A Formal Theory For The Discovery of Local Boundaries in a Melodic Surface (Cambouropoulos) *Naru Sundar, ISE 575*

This paper proposed a general theory for finding groupings in an input sequence of notes based on various parameters such as pitch or duration. The approach was meant to supersede the Gestalt Theory of Tonal Music by exploiting its limitations and inconsistencies. To preface this discussion, I found the paper not as clear as other paper's we have discussed so far. It offered too many diagrams without a clear picture of the meaning behind them. The proposed theory is named the LBDM or Local Boundary Detection model.

The theory is based on two fundamental principles. The first is the identity-change rule which although formally noted (or obfuscated as the case may be) is simply expressing the notion that observers tend to assign group boundaries on instances of noticeable changes. That is, a repetitive sequence with one note out of four being different will tend to be seen as grouped either before or after the note that is not repeated. The second rule is the proximity rule which indicates that grouping boundaries are implied at longer intervals, or conversely fragments with short intervals tend to be grouped together.

The theory works as follows. Considering a simple sequence of notes, we construct a series of intervals on the metric we are using. For example note metrics could assign an absolute number to each note, all that we really care about is the interval. The interval deltas are then further described by 0 for no change, + for the case where the first delta is greater than the second delta and - for the case where the first delta is less than the second delta. For longer note sequences a matrix of all possible transition types is constructed, scores being assigned as the count of instances of that particular interval sequence. Then the columns of the matrix are summed, with the highest summed transition being the presumed boundary. The theory does allow for ambiguity in case that multiple intervals are represented by the maximum. This part of the paper wasn't particularly clear. It was unclear how this matrix representation was used later to compute the final LBDM sums.

The process described, as unclear as it was, could be applied to different metrics, with the results being summed. This allowed different features such as note duration and pitch to contribute to the boundary finding. The refinements section discussed weighting these different metrics based on the expected degree of prominence. I found this a faulty approach since the paper was attempting to be general, but any attempt at parameterizing the different metrics would result in skewing the generality towards the test set. Another refinement was adjusting the rule scoring to produce sharper maxima. This was unclear, but most likely because I did not feel the paper clearly explained the rule computation scheme. The third refinement was to skew the interval values for 0, + and - based on the ratio of the change. This seemed a useful modification since large pitch differences could indicate a boundary of some sort, and long rest sequences clearly would indicate a boundary. I found the paper weak in its description of results. Examples of the theory in use were given on relatively tiny sequences, certainly only monophonic sequences. It would be interesting to augment this theory so it could handle polyphonic material, and see how well it identifies boundaries in multi-voiced data.