

A NUMERIC INDEXING AND ACCESS MECHANISM FOR MELODY RETRIEVAL

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Received April 2010; revised August 2010

ABSTRACT. *The increasing availability of digital music has created a need for effective music retrieval methods. Existing approaches, such as the n-gram indexing methods, create indexes full of redundancies. In this paper, a numeric index construction method is used for efficient content-based melody retrieval. Music phrases are adopted as the basic unit for processing, with each phrase having a unique numeric index. The proposed method significantly reduces the required processing time and storage for retrieval and indexing. For similarity matching, an approach that solves the problems caused by the complex interaction of substitution, insertion, and deletion errors is proposed. The proposed approach is compared with n-gram method and its effectiveness in melody retrieval is demonstrated. In addition, extensive experiments show its robustness against various kinds of query error.*

Keywords: Music retrieval system, Content-based retrieval, Similarity matching

1. Introduction. As the storage capacity of computers and consumer products increases, the size of personal music collections has correspondingly increased. Efficient tools for retrieving music are thus necessary [1, 2, 3, 4]. Many search and retrieval tools work with textual specifications, such as song titles and names of singers and composers. However, music content analysis that uses more natural query methods is lacking. It is quite natural to recall music by its content. Therefore, content-based music information retrieval (MIR) systems are of primary importance. An appealing method is to allow the user to sing, hum, whistle or play (on an instrument) a piece of the music that he or she wishes to retrieve. Mulder et al. [5] referred to this as the query-by-melody (QBM) method.

Ghias et al. [6] transformed a music object into a string which consists of three kinds of symbol (“U”, “D” and “S”, representing a note which is higher than, lower than, or equal to the previous note, respectively). The string can be regarded as a coarse melodic contour of the music. The problem of music retrieval is then transformed into a problem of string matching.

N-grams, which have been extensively studied in the text retrieval community, have also been applied to music information retrieval [7, 8, 9, 10, 11, 12]. A sequence of characters (symbols) is divided into overlapping constant-length subsequences (substrings). A string formed from n adjacent characters within a sequence is called an n -gram. For example, the string ‘abcbca’ comprises the following 4-grams: ‘abcb’, ‘bcbc’ and ‘cbca’. Downie and Nelson [7] adopted this technique to develop a MIR system. The songs were converted