Sacred Geometry

An Analysis of Pat Martino’s Improvisations on Just Friends and Welcome To A Prayer

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Pat Martino commands high status in the world of jazz, for his prodigious talents as a teenage jazz phenomenon, numerous awards, recording output and his remarkable recovery from extreme amnesia following a life-saving brain operation in 1980.

Martino has been particularly praised, from a young age, for his ability to execute long seamless improvised lines with a rhythmic feel which somehow manages to be both precise and relaxed (Fewell 1996). This particular time-feel is evident on Martino’s performance on the jazz standard Just Friends from his debut album El Hombre (Martino 1962, extract Example1.mp3). The tune is performed at around 230bpm, ≈260ms per crotchet, so a keen listener able to distinguish 13ms time differentials may perceive 5% slivers of the beat. This would imply the ability to distinguish at best five levels of swing from straight to 70%, and a similar number of values from -10% to +15% latency.

A swing and latency analysis of the melody and first improvised chorus reveals swing values mainly in the 50-63% range and latency (where possible to derive) is almost exclusively positive (behind the beat), largely occurring from 0 to +15% range. The calculation of latency, not always possible, was made in reference to the drums, which commanded a time-line monopoly for the purposes of this analysis.
A swing friction exists between the drums (with swing values of 62-74% and Martino’s lighter 50-63% range). However, Martino’s significant latency, particularly on his straighter quaver groups, brings his offbeat more in line with the absolute placement of the drums’ second quaver. Latency is only written in when directly calculable, but analysis (through extrapolation of note separation) suggests a general latency 0-15% range. An analysis of the solo break (Example2.mp3) illustrates this mechanism (Figure 1).

Figure 1 Transcription of the solo break from Just Friends (Extract2.mp3) with swing and latency values annotated.

A glance into the analytical process for this passage is provided in Figures 2 and 3 (p 4). The sonogram has been annotated with these swing values, as well as the drums’ ride pattern when distinct. Discrepancies between the drummer’s, and Martino’s, onbeats are analysed where possible, and latency calculated.
Figure 2 A sonogram analysis of bars 1-3 of Figure 3.6.1. Swing and latency values, where clear are annotated.

Figure 3 Sonogram analysis of bars 4-6 with swing values for guitar solo and ride pattern annotated. The swing friction between these values is softened by Martino's significant latency.
In this passage Martino’s swing value stays mainly between 50-63%, hardly crossing the drums approximate range of 62-70%\(^1\). However, Martino’s significant latency softens this friction. Since we are dealing with a 5% benchmark, these values can be approximated for the purposes of simple illustration. Consider a constant drum swing value of 65%, and Martino’s characteristic swing values of 50%, 55% and 60%. Figure 3.6.4 shows values of swing and latency that match the drummers offbeat placement of 65%. Although these time-feels have the same offbeat placement, they have significantly different effects, even at this brisk tempo. Example3.mp3 renders electronically a phrase in time-feels i-iv, to a 65% swing backing.

![Figure 4](image)

Figure 4 Four swing and latency combinations (i-iv) that share an offbeat placement of 65% (Example3.mp3).

Time-feel ii (60% swing and 5% latency) perhaps comes closest to a generalization of Martino’s feel, but it’s still not quite right. A closer listen to Example2.mp3 suggests that the first, and the last quaver pairs are generally more swung than the central material, and there are passages that are clearly straight. Limiting a reconstruction to the time-feel

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\(^1\) An enquiry into the whole solo, in fact, shows Martino’s tendency to swing more on melody notes and idiomatic bebop phrase endings than on long sustained lines.
values along the red line (the 65% offbeat ‘iso-contour’) the feel of the solo break may be reconstructed more convincingly, as outlined in Figure 5. The reconstruction generalises some of the details of the passage (in particular the swung and late quaver pair in bar 5, beat one) but much of the feel is captured, demonstrating the effectiveness of this sophisticated time-feel mechanism (Example4.mp3).

![Time-feel values diagram](Example4.mp3)

Figure 5 A generalized reconstruction of the solo break (top line) from *Just Friends* using time-feel values (i-iv) from Figure 3.6.4, all sharing 65% absolute offbeat placement (Example4.mp3).

How much of this sort of sophistication is apparent to Martino? The author was given, as composer for the soundtrack to a movie documentary of Martino’s life, an opportunity to shed some light on this question.

