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*Designing a Mathematical Measure of Musical Rhythm Complexity: Trials and Tribulations*

Several dozen mathematical measures of the complexity of musical rhythm are reviewed and compared with measures of performance and perceptual complexities based on experiments done with human subjects. Some of these measures were designed using purely mathematical considerations such as irregularity, some attempt to model the musical concept of syncopation, some are based on theoretical constructs from music theory, and others are based on information theory concepts such as entropy and data compression. The measures are compared using several data sets of rhythms, that were tested with human subjects, to obtain rankings of the rhythms according to the various complexity measures.

For each data set the complexity measures were compared with each other by calculating Spearman rank-correlation coefficients between the pairs of rankings. Phylogenetic trees were then used to visualize and cluster the matrix of rank correlation coefficients. Designing a mathematical measure that predicts well the human performance complexity remains a challenging open problem. However, the path to the goal uncovers interesting mathematical, psychological, and musicological questions.

This is joint work with Eric Thul.