

It don't mean a thing if it ain't got that swing....

doo-wah, doo-wah, doo-wah, doo-wah.... So say the lyrics of Duke Ellington and Irving Mills 1923 composition, but what exactly do we mean by swing?

Defining what we mean by Swing and "having a good sense of swing" is not a simple matter; in this article I'll take a look at what we mean by swing and how research in computer music has helped refine our intellectual understanding of swing.

In 1983 the MIDI (Musical Instrument Digital Interface) standard was established. It provided a standard way for various electronic musical instruments to interact with each other. For example, using a MIDI-capable guitar, you could connect it to a sound module and trigger various sounds using the guitar.

Using a MIDI device such as a guitar or computer to enter notes you could build a MIDI file (or "sequence"). Unlike digital audio files, MIDI files do not contain actual recorded music. Instead, the music sequence is recorded as a series of numbers that explain how the music is to be played back. For example, to reproduce the sound of a piano playing a C note, the MIDI sequence contains digital information that says, "this is a piano sound." Another number says "a note has been played," other numbers convey information such as "the note is middle C," "the key was struck very softly," "the note has now stopped," etc.

In this way, a musician could build a composition, by entering the requisite data into a sequencer. This resulted in a file, which contained all the information to play back the tune.

Producing good jazz sequences however was difficult. It was hard to get them to swing right and sound authentic. The best files produced were generally played "live" or programmed in "real-time" rather than entered one note at a time so called "step-entry".

So in an effort to improve how jazz midi files sounded, computer music researchers set about researching the swing feel and what contributed to that swing feel..

Traditional Explanations

The fundamental rhythmic unit is the quarter note, counted as 1, 2, 3, 4 or vocalized as "Doo", "Doo", "Doo", "Doo". Melodies are superimposed over this quarter note beat, and are often made up of eighth notes, which, in classical music, are exactly one half as long as quarter notes, so called "straight eights". Straight eights are counted "1-And", "2-And", etc. or can be vocalized as "Doo-Dah", "Doo-Dah etc.

Jazz swing historically has been explained as being based on swing eighth notes. (Incidentally, pre-jazz music theory refers to "swing eights" as "rolled eights"). These eighth notes are alternately long and short, with the long note on the beat, and the short note off the beat. In jazz education, swing eighth notes are explained as being based on a triplet feel. A triplet divides the quarter note beat into three equal parts. Various ways of counting triplets are used; "1-And-Ah", "1-Ah-Ly", "Trip-A-Let" or "1-Trip-Let", and even "1-Gui-Tar" or they can be vocalized as "Doo-De-buh". "1-And-Ah" is illustrated in the following figure:

1			2			3			4			1
	And	Ah										

Traditionally, swing eights are explained, "tying" the first two parts of the triplet "1-And" together and keeping the same timing or leaving the middle "And" out. They can be counted as "1-Ah", "2-Ah" or vocalized as "Doo-buh"

1	And		2	And		3	And		4	And		1
		Ah			Ah			Ah			Ah	

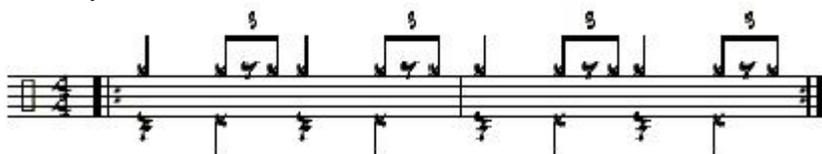
In notation they look like this:



We can also express this in number terms as a ratio. Remember ratios? For example you have three guitars and your friend has two, so you say the ratio of my guitars to their guitars is 3 to 2 or 3:2. Looked at in this way, even eighth notes have a time duration ratio of 1:1 (1, And) jazz or swing eighth notes have a ratio of 2:1 (1-And, Ah).

Computer Analysis – The Drummer

The drummer holds the stewardship of the jazz swing feel, as they normally play a pattern of quarter notes and swing eighth notes on the ride cymbal:



The Ride Cymbal Pattern is illustrated on the top staff.

