Readings by London, Longuet-Higgins/Steedman, and Temperley

Q1) What would you say is the "take-home" message [from London]? What are the implications for the way we think about rhythm and meter?

London bases his discussion of rhythm and meter on the perceptual limitations of human hearing. In particular, humans can only detect rhythmic periodicity between the ranges of 100 ms and 5-6 seconds. Because of these perceptual boundaries, we can only "grasp a sense of beat or tempo" in the range of about 200-250 ms to 2 seconds (46). The floor and ceiling values for this tempo range derive from the need for rhythmic hierarchy, as each only allows a single subdivision or grouping before our perceptual boundaries are surpassed. London also references the "maximal pulse salience" of tempi around 500-750 ms (i.e. 80-120 bpm), thus providing a psychological basis for the music theorists' notion of tactus.

Through his Figures 2.5 and 2.6, London lays out how our sense of tactus and the concomitant possible subdivision and groupings of the beat fall within our perceptual boundaries (42-44). The relative paucity of "comfortable" ternary options in these illustrations provides a plausible hypothesis to explain the apparent compositional preference for duple meters (46). Another implication is that "as the tempo changes there may be changes in the perception of the perceived beat" since certain subdivisions and groupings may fall out of or back into our perceptual boundaries given a new tactus (46). Moreover, musicians "may gravitate toward those tempos that allow for a resonance in the range of maximal salience and avoid those tempos that do not" (43). As may be obvious to musicians, therefore, optimum tempi are possibly decided not by the tactus level at all but by the most ideal placement of small subdivisions and large groupings of this tactus within our cognitive hearing abilities.

Compare and contrast the "beat-finding" models of Temperley and Longuet-Higgens/Steedman (L-H/S) with regard to the following issues:

Q1) What is the nature of the input representation–what kind of information is given to the model? Are rhythms represented in a manner similar to music notation, or with raw timing data? Is pitch considered at all?

The L-H/S model relies "solely on the relative durations of the notes and rests, as they are given in the score" (226). No expressive or performance variations are taken into consideration. The rhythms used in their model are thus similar to music notation. "The pitch of each note is disregarded" in the L-H/S model, though. This exclusion of pitch information stands as a limitation that even the authors themselves admit is "quite severe" (226).

In Temperley's model, both raw timing data and musical-notation information were used. Expert-level performances of standard repertoire works were captured as MIDI data, while quantized versions of the music were also input as a notationally-accurate corollary. Temperley did not optimize "over both the metrical and harmonic rules," but pitch and chordal information were considered in refinements of the model (46). For example, the output of the metrical algorithm was given as an input to Temperley's harmonic program and then re-input to a modified metrical algorithm (46). Also, Temperley experimented with L&J's MPR 6, which prefers a stable bass. The harmonic information, however, was found to be "more useful than bass-note information as a cue to metrical structure" (47).

Q2) What is the nature of the output–the analysis that the model generates?

The results from the L-H/S model attempt to match the time signatures of the original pieces. L-H/S developed a slightly modified version of time signatures which takes into account different levels of groupings within that time signature. In their Table 1 on p. 230, a list of observed time signatures is contrasted with a list of the correct time signatures. In this list, however, only two fugue subjects appear to have had their time signatures modeled as notated. While many of the L-H/S results are close to the notated meters they are attempting to extract, the general imperfection of the model perhaps stands as a testament to the sometimes indistinct character of meter, particularly in the Baroque era.

The goal of Temperley's model was to extract tactus-level information from the performances along with sub- and super-tactus levels. In fact, each metrical level could be separately analyzed in Temperley's model. With this information, L&J-style metrical dot diagrams could be constructed to show the metrical structure of the piece. One significant issue with Temperley's model was detecting the proper phase for the output dot diagrams. This issue arose since long notes, typically considered metrically strong, often occur at the ends of phrases. The inclusion of harmonic information was seen as an important requirement to best resolve this issue.

Q3) Does the model build up its analysis in a "left-to-right" manner, or does it wait until it has seen the whole piece and then generate its analysis?

The analysis of L-H/S was designed "to describe the mental processes of the listener" (223). Thus their model worked in a "left-to-right" manner, much like music confronts a listener bit by bit through the passage of time. This "progressive character of musical comprehension" is contained within their "rule of congruence," where the model attempts to account for each successive note within a possible metrical structure until (and only until) it is impossible to continue to do so (223-4).

Temperley was less concerned with modeling the "real-time" aspect of the listener and more concerned with developing a model that gave the best analytical results from the input file. The recursive nature of some of the functions, such as running data through a metric algorithm, then through a harmonic algorithm, and back again through a revised metric algorithm, necessarily involved a non-real-time process.

WORKS CITED

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