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Just in Time as a scientific interface between rhythm composition and performance

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In apparent contradiction to the commonly addressed "naturalness" of rhythm and its intrinsic relation with humans, the study of this music parameter has received only modest attention from the Western theory of music, as compared with the study of pitch issues (in the form of melody and harmony). Throughout the history of Western music, composers and performers developed the articulations of temporal structure to a remarkably high level of imaginative skill and proficiency in matters effecting phrase lengths, rhythmic combinations, and the architectonics of music and structural proportions. From a rhythmic point of view, however, these practical achievements were rarely matched or accompanied by theoretical consideration of the problems they faced or the solutions at which they arrived: rhythm and meter were generally seen as subordinate to pitch structure. Using the rhythmic theoretical tool *Just in Time*, this paper presents a rhythmic analysis of the first part of the A section of the jazz tune *After You've Gone* by Creamer e Layton, as well as Benny Goodman's improvisation in the same section. Within the context of composition/notation (original tune), and improvisation/performance (Goodman's version), the proposed rhythmic model provides useful insights about some of the processes involved in rhythmic composition and performance.

Keywords: theory; analysis; perception; rhythm; meter

One of the aims of the theoretical construct *Just in Time* (Lopes 2003) was to develop a way in which a critical "voice" can also be given to the so-called "musical surface." As opposed to pitch relationships, which show up at all levels of conventional music theory, durational relationships (rhythm and meter) are usually seen as confined to the musical surface, and thus as lacking critical value; not, in short, a concern of the connoisseur. This (traditional)

positioning of the durational parameters of music is well demonstrated in the work of Cooper and Meyer (1960), Yeston (1976), and Lerdhal and Jackendoff (1983), just to name a few. It is, then, exactly the perceptual qualities of the music surface, of which rhythm and meter are among the most important, that should be the concern of a music theory aiming to do justice to the listener: a music theory, therefore, with a more contemporary (i.e. inclusive) stance.

MAIN CONTRIBUTION

Many empirical studies on the perception of music, such as the ones conducted by Drake *et al.* (1991) and Drake and Botte (1993), where the perceptual significance of accent structures derived entirely from the durational parameters of music is compared to those derived from pitch, reveal a minor but systematic difference favoring the perceptual importance of duration-related parameters. In line with this, *Just in Time* created a systematic rhythm and meter model that is closely related to the perception of music, since it was based on empirical experiments. Such a model can then be used to predict the relative salience and perceptual qualities (e.g. kinesis) of different durational patterns.

Just in Time revisited

The following is a *Just in Time* analysis of a rhythmic sequence; it is assumed that a successful inference of the notated rhythm and meter has taken place (so that the metrical framework is known from the start). As shown in Figure 1, the quarter-note at 1:1 is an extremely salient pulse: not only it is stable because of its strong metrical placement, but also it is a long pulse (agogic accentuation), and further accentuated by the preceding two small pulses (rhythm cell accentuation). The rhythm cell on the second beat is isochronous and does not accentuate the following pulse 1:3 because it is longer than the ensuing eighth-notes.

The internal organization of the rhythm cell at 1:3 accentuates the eighth-note on the upbeat. Although similar to that at 1:2, the rhythm cell at 1:4 receives an analytical notation because it precedes a longer pulse, which it further accentuates. In this way, and similarly to that at 1:1, the quarter-note at 2:1 is an extremely salient pulse. In measure two, the second, third, and fourth beats create a rhythm motif, as notated, with the short pulses in beats two and three further accentuating the quarter-note at 2:4; this too becomes an extremely salient pulse, as indeed does the half-note at 3:1, the longest duration in the sequence.

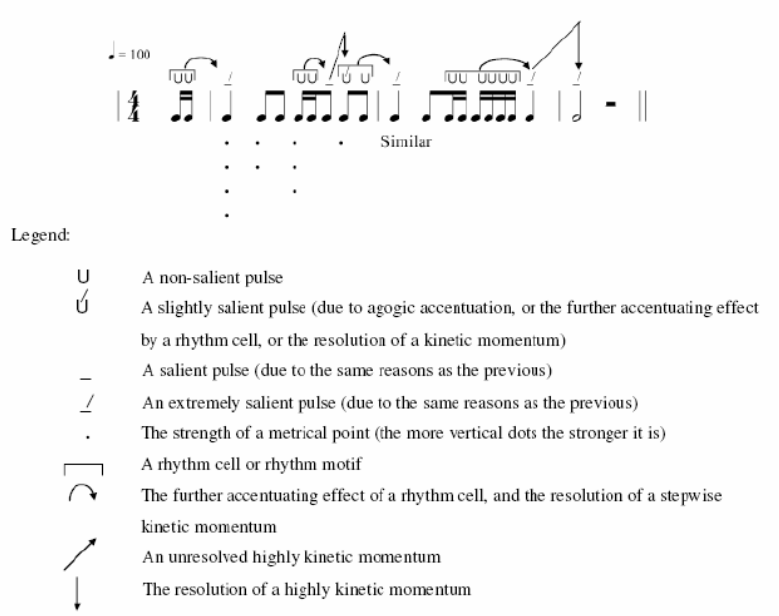

Figure 1. A *Just in Time* rhythmic analysis.

While these are the primary saliences, there are others, such as the eighth-notes at 1:2 and 2:2. These are, after all, long as compared to the surrounding sixteenth-notes, and they are also placed on the first part of the second beat of a quaternary meter. As the meter stratum notation indicates, this metrical point is the third strongest of the sixteen points which comprise the lowest realized metrical level in this sequence (i.e. the eighth-note level). The eighth-note at the first part of 1:4 will also receive some extra accentuation due to the resolution of a high kinetic momentum.