Martino’s writings on music are lucid and intriguing, particularly after his recovery when his representations and illustrations of harmony and the fretboard took on both a conceptual and aesthetic beauty (Martino 2004, Martino 2005) so illumination on the topic seemed likely. But, as is often the case with skilled practitioners, Martino does not have the same clarity when it comes to explaining his rhythmic approach, however refined it seems to be from an analyst’s perspective.

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2 *Martino: Unstrung* (2007) funded by the Wellcome Trust and released on Ken Loach’s Sixteen Films.
This hand [indicates right hand] is aggressive, and it's thoughtless, this side of me, this hand, is the drop out. This side [indicates left hand] is the graduate. [...] This side [indicating left hand] is Spock, this hand [indicates right hand] if I have to be honest with you, is not even Kirk…this side is the Klingon.

(Martino:Unstrung 2007)

So while Martino can write entire books on fretboard visualization, his rhythmic approach is described as “thoughtless”, even though this feature of his playing is highly sophisticated. Fortunately, Martino was very helpful to the author, participating in a specifically designed recorded session in order to dig deeper into his time-feel and rhythmic mechanisms.3

An arrangement of Martino’s ballad *Welcome To a Prayer* (Martino 2001) provided a suitable candidate for analysis of his rhythmic flexibility at a ballad tempo, and as this was a favoured track in gigs, his confidence with it was not in question. A metronomic backing track of the 24-bar chorus was made with as little ‘leading’ rhythmic information as possible so as not to impose any particular time-feel to his performance. The recording was prepared with a visual and audio quaver-click track, in this way it was possible to track with a high degree of accuracy the rhythmic placement of the performance against the master time-line.

A Gibson ES-175 fitted with heavy-gauge strings and a Roland GI-20 midi guitar system allowed a confident tablature transcription (as each string’s data was sent out of a unique midi channel), another method for retrieving micro-timing data, and the real time realization of visual representations of his improvisation using a purpose-built

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MAX/MSP patch (*Show of Hands*). These visualizations were inspired by Martino’s writings (*Nature of the Guitar* and *Sacred Geometry*) and allowed him to witness, in real-time, his theoretical concepts.4

At the start of the session, in an effort to calibrate the system as much as possible, Martino was requested to play onbeats to click for 32 bars to provide a helpful indication of how much, or little, rhythmic characteristics may be attributed to random noise and how much to purposeful expression. The results showed onbeats falling within 11ms either side of the click, providing a useful guideline to extract relevant data.

Four takes of two choruses each were recorded, included here is a detailed analysis of chorus one from the first take Example5.mp3.

The four page transcription of Martino’s first take includes four staves (Figure 6). The top stave displays the published lead sheet, and the second a transcription of Martino’s interpretation. The third stave describes latency in reference to the crotchet (at 47.5pm), with values below the central line representing notes that fall behind the notated rhythm, and above the line, rushing. When appropriate this stave switches to note separation values (a method also conducted by the author in analyses of Nick Mason’s drum fills). In these moments (Bar 11.2-12.4) more meaningful information is gained from this method rather than referencing the master time-line placement. The lowest stave shows a guitar tablature transcription, Martino’s fretboard concepts being an important focus in his literature. (Martino 2005, Martino 2007).

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4 The real-time translation of music improvisation to digital visuals is also explored in the author’s composition *Rat Park Live* and, in a reversed configuration, *Macrocosmos and Head Music*.
Figure 6.a Transcription of Martino’s performance on Welcome To a Prayer. The top stave displays the original lead sheet, below which is a standard transcription of Martino’s performance. A latency contour and guitar tablature make up the lower two staves (Example5.mp3).
Figure 6.b Page two of Martino’s performance on *Welcome To a Prayer*. In bar 11 the latency contour is transformed into a note separation curve to better accommodate the fluctuating rhythmic material (Example5.mp3).
Figure 6.c Page three of Martino’s performance on *Welcome To a Prayer* (Example5.mp3). Almost all melody notes are delayed.
Figure 6.d Page four of Martino’s performance on Welcome To a Prayer (Example5.mp3). A rare (and minimally) anticipated melody note occurs in bar 21.
Between the *Lead Sheet* and *Take One* staves, there are a series of arrows that signal, by their angles, the displacement of the rendered to the written melody. These are divided into primary and auxiliary melody notes - the distinction being based somewhat subjectively on note-length and melodic emphasis. What is immediately apparent is that virtually all the melody notes are delayed, with only two rhythmically anticipated melody notes, (bar 5 and 11 and these are auxiliary melody notes and only slightly early). In fact the key melody notes are so delayed they are played, with considerable dissonance, on the next bar’s harmony (See bars 4, 17, 21 in Figures 6.a, c and d respectively).

