

Observations of timing in a Funk groove

Project report, course 2F1213/Musical Communications

Matthias Rath, Daniel Borch

May 23, 2003

1 Background and Motivation

In an article from 2002 [1] Friberg and Sundstroem examine the timing behavior in several performances in a “classic jazz style”. The micro-temporal distribution of eighth notes (the smallest regular rhythmical unit in these recordings) for various instruments is examined as well as the temporal relation between instruments and the overall tempo development. Our goal was to apply similar observations to more “modern” dance grooves. Funk recordings from the period between 1968 and 1972 appear to hold a central position in this respect, since they mark the birth of a new rhythmical concept that seems still central for groove-oriented music until today. In fact, most beats and rhythms in current western music are derivations of exemplars from the mentioned period. The lasting attraction and relevance of “classic” funk music is underlined by the widespread use of samples from the period in e.g. HipHop, House or Drum&Bass productions.

2 Subject

Searching for suitable material for our examination, we finally decided for a recording of one of the main pioneers of Funk, Sly Stone, the track “Thank You For Talkin’ To Me Africa” from his 1971 album “There’s A Riot Goin’ On”. The reasons for this choice are several:

- The piece is a later version of Sly Stone’s 1970 milestone “Thank You falettinme be mice elf agin”, that may be considered a birth moment of slap bass and electrified dance music. After a try to analyze its “father-tune” though, the chosen piece turned out to be advantageous for its slower tempo and more spare instrumentation (rhythm group only for a long part, later completed by vocals only — no brass...).
- Also, the recording has a rather session-like character, seems less arranged or planned, instead more monotonic, focused yet more on rhythmic features than e.g. melodic harmonic or formal elements.

- The overall dynamics in the piece (as far as existing) is achieved to big extend through subtle variations in instrumentation, another dominant principle in recent musical developments; “breaks” are central, rather than a verse–refrain–bridge... structure.
- Drum machines/sequencers are not present in the recording; they would be clearly recognizable due to the technological state at the time of recording. We can assume that all tempo/timing behavior is based on musicians’ spontaneous behavior.

