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Dissimilarity Measures and Emotional Responses to Music

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Background: A common method of studying emotional responses to music is to have listeners describe their internal states using words. Many studies, however, constrain the listener to one or two valenced dimensions. Empirical results, as well as introspective experience, suggests that emotional responses to music are much more elaborate and oftentimes conflicting.

Aims: The goal of this study was to develop a more nuanced method of measuring emotional response to musical excerpts. We explored self-report by having subjects choose from a subset of descriptors and analyzed the data using dissimilarity metrics.

Method: We presented to musically-trained listeners (N=7) twenty-two excerpts (M=53s) of non-vocal pieces from Western music. Following each excerpt, listeners saw a list of sixteen words (chosen from prior studies) and selected the words that described their emotional experience. Selection of a word then required listeners to rate the strength on a scale from 1.0 to 9.0 (unselected words received a value of 0.0).

We used four dissimilarity metrics to compute the distance between descriptors: 1) non-Euclidean measures such as Manhattan and Hamming distance (where a word's strength was one if selected, zero otherwise); 2) two measures developed to incorporate prior hypotheses: common distance, which only computed the distance between words if they were both selected; and weighted Manhattan distance, where non-common selection of words was weighted less than common selection. This created a dissimilarity matrix which was visualized in 2D using classical multi-dimensional scaling (MDS).

Results: Via the MDS solution and across all measures, we viewed a segregation of terms into axes of passive to active (calm and relaxed on one end, ecstatic, tense, and angry on the other) and pleasurable to sad. These results fit well with other studies that have found similar distributions of terms, but required subjects to rate all of the words.

Conclusion: While our results are preliminary, they do suggest the utility of the proposed approach. We allowed subjects to choose only those words that were pertinent to their emotional experience. The early results also corroborate with prior findings in the literature. Further work will involve development of more domain-specific dissimilarity measures.