

23 Perception of Dyads of Impulsive and Sustained Sounds

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Perception of instrumental blends is important for understanding aspects of orchestration. Previous work (Kendall & Carterette, 1991; Sandell 1995) has focused on dyads of sustained sounds. However a common technique in orchestration consists of using mixtures of impulsive and sustained sounds. The first experiment identified the factors that influence the blending of dyads, i.e., whether they are perceived as one or two sounds. 11 sustained and 11 impulsive sounds of the same pitch and loudness were used yielding a total of 121 dyads. Each participant rated each dyad four times on a continuous scale between “twoness” to indicate the absence of blend, and “oneness” to indicate perfect blend. We found that longer attack times and *lower* spectral centroids improve fusion. The choice of the impulsive sound thus seems more important than the choice of the sustained sound in controlling blend. The second experiment determined the factors that influence the perception of similarity between the dyads. Participants rated the dissimilarity on a continuous scale between pairs formed of 16 well-blended dyads chosen from the previous 121 to maximize the timbral variety. In this experiment, contrary to the first experiment, the sustained instrument had more influence on the perception of similarity. The mean spectral envelope of the dyad is the feature that best explains the similarity ratings, but the spectral envelope of the sustained sound is more important than the spectral envelope of the impulsive sound. A multidimensional scaling of the dyad dissimilarity ratings yields one dimension correlated with the attack time of the dyad and another dimension whose spectral correlate is different for two different clusters within the space, suggesting a combined categorical-analogical organization of the second dimension.

24 Blend, Identification, and Similarity of Differentially Orchestrated Wind Triads Correlated with Acoustical Analyses of Spectral Distribution and Roughness

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Previous experiments with orchestral triads in non-traditional orchestrations of flute, oboe, and clarinet are extended in this study. Traditional doublings within a triad are compared to less common orchestrations with separate instruments on each note. Major and minor triads (C5) were orchestrated using Kontakt Silver sampled oboe, clarinet and flute tones and incorporated doublings suggested by orchestration monographs. Unison doublings were enhanced with a chorus effect created by slightly misaligning the dyad tones’ fundamental frequency and onset time. Music-major subjects rated sets of triads on similarity, degree of blend, and participated in identification tasks for the soprano and bass instruments. Perceptual spaces derived from the similarity data corresponded well to previous multidimensional scalings where the first-dimension triad distribution was related to the timbre in the bass of the triad. Correlations with long-time-average spectral centroid were high for both major and minor contexts ($r = .98$ and $.94$ respectively). Calculations of roughness based on one of the authors’ formulations, using spectral time-frequency reassignment, correlated well with the major context’s first dimension as well. Higher blend ratings were obtained for major vs. minor orchestrations; additional analyses relate blend and identification to timbral combination. In particular, the similarity of clarinet and oboe timbres on G5, and their corresponding spectral similarities, appears to lead to identification difficulties.