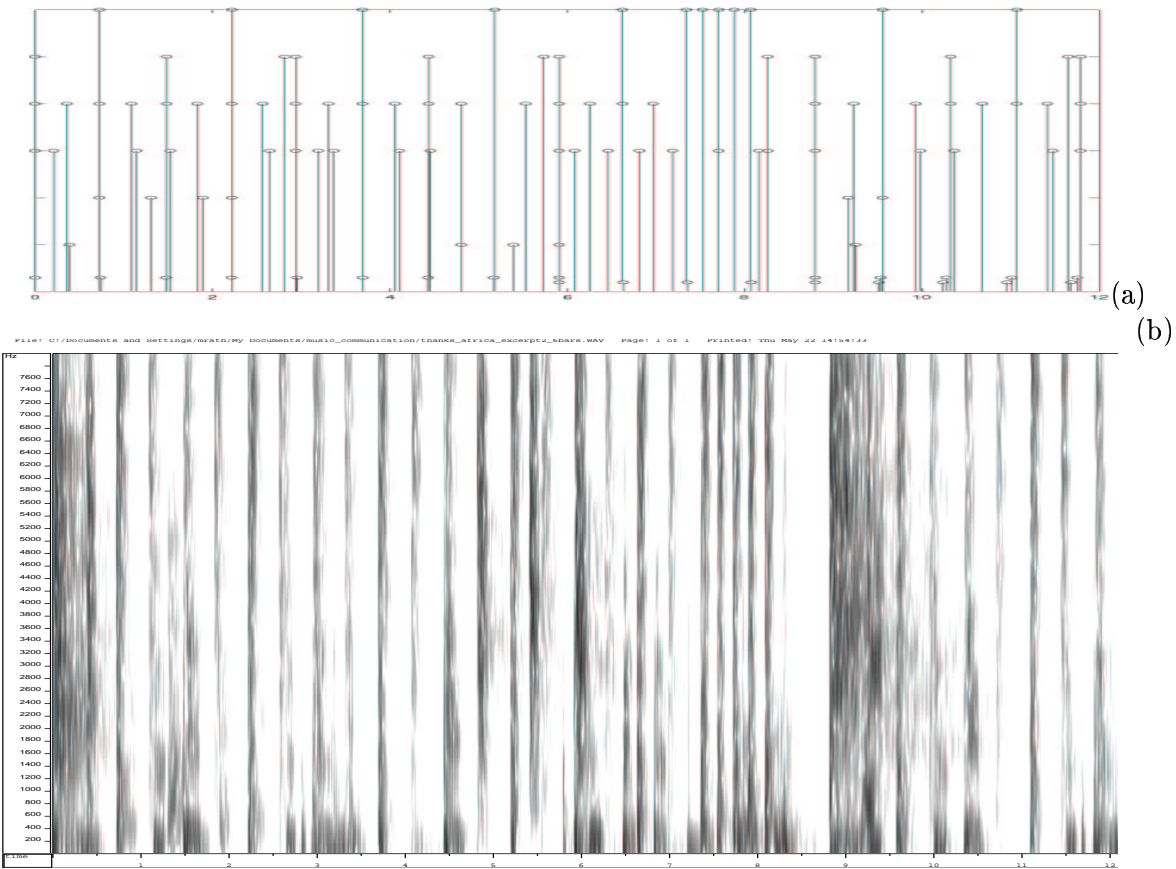


Figure 1: Spectrogram(a) of a 4-bar section containing a “bass-break” (in bar 3) and the extracted “score”(b). The lines in (b) represent notes of the different considered instruments, snare, bass drum, hihat, bass, clavinet and guitar (from above) over a time axis (labeled in seconds). Below, two tempo grids (beats/quarter note units) are displayed; the first (upper) one is extracted (by averaging) from the first two bars, the second (lower) one from the bar of the break. Abrupt tempo changes can be noticed, with the final tempo, i.e. after the break, slightly slower than before.

According to aforementioned considerations we extracted several 4-bar fragments around one-bar “bass-breaks”, that mark structural “points of focus”. In the course of this project we were finally only able to analyze one of these, appearing near the beginning of the piece; figure 2(b) shows a spectrogram.

3 Method and tools

Spectrograms helped in the detection of tones of the different instruments. The basic program used was Soundsurfer; unfortunately a buggy grid function made the process more difficult rather than supporting it. As a consequence, we worked with Soundswell, which also allows the exporting of lists of set marks in the time-frequency-grid. This program on the other hand does not supply sound output, at least no control of playback via the spectral display. It has to be noted, that the extraction of note onsets from a spectrogram of a mixed recording is “tricky”. The general choice is between better temporal but lower spectral resolution which makes the distinction, especially of instruments residing in neighboring frequency regions difficult, or, vice-versa, better spectral resolution with connected temporal inexactness. Apart from this general inherent time-frequency uncertainty of the representation, onsets of instruments can show highly complex transients that are not easily detected as units; lower partials of a bass e.g. tend to “build up” slower, which increases the danger of locating these tones too late.

We thus finally opted to locate onsets by (time-consuming) auditory control, using the ear as the final relevant deciding instance. Again working with Soundsurfer, we used the spectrogram representation as basic orientation and identified musical events by listening to short selections chosen according “detection marks” in the spectrum. These acoustic “slices” were then moved within the piece until the desired event was acoustically precisely isolated (cross-checking both inside and outside the selection). The borders of selection were moved in steps decreasing to 2-3 ms, thus giving a very high temporal accuracy. The method seems to be much more accurate and secure than onset detection from spectrograms by graphical means. The measured time-values were then transferred to Matlab for graphical display; figure 2(a) shows the “score” of the first excerpt.

4 Results and questions

In the musical excerpts of our focus groups of more than three sixteenth notes are generally not equally spaced in time but placed with a certain “swing-ratio”, analogous to eighth notes in classic Jazz rhythms as often noted. Analogous to Friberg and Sundstroem [1], we find different swing ratios for

different instruments. Bass drum “offbeats” show a clear shift away from the “straight” central position between two eighth notes; the same holds for the lines of bass, clavinet and guitar. Exact values however seem to be of little meaning for the shortness of our examined excerpt; a deeper investigation of the whole piece, for which our time was not sufficient, would be necessary to give meaningful average values. In contrast, the sixteenth notes of the snare “fill” in the central “bass break” that we looked at, are equally spaced, i.e. with a swing ratio of 1 : 1. This may correspond to Friberg and Sundstroem’s finding of rather straight eighth lines for solo instruments over strong swing ratios for ride cymbals. In this respect it has to be noted that in the style of music that we deal with here the roles of different instruments are not as clearly defined in terms of soloist or accompaniment as in classic Jazz. The mentioned snare fill e.g. might be considered a short “soloist” insert within a general accompanying function. Also paralleling previous results, we find a tendency of the bass to play behind the drum. The same can be said for the other two rhythmic/harmonic instruments, clavinet and guitar. However, in clear contrast to [1] all players seem to synchronize perfectly on the first beat of each bar. The beginning of the bars seem to form strong “fix-points” at which the rhythmical interaction of the instruments is anchored.

Another interesting question is that of the overall tempo development in the piece. Of course, more analysis (i.e. more and longer excerpts) would be necessary to receive strong results. From the little analyzed material two remarks have to be made: 1. Not surprisingly, there are no within-phrase acc-/decelerations, in particular no final ritardando before or at the end of the break. The use of tempo as a mean of musical expression is here clearly different from that in most traditional European music. 2. We find abrupt tempo changes at the beginning and the end of the break. The question arises if these might be due to editing of the played material or if they mark a musical principle? Perceptually connected to this phenomenon may be the curious fact of an appearing delay before the “restarting” first beat of the bar following the break, which can in fact not be proved in the measurements.

References

- [1] Anders Friberg and Andreas Sundström,
Swing Ratios and Ensemble Timing in Jazz Performance: Evidence for a Common Rhythmic Pattern
Music Perception, Spring 2002, Vol.19, No.3, 333-349.