STRUCTURAL SEGMENTATION - MIREX 2009

N.N.

ABSTRACT

The paper describes our submission to the MIREX 2009 Structural Segmentation Task. The algorithm is presented and the task results are discussed.

1 INTRODUCTION

Structural segmentation of songs is a MIREX task that is held for the first time in 2009.

The submitted algorithm extracts a non-hierarchical structure description of a song using harmonic features. The description consists of start times for each identified segment as well as generic identifiers like A, B or C. All occurances of the same segment type are denoted with the same identifier.

2 ALGORITHM DESCRIPTION

The chosen approach uses local information change through time as the basis. Timbral features and beat onsets are incorporated. Unsupervised clustering with some heuristic constraints is performed.

The algorithm is in prototype stage, some effort has been invested to improve runtime performance, though.

2.1 Structure Output

Our algorithm divides songs in non-overlapping segments that cover the whole piece of music. No parts are left unexplained. Segments that occur only once in a song are possible.

2.2 Parameter Sets

As the granularity of the groundtruth annotations is unknown to us we decided to create three sets of pre-set parameter values for this MIREX contest, (1), (2) and (3). Basically, we change the parameter that controls how much neighboring frames are taken into account when searching for segment boundaries.

(1) provides the best results on our diverse training set whereas (2) tends to produce longer segments and (3) usually delivers shorter ones.

2.3 Dependencies

The algorithm is implemented as Matlab `m` file and uses the Signal Processing Toolbox.

2.4 Computation Time

Runtime on a 2.5 GHz Intel Core2 Duo laptop is approximately 11 s per song for first time run. Subsequent runs take only a tenth of the time since beat onset information and feature vectors need not be calculated again.

3 RESULTS

3.1 Evaluation Measures

For this task, a number of evaluation measures have been calculated. The following table shows the numbers which are published on the MIREX 2009 wiki [1] . Our entries are marked with ANO1 and ANO2. Please refer to the website for explanations of

EvalMeasure	ANO1	ANO2	GP	MND	PK
overSegScore	0.63	0.65	0.60	0.73	0.59
underSegScore	0.63	0.57	0.67	0.61	0.78
pwF	0.58	0.57	0.53	0.59	0.54
pwPrecision	0.59	0.54	0.62	0.56	0.74
pwRecall	0.61	0.67	0.50	0.71	0.46
R	0.76	0.73	0.75	0.74	0.79
Fmeasure@0.5s	0.18	0.12	0.18	0.20	0.27
precRate@0.5s	0.16	0.12	0.14	0.15	0.24
recRate@0.5s	0.22	0.13	0.25	0.35	0.32
Fmeasure@3s	0.58	0.58	0.49	0.39	0.53
precRate@3s	0.51	0.57	0.39	0.29	0.47
recRate@3s	0.71	0.61	0.69	0.69	0.63

The figures show that our algorithm performs best in one category: Hit rate F measure with an allowed deviation of 3 seconds. In the related category F measure with half a second deviation our algorithm scores worst. Thus, the focus of improving our program lies in the local optimization of segment boundaries found.

[1] `http://www.music-ir.org/mirex/2009/index.php/Music_Structure_Segmentation_Results`

3.2 Runtime

Runtimes, taken from MIREX 2009 website:

Participant	Runtime(hh:mm)
ANO1	01:42
ANO2	01:38
GP	04:12
MND	09:12
PK	09:53

We can learn from these numbers that our algorithm is very fast, in fact it runs more than two times faster than the second fastest one.