Melodic interpretation is a key component of jazz technique (Berliner 1994, p 187 and Crook 1999, p 119) and can offer as much improvisational expression as a ‘free’ solo. An illuminating way to reveal the degree of melodic transformation is by superimposing the written melody on top of the recorded solo. In this way the dialogue the performer holds with the melodic reference is revealed (Example6.mp3).

What may also be heard is that the delay in the melody notes tends to be compensated in several ways, as if their postponement obliges a corresponding emphasis. These late primary notes are often repeated (bars 2, 3, 6, 11, 13, 14, 15, 22 and 23), played with greater intensity (bars 1, 9 and 12) or played with rhythmic precision on identifiable subdivisions (twice in bar 3 and also in 6, 17, 19 and 23).

A musical effect is created by the varied delay of melody notes, and an expressive contour may be traced to this end. This allows the observation of a hidden but powerful musical mechanism: *melodic shadowing*. Distance from melody (in this case rhythmic) may change over time and this creates the opportunity for the jazz performer to impart improvisational expression in the context of melodic interpretation. Figure 7 (p 14) shows an analysis of the first eight bars of the performance and traces a contour.

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5 This concept of dynamic melodic shadowing is explored technologically in *Strike, Omnia and 11th Light* from the author’s portfolio.
describing the extent to which each melody note is displaced. The vertical height of the blue contour indicates the distance that the melody note at that original bar and beat position has been displaced. When a melody note is re-attacked, this is shown by different shades of blue (as indicated on the legend), at progressively higher positions.

Figure 7 Melodic displacement expressive contour for the first eight bars of Welcome To A Prayer, indicating the extent to which melody notes are displaced in the interpretation (melodic shadowing).

Figure 7 demonstrates the extent to which the melody is rhythmically displaced, and since this changes over time, an expressive contour emerges. However, displacement is not the only transformative mechanism employed by Martino. Insertion of approach notes, interjected phrases, melody note repetition, articulation and time-feel mechanisms all pull away from the written melodies by differing amounts in various musical dimensions. The concept of M-Space describes improvisation as the serial procession of related phrases through multi-dimensional musical space, with dynamic control of the degree of proximity between any new phrase and a dwindling memory of preceding material. The concept of melodic shadowing however introduces the idea of melodic interpretation as the improvisational control of musical proximity relative to a pre-existing, if unheard, set of phrases, a tacit parallel improvisation. Figure 8 illustrates the first five phrase units from Welcome To A Prayer as variously proximate phrases to the
‘platonic ideal’ fixed melody units, with a changing set of salient transformative mechanisms indicated.

Figure 8 An M-Space illustration of melodic shadowing for the first eight bars of Welcome To a Prayer. Melodic interpretation is seen as the improvised transformation, along multiple dimensions, of the ‘fixed’ musical objects (A–E). The resulting interpretations (A’–E’) lie in varied proximal relationship with their referenced, but unheard, counterparts (Example6.mp3).

The expression inherent in melodic interpretation is evidenced by listening to the improvisation against the referenced melody (Example6.mp3) but what can be said of time-feel in this performance? The slow tempo, variation of subdivision implications and stylistic feel of Martino’s playing does not allow much value to come from a swing analysis. An enquiry into latency should also be approached with care, and although recorded to click, the rhythmic feel is in general nebular and without the sense of friction against a rigid time-line usually associated with this mechanism. Indeed, the transcription of the intended rhythmic placements of some notes is inevitably subjective, which limits commentary on their latency. In the analysis of such musical nuances as micro-timing, one must be constantly vigilant against pareidolia, the tendency to see patterns and meaning where none exist. Awareness of perceptual limits, and blind aural testing of the
hypothesis-filtered results can help prevent these Type I false positive errors.

