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“The Perception of Metrical Structure: Experimental Evidence and a Model”  
By Christopher S. Lee

Lee develops a model for inferring the metric structure of music. The model works from left to right, comparing the note lengths of consecutive notes. The output of the model will give the time of the downbeat, the length of the bar, and the meter. There are four major improvements to earlier models. First, it has a preset variable called  $C$ , which determines how tolerant it is to new counter-evidence to the metrical hypothesis. Second, it assumes the first note of the sequence as being where the downbeat falls. Third, it can do metric sub-division and discover lower metric levels than the one established. Fourth, it takes into consideration tempo effects. The first part of the model calculates times,  $t_1$ ,  $t_2$ , and  $t_3$  which are onsets of consecutive notes. Initially, the times are calculated so that  $t_3 - t_2$  and  $t_2 - t_1$  are equal. If counter evidence exists and exceeds the variable  $C$ , then the times are readjusted. The routines to revise the metrical hypothesis are called update and stretch. Update moves the downbeat, while stretch modifies the beat-length. The local counter-evidence (LEV) is then added to the accumulated counter evidence (GEV). The two types of counter-evidence are a weak long note and a major syncopation. This is due to the listeners tendency to avoid interpretations with long weak notes or major syncopations. When considering tempo effects, the model revises a metrical grouping so that a tactus in a certain range is achieved. Also, there is a cut off point to where the model stops accumulating counter evidence. In metrical subdivision, it tries to establish groups of binary or ternary sub-divisions. Every time a level of metrical grouping is established, then the model determines if there are any notes in the sequence that occurs between consecutive beats of the lowest established metrical level. At the end of the paper, Lee attempts to solve some

problems with the model. The first is the inability to discover lower-level metrical groupings where the lowest-established units contain no subdivisions in a 2:1 ratio. The second is the subdivision routine's method of working in a top-down fashion and preferring binary subdivisions, which leads to biasing more towards one type of interpretation when others may be correct. The evaluation routine is not about to evaluate the work of the subdivision routine or the beat-length updates. Also, the program gives up parsing when several possible interpretations are eliminated. Lee gives a solution of parallelism that would solve a few of the above problems. Lee does do a good job of pointing out the fallacies of the model and does try to recommend some type of solution. Also, Lee tries to create this model with the way that human listener does this perception of metric structure.