OPTIMISING PARAMETER WEIGHTS IN MODELS FOR MELODIC SEGMENTATION

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Background

There are few computational models for the segmentation of melodies. All models like Lerdahl's and Jackendoff's GTTM, Tenney and Polansky's 'Temporal Gestalt Perception', Cambouropoulos' 'Local Boundary Detection Model', and the Model by David Temperley rely basically on differences of parameters of successive notes. Those are weighted and linearly combined to give a distance measure, which indicates group boundaries at local maxima or by optimising an accumulated score. None of these models allows the adjustment of parameter weights by empirical data.

Aims

The aim of this work is to show that parameters for segmentation can be learned from empirical data using Iterative Training, a method for learning structured data based on error backpropagation. A linear and non-linear models are evaluated and the learnt weights are compared to the literature.

Method

In an experiment, subjects segmented randomly generated melodies. We used this data to train and test linear regression, a neural network, and a neuro-fuzzy-model based on a full set of parameters (temporal proximity, intensity, tonal proximity, group length, group duration, constant interval direction).

Results

In the experiment the neuro-fuzzy and multi-layer-perceptron models performed better than the linear regression model. The learnt weights show a strong influence of temporal proximity, pitch distance and less of dynamics and melodic turns as could be expected by the literature. Group length and duration also have considerable influence.

Conclusions

The weights of factors temporal proximity, pitch, dynamic accents and constant interval direction can be learned from data and used in a working computational model for melodic segmentation. The learnt parameter weights are generally in accordance with the literature, but automatic learning enables fine-tuning weights to specific purposes and adjusting larger numbers of parameters in a consistent way.

ISBN: 3-931852-66-0
ISSN: 1617-6847