Time-delayed Melody Surfaces for Rāga Recognition

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Rāga in Indian art Music

- Hindustani (North-Indian), Carnatic (South-Indian) music
- Rāga: melody framework, Tāla: rhythm framework
- Rāga: svaras, aroha-avroha, Characteristic phrases, Calan

Time-delayed Melody Surfaces (TDMS)

- Predominant melody estimation (Salamon et al.)
- Tonic normalization (Gulati et al.)
- Surface generation (Parameter: τ)

Power Compression
- Gaussian smoothing (Parameter: α,φ)

M - Frobenius norm M_
KL - Symmetric Kullback-Leibler divergence
B - Bhattacharyya distance

Cont. Inst. - Gulati et al.
Cont. Stat. - Current study

Results

<table>
<thead>
<tr>
<th>Data set</th>
<th>M_f</th>
<th>M_KL</th>
<th>M_B</th>
<th>E_PCD</th>
<th>E_VSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMD</td>
<td>91.3</td>
<td>97.7</td>
<td>97.7</td>
<td>91.7</td>
<td>83.0</td>
</tr>
<tr>
<td>CMD</td>
<td>81.5</td>
<td>86.7</td>
<td>86.7</td>
<td>73.1</td>
<td>68.1</td>
</tr>
</tbody>
</table>

Accuracy (%)

(a) Time (seconds)
(b) Internal parameter α

Summary

- TDMS representation of melody captures useful tonal and temporal characteristic features of rāgas
- TDMSs significantly outperform state-of-the-art in rāga recognition
- Kullback-Leibler and Bhattacharyya distance are more appropriate for computing distances between TDMS
- Performance of TDMS is invariant to a large range of different parameter values

References