ISE575/CSCI575

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Mohammad Anwar Hossain
Student ID: 8813190224

<u>A Formal Theory for the Discovery of Local Boundaries in a Melodic Surface</u>

By – Emilios Cambouropoulos

In nutshell, what the paper is about?

A model to detect local boundaries in melodic surfaces is introduced. This Local Boundary Detection model is proposed to be a more effective method for lower level segmentation compared to existing models. The LBDM is an extended and adjusted version of the Gestalt rules.

What is Detection of Local Boundaries and why is it important?

The detection of local boundaries and the systematic understanding of music is an important facet of real-time musical segmentation.

Background on the topics and the previous efforts:

The LBDM introduced in this paper attempts to address several issues of the current boundary detection methods, including the Gestalt rules of proximity and similarity. The Gestalt principles are a set of heuristic rules that suggest preferential ways of grouping mainly visual events into larger scale groups. This has grown into a volume of work discussing the use of proximity and similarity as a means of providing cohesion and clustering.

The specific issues addressed in this paper include 1) the problems/limitations and inconsistencies of the Gestalt rules, 2) A more general & clear way to define low-level rules of perceptual organization and 3) the construction of a general fundamental theory to define all possible grouping boundaries (as opposed to the current set of heuristic rules).

Discussion on Proposed Methods:

The LBDM includes an Identity-Change and Proximity Rules. The Identity-Change rule is where grouping boundaries is and can be introduced only between two no-identical elements. Identical elements don't have any boundaries between them. The Proximity rule states that amongst 3 adjacent objects, the two that are closest together will form a group – and thus a boundary will be inserted between the group of two and the other object.

The LBDM is initially presented by an exemplifying its application to the musical events of pitch, dynamics, rests and articulation. Several tunes and lengths of music, from classical to contemporary were considered to exemplify the LBDM rules. All of the examples showed that the LDBM is an effective method to determine local boundaries. Of particular interest is actually the last section that discusses additional refinements in the method. Each of these will lead to even more accurate descriptions of the low-level grouping structure. These refinements revolve around 5 areas: a) the parametric profiles can be assigned different weights depending on prominence of a melodic surface, b) the numeric value of the Proximity Rule can be increased to produce sharper local maxima, c) the identity-change relations may be refined by taken the interval size into account, d) examining the total size of intervals, the appropriate prominence of the perceived boundary is realized, e) values under slurs may be connected or deleted altogether.

This refined LBDM includes various facets of similarity more effectively and can be incorporated in real-time systems that segment input musical data.

Conclusion:

In this paper a formal theory has been described that attempts to define local boundaries in a given melodic surface. The proposed Local Boundary Detection Model is based on two rules, namely the Identity-Change and the Proximity rules, and it is suggested that it presents (especially the refined version) a more effective and general method for low-level segmentation in comparison to other existing models.