A MEMORY-BASED APPROACH TO METER INDUCTION

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Background

Meter induction has been an important topic in the computational modeling of music cognition for quite some time now (Desain & Honing, 1994). In this research an attempt is made to model how listeners arrive at a metrical interpretation of a fragment of music. There is a vast amount of literature on modeling this phenomenon, using a large variety of computational paradigms. One class of models is based on the Gestalt principles of perception, 'simplicity' or ease of encoding being a key aspect. An alternative to this approach are models based on the notion of 'likelihood', so called memory-based models. The latter stress the role of sheer exposure to music and try to explain structural interpretations in terms of the most probable metrical coding, as opposed to the former approach that searches for the simplest encoding of the input.

Aims

In this paper we will adapt a number of memory-based models (Manning & Schuetze, 1999) for parsing metrical structure. In particular, we will use the models covered by the Data-Oriented Parsing (DOP) framework (Bod, 1998). The DOP framework defines a large class of probabilistic grammars by taking all subtrees from an annotated corpus to form a general Probabilistic Tree Grammar. We will assess in how far these probabilistic grammars offer an alternative to other computational paradigms.

Method

The two corpora used in this study are all National Anthems (105 songs, see Desain & Honing, 1999) and the Essen Folksong Collection (5860 songs, see Schraffrath, 1995). As evaluation method, we used 10-fold blind testing where 90% of the trees of each corpus were used for training and 10% for testing. To establish how well memory-based models scale to different domains, we tested our models also by training on one corpus and testing on the other.

Results

Preliminary results show that the system found correct upbeats in 62% (18.7) (standard deviation between brackets) of the test set of the Anthem corpus. The system assigns structure in the form of pairs of brackets indicating bar and sub-bar levels. The system reached 95% (1.3) precision (correctly found pairs of brackets). The system arrived at 97% (0.7) recall (correct structure it could have found. This is encouraging since this training set is relatively small. Furthermore, only rhythms of size 64 (64 32nd notes) were given to the system to structure. We expect the results for the Essen corpus to be even better. The final results will be presented compared to a number of baseline models used in previous studies.

Conclusions

Memory-based models could say something about the role of musical idiom in meter induction. It might well be that certain rhythmical patterns are a strong clue for a metrical interpretation by a listener, simply because s/he has heard these patterns often in those metrical contexts. As such a memory-based models can be expected to predict the proper metrical interpretation for these often heard rhythmical patterns.

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