

Applying Rhythmic Similarity based on Inner Metric Analysis to Folksong Research

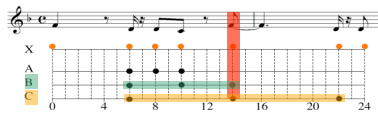
Anja Volk, Jörg Garbers, Peter van Kranenburg, Frans Wiering, Louis P. Grijp, Remco C. Veltkamp

Department of Information and Computing Sciences, Utrecht University

Inner Metric Analysis

Symbolic metric information

- Metric weight for each note based on local meters (chains of equally based onsets)
- Weight profiles reflect metric hierarchies generated by the notes



$$m(s, d, k) = \{s + id, i = 0, \dots, k\} \subset X$$

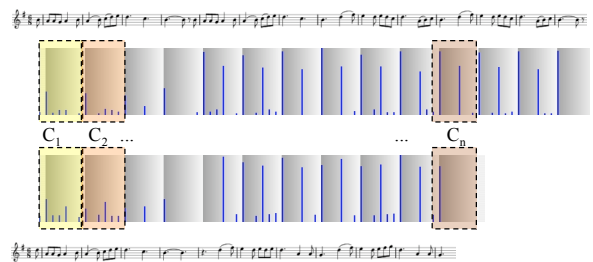
$$M(\ell) = \{m(s, d, k) : k \geq \ell\}$$

$$W_{\ell,p}(o) = \sum_{\{m \in M(\ell) : o \in m\}} k^p$$

Rhythmic Similarity

Measure similarity between metric weights

- Mean of correlation coefficients between weight patches



$$IMA_{c,s} = \frac{1}{\min(n,m)} \sum_{k=1}^{\min(n,m)} c_k$$

Evaluation on Folksongs

Rhythmic similarity as part of melodic similarity

Hypothesis

- Rhythmic similarity plays a central role in melodic similarity

Experiment

- Onder de Groene Linde: collection of Dutch folksongs transmitted through oral tradition; contains many variants for one song
- Test collection of 140 melodies classified into groups of similar melodies
- For each melody group one melody used as query, all other melodies of the corpus ranked according to rhythmic similarity
- $IMA_{c,s}$ compared to *rhytGauss* (*SIMILE*)

Results

Melody Group	Group Size	Mean Rank $IMA_{c,s}$	Mean Rank <i>rhytGauss</i>	F-score $IMA_{c,s}$	F-score <i>rhytGauss</i>
Deze Morgen	15	42.49	38.62	0.581	0.645
Halewijn 2	11	10.18	15.54	0.818	0.273
Halewijn 4	11	26.45	73.64	0.636	0.27
Halewijn 5	8	25.5	46.25	0.375	0.25
Frankrijk 1	11	8.63	15	0.638	0.57
Frankrijk 2	47	45.51	55.53	0.818	0.273
Jonkheer 1	8	39.87	30.37	0.25	0.5
Moeder 1	11	15.27	24.72	0.72	0.54
Deze Morgen 6/8	12	11.08	8.16	0.583	0.75
Frankrijk 2, 6/8	36	24.88	32.41	0.833	0.639
Frankrijk 2, 3/4	11	6.81	17.36	0.909	0.818

Conclusions

- $IMA_{c,s}$ outperforms *rhytGauss* on most of these melody groups
- Many songs can be retrieved by rhythm only
- Rhythmic similarity is an important aspect of melodic similarity



Universiteit Utrecht



Project no 640-003 501



WITCHCRAFT