Initial analysis of the swing eighth feel involved analyzing the swing eighths of well-known Jazz drummers. There have been many studies; I will focus on a collective summary of the results from

three studies by three pioneers in the field, Ernest Cholakis of Numerical Sound, Anders Friberg and Andreas Sundström of the Royal Institute of Technology in Stockholm, Sweden. Both researchers used frequency analysis computer programs on sound samples from commercial recordings to measure the time duration ratio (referred to as the swing ratio) between the swing eighths.

Cholakis analyzed 16 drummers at tempos of 200-251 quarter-note beats per minute (bpm). Friberg and Sundström analyzed four drummers, Tony Williams, Jack DeJohnette, Jeff Watts, and Adam Nussbaum at tempos of 60-350 quarter-notes bpm.

Firstly, they found that the drummers varied their swing ratio according to the tempo of the piece. At slow tempos the long eighth notes were played extremely long and the short eighth notes were almost sixteenth notes, but at faster tempos the eighth notes were practically even. The traditional wisdom of a swing ratio of 2:1 was only true at about 200 quarter-note beats per minute. Friberg concludes that the swing ratio has a more or less linear relationship with tempo, the faster the tempo; the less the eighth notes are swung.

Secondly, although there is an overall tendency toward even or straight eighth notes at faster tempos, it varied among individual drummers. Cholakis study noted that Art Taylor's off beats were nearly 16th notes at a tempo when most drummers were nearer even 8th notes. Incidentally, both studies noted that Tony Williams had the longest swing ratios.

Friberg also undertook a study where he created a computer-generated version of a jazz trio playing Parker's Yardbird Suite. He then played the piece back to a panel of 34 listeners at different tempos and asked them to adjust the swing ratio. He found that the listeners preferred larger swing ratios at slow tempos while at fast tempos the ratio was closer to 1:1.

At a tempo of 120 beats per minute most listeners prefer a swing ratio somewhere between 2.3 and 2.6.

Computer Analysis – The Soloist

Friberg's recent research has focused on the timing of soloists to see if they used the same swing ratios as the drummer. Not surprisingly he found that the swing ratio also had a more or less linear relationship with tempo. However interestingly he found that the drummer always played larger swing ratios than the soloist, with the result that the soloist sounded more "laid-back". Friberg also found that jazz musicians unconsciously synchronize with one another on the short eighth notes of the swing pattern.

Practical Application

The Computer

Analysis along these lines has led to the development of “Groove quantization templates”. Quantization is a software tool or procedure that allows a compositions timing and durations to be altered so they fit a specified time grid with fixed intervals. The trouble with this basic method was that it tended to result in music that sounds too mechanical. A better method which resulted in a more “realistic” music, was to take a piece of music which had all the characteristics of the piece you wanted, such as swing timing, produce a groove template and then apply that template to the composition. In other words, groove quantization works by imposing the timing, duration, and velocity values of one piece of music onto another. Suppose you record a melody that sounds a bit too mechanical, but you have a great Jack DeJohnette recording and he really grooves on it. You can use a piece of software to analyze the Jack DeJohnette track. Produce a groove template and apply that template to your melody. This will impose the feel from the drums onto the melody without changing the pitch of the notes. Now your melody really swings.

The Musician

The research has pointed out “what” we mean by one aspect of swing feel. It has to be said, that swing feel encompasses more than just swinging eight notes and their ratios it also includes accents, articulations, and a combined ensemble groove. As is always the case, the best way to understand jazz is through listening to great jazz music, the best way to understand swing and swing feel is to listen to artists and tunes that swing.

However, the research has made some important observations about swing eighths, namely that the ratio goes from almost 3:2 at slower tempos to 1:1 or even eighths at faster tempos, that the ratios vary between players and that for “the band” to groove the swing ratios of the individual players are related to one another. The interpretation of the swing also may change from song to song.

The ability of the individual musicians to adjust their swing feel will contribute to how well the overall band grooves. When players have different swing feel philosophies, the band will not groove. The ability to adjust ones “swing“ is essential. Most instrumentalists have favorite drummers they like to work with, and vice versa, one aspect is that their sense of swing timing is concordant.

Practical Exercises

In my teaching I have found the following exercises useful to increase an awareness of eight-note jazz feel. For the exercises I recommend using a metronome that has the ability to sound accents on downbeat of 0,2,3,4,5 & 6 and Light Emitting Diodes (LEDs) that simulate pendulum motion/beat with strong beat indicators. The one I use is detailed on my website (<http://www.alisdair.com/forstudents/accessories.html>). The LEDs are extremely useful as they give a visual reference to where in the beat you are clapping or counting.

Basic Exercises

Set Metronome to 60 BPM.

1. Quarter Notes Exercise: Clap on the beat. Notice if you clap “naturally” on the beat, just before the beat, just after the beat. Adjust accordingly so you are exactly on the beat. Count: 1,2,3,4; 1,2,3,4 etc. and Clap each number at the same time exactly on the beat.
2. Eight Note Exercise: Count: 1, &, 2, &, 3, &, 4, &; 1, &, 2, &, 3, &, 4, & and Clap each number and letter. Ensure each clap is exactly even.
3. 16th Note Exercise: Count: 1, e, &, a, 2, e, &, a, 3, e, &, a, 4, e, &, a, and Clap each number and letter. Ensure Each Clap is exactly even.
4. Upper limit of swing feel exercise: Count: 1, e, &, a, 2, e, &, a, 3, e, &, a, 4, e, &, a, and Clap 1, a, 2, a, 3, a, 4, a.
5. Triplet Exercise: Count: 1, &, Ah, 2, &, Ah, 3, &, Ah, 4, &, Ah and Clap each number and letter. Ensure Each Clap is exactly even.
6. Lower limit of swing feel exercise: Count: 1, &, Ah, 2, &, Ah, 3, &, Ah, 4, &, Ah and Clap: 1, Ah, 2, Ah, 3, Ah, 4, Ah..

If any difficulty is encountered, slow the metronome down.

Intermediate Exercise

Set Metronome to 60 BPM. Use Alternate (down, up, down, up) picking. 4/4 Time Signature.

1. Single Note. Play 2 bars of Straight Eight Notes followed by 2 bars of Triplets. Repeat.
2. Single Note: Play 2 bars of Triplets followed by 2 bars of Swing Eight Notes. Repeat.
3. Single Note. Play 2 bars of Straight Eight Notes followed by 2 bars of Swing Eight Notes. Repeat.
4. Scales & Arpeggios following the same exercises.

If any difficulty is encountered, slow the metronome down.

Advanced Exercise

Set Metronome to 60 BPM. 4/4 Time Signature

1. Eight Note Exercise: Set Metronome to Click on the & of straight eight notes. Single Note: Play Even straight eights ensuring up stroke on the & (the metronome click) and down where there is no click.
2. Triplet Exercise 1: Set Metronome to Click on the "Ah" of triplet. Single Note: Play triplets using down, down, up, down, down up ensuring up stroke on the "Ah" (the metronome click) and down, down where there is no click.
3. Triplet Exercise 2: Set Metronome to Click on the "&" of triplet. Single Note: Play triplets using down, down, up, down, down up ensuring down stroke on the "&" (the metronome click) and surrounded by down, and up where there is no click.
4. Swing Eights: Set Metronome to Click on the "Ah" of triplet. Single Note: Play swing eights using down, up, down, up ensuring up stroke on the "Ah" (the metronome click) and down where there is no click.

Emulate and Feel

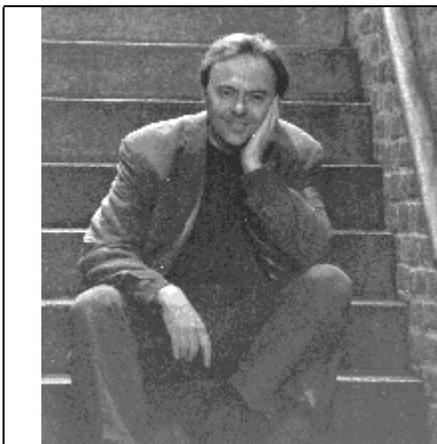
The jazz swing feel has part of its rhythmic roots in the West African tradition of Music/Dance/Poetry. This tradition is an aurally based tradition; therefore to really learn to swing the rhythmic feel must be related to dance and learnt within this context. Listening and emulating the feel from repeated listening is essential. Pick an easy jazz solo that swings. Copy and emulate the feel. Listen closely to where the drummer is placing the accents listen to where the soloist is placing accents. Develop awareness of the interaction. Playing rhythms on a hand-drum either for example a djembe or bongos will help to internalize the feel and can be a fun break from practicing all those