assume. There are many combinations of notes, but melodies, by comparison, are much less numerous. Since, melodies are combinations of notes that bring people pleasure or excitement when listening. If these kinds of typical melodies can be found from the musical pieces, musical pieces can be represented by typical melodies. Moreover, specific melodies that are used in the music pieces can be represented by typical melodies. Based on assumption of music structure, the coded melodic contour model is defined.

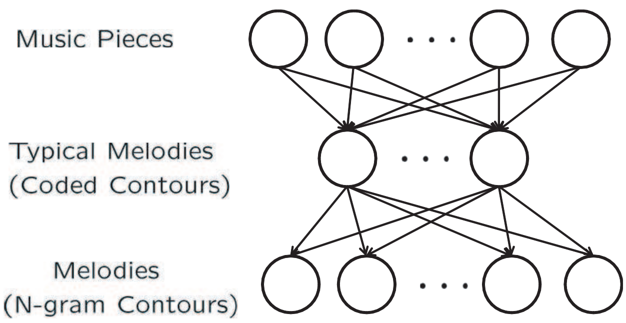

Figure 1. The Structure of Music.

For retrieving similar music, proportions of coded contours of each music should be found. After find them, compare between query and musical pieces in the DB. Musical pieces, that have common coded contours, can be thought that they are similar. Like this, programs retrieve musical pieces which have common coded contours with query.

To represent melodies, n-gram contours are used. They are geometric contours of n notes, transposition and tempo invariance must be secured because it is hard to cognize variation of melodic similarity due to key or tempo changes. The representing method of melodies is based on the method proposed in [8]

There are too many n-gram contours in the DB, so the relations between these are hard to define. If n-gram contours are represented as a mixture of typical contours (coded contours), the relation or distance between n-gram contours can be defined easily. The n-gram contours are clustered with similar ones by the Gaussian mixture model(GMM)

3. CHARACTERISTICS OF TWO PROGRAMS

3.1 coded melodic contour model for Whole DB

This program calculates similarity using the whole DB. It takes query and calculate similarity to whole DB. Clustering for find coded contours is not included becaese coded contours are given.

3.2 coded melodic contour model for Partitioned DB

Essen collection has quite large amount of MIDI files. So, finding coded contours in the whole DB take a lot of time and memory. Thus, this program divides the DB into 7 parts. And, it filters 100 most similar MIDI files from each part. After filtering 700 MIDI files, find coded contours from it. And then, it retrieves similar MIDI files.

4. EVALUATION

5. CONCLUSION

This paper proposes an algorithm to retrieve music pieces which are similar to the query based on symbolic music similarity via coded melodic contour model. The algorithm uses n-gram contours which are approximated to the melodic contour as features which are transposition and tempo invariance. To obtain coded contours ,which represent typical melodic contours, the n-gram contours of whole music pieces in the DB are clustered using GMM.

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