Furthermore an enamoured focus on just time-feel runs the risk of missing other salient characteristics contributing to musical expression. Again, the use of technology to strip and recombine component musical parameters in order to understand further their role in the listening experience is a valuable exercise. There are however two passages from this excerpt that are clearly instructive and should be discussed. The first is the initial phrase (Bar 0.2-1.2 in Figure 9 and Example7.mp3) in which the melody is pushed and pulled micro-rhythmically either side of the metric quaver length. The second, a passage where a series of notes bear little relevance to the master time-line, other than some anchor points, and are best notated in terms of changing duration, rather than their metric placement (Bar 11.3-12.4 in Figure 9 (p 17) Example8.mp3).

![Figure 9 Latency contour of the first phrase from *Welcome To a Prayer* (Example7.mp3). The melody is micro-rhythmically stretched to produce a hyperlatent last note.](image-url)
Figure 9 analyses the first phrase in terms of latency to the master time-line. At 47.5bpm, each percentage of latency is more than 12ms and perceptible, anything above 3% are clearly significant and beyond any reasonable error margin. The final G is played over 250ms late, and could have been notated as its nearest major subdivision, the $2^{nd}$ semiquaver of bar 1. If there were no preceding quavers, this would clearly be the most sensible transcription, however the elasticity of quavers 1-5, and the rising contour implicates the G as a very late, or hyperlatent, downbeat rather than a semiquaver displacement. A listen to the recording with, and without the referenced lead sheet superimposed, seems to support this position (Example7.mp3). The fact that the latency contour is smooth and in one down-up motion (lower diagram, Figure 9, p 16) implies that the melody is micro-rhythmically stretched, rather than metrically displaced or just played with loose, or inaccurate, time.

The concept of differential elasticity, the contoured micro-rhythmic pushing and pulling of a phrase, is exploited to a much further extent in Bars 11.2-12.4 (Example8.mp3). The series of notes is stretched with little metric relevance rendering a standard notation transcription rather clumsy and inaccurate. The phrase can be seen as having three main anchor points relative to the written melody, the initial note (F# which is also used as a pivot note), the B$b$ at the beginning of bar 12 (which creates the b9 interval with the A7 harmony) and the A at the end of bar 12 (which is resolved two octaves lower and re-resolved in the next bar, this time with the preceding B-natural from the melody). These three notes form the melodic arch of the phrase and occur reasonably close to their lead-sheet counterparts. There are also subsidiary skeletal melodic reference points as indicated in Figure 10 (p 18).
Figure 10 The melody in bars 11-13 is used as a skeletal structure to frame a series of notes with little metric relevance other than stretching time to hit the middle and endpoint anchors. The lower diagram tracks the interaction of the melodic register and metric length contours (Example8.mp3).
Plotting onset separation for the phrase (which is equivalent to note duration given the assumption of legato playing), a series of notes is observed that is used to fill time to hit the key anchor points circled. Although these notes are very loosely in the semiquaver range, they do not have a metric sense, rather they are variably stretched in order to target the melody anchor points. Since the relevance to orderly subdivisions is dissolved, so too is the sense of latency as defined in the author’s time-feel model (Mermikides 2005). This passage cannot be explained satisfactorily by polyrhythms either, as the note durations are not of sufficiently regular duration. Although the relationship to the master time-line is momentarily abandoned, this is not an example of traditional rubato; the accompaniment is completely rigid and unyielding, and Martino’s sense of form is clearly retained, marking key melodic notes and re-joining the melody clearly in bar 13. Whereas rubato concerns ‘stolen’ time, this mechanism only allows lending and borrowing of time, and all debts must be repaid in full. The best definition is of a variable tempo superimposition, like a tape speed being variably and purposefully manipulated in order to target hit points in absolute time. This idea of tempo superimposition, be it a fixed tempo (in a simple or complex ratio with the master time-line) or variably distorted, explains much of the latency curves found in Figures 6a-d (p 9-12). A slower tempo superimposition on to a master time-line causes a sloped latency curve, while a varying tempo causes a latency curve as identified in Figure 9 (p 16).

Figure 10 (p 18) describes an expressive contour of onset separation (note duration). To illustrate the idea of simultaneous expressive contours, a curve of melodic register has been superimposed on the lower diagram. These two contours are independent and can theoretically move freely against each other, however the expressive effect of these two contours moving variously together and apart, is clear yet only explicitly defined with this type of analysis.

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6 This concept correlates with Benadon’s description of shift (fixed tempo superimposition) and flux (variable tempo superimposition) in reference to early jazz (Benadon 2009).
References

Books and Articles


### Unpublished Materials


### Discography, Videography and Broadcasts