Considering the quality of kinesis which is conveyed by this sequence, following the stable quarter-note on 1:1, we can now better assess the isochronous rhythm cell at 1:2 : it is part of an increase in pulse density which culminates in the accentuation of the second eighth-note of 1:3. This pulse density increase (two eighths plus two sixteenths) also creates an increase of kinesis.

The second eighth-note of 1:3 also releases kinesis because it is a salient pulse on a weak metrical point. Unlike the stepwise kinesis resulting from pulse density, this type of perceptual motion implies a far-reaching release of

kinesis. Because this highly kinetic momentum causes great instability, it needs resolution, which is accomplished through the charging of the next relatively strong metrical point. The expected resolution of this highly kinetic momentum further accentuates the eighth-note on 1:4. Implying stepwise kinesis, the rhythm cell at 1:4 in turn accentuates 2:1. If the sequence is being heard for the first time, then it will be only here, following this highly kinetic momentum, that the metrical context will be stabilized. Further stepwise kinetic potential starts to be realized at 2:2, which culminates in the extreme salience of 2:4, releasing an even greater amount of kinesis. As before, this momentum is resolved at 3:1, and hence further accentuating the quarter-note and stabilizing the metrical context.

In short, the rhythmic structure of the sequence makes some pulses more salient or kinetic than others, and hence more prominent to the listener. In this way, the qualities resulting from a rhythmic construct can be measured against that resulting from other musical parameters. By providing a means to assess rhythmic pulse salience, the proposed rhythmic model becomes a specialized tool within an overall analytical approach.

The bridge between rhythm composition and performance

We will now proceed to evaluate in which ways *Just in Time* is able to provide insights into the relation between rhythm composition and performance. For this, we will analyze the first few bars of the A section of the Jazz tune *After You've Gone*' as improvised by Benny Goodman.

The solo starts at the break. Goodman's choice to start the solo on the third beat of the quaternary measure, which is only the second strongest beat in the measure, shows a way to infer as early as possible some kinetic qualities. One should also mention that the first four beats present the so-called jazz groove: shorter notes on the second and fourth beats. The choice of this construction is well in line with one of the main composition principles: the introduction as early as possible of the main theme. The solo follows with an eighth-note rhythm motif during one and a half measures, stabilizing the kinetic momentum initiated. The last measure of the break introduces rhythm cells on the first and second beats containing two sixteenth-notes on the beat's weak part, raising the perception of kinesis and accentuating the following beats. In the second beat, this rhythm cell is followed by a rest which abruptly stops the kinesis and its resolution; in this way, Goodman clearly states the end of the break and the beginning of a new section.

This section is efficiently inferred through the return of the jazz groove on the fourth beat of the last measure of the break. By preceding a long note on

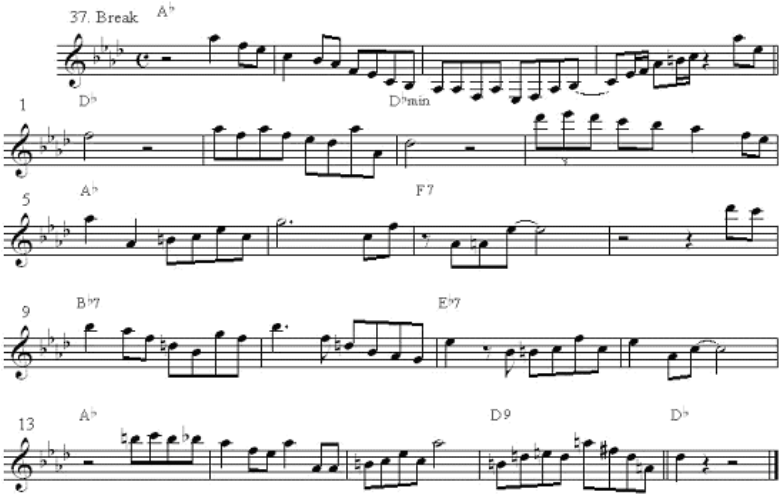

Figure 2. The solo.

the first beat of the first measure of the theme, these eighth-notes also accentuate the half-note on the first beat, clearly initiating a new structure. The first four measures present a dual structure, in which long notes on the first and third measures correspond to a group of notes that almost fill measures two and four. This structure is relevant in many ways: from the highly kinesis point of view that is expected from this music genre, the placement of only one note on the most stable point in the measure is counterbalanced by the following highly kinetic measure. Also, the perception of the metric off-phase that exists between the original melody and the solo tends to raise the kinesis of this section. Although this music genre is highly kinetic, it exists over a clear metrical frame. Therefore, as in the break, Goodman rhythmically refers to this idea: a kinetic genre (i.e. motion measures two and four) over a controlled basis (the half-notes on measures one and three). Interesting to notice is that under the small harmonic motion of these measures, the design of the jazz groove at a hyper-metrical level becomes clear: less notes on the first and third measures, more notes on second and fourth measures.

IMPLICATIONS

Although in a brief way, we hope to have shown ways in which *Just in Time* relates to musical listening. As well as generating kinetic effects, rhythmic saliences can act as yardsticks in the listening process, helping to construct a cognitive framework within which moment-to-moment perceptions are organized. Because this model promotes a systematic understanding of the means to produce, underline, or contradict pulse salience and kinesis, it also has something to offer to the composer, performer, improviser, and music teacher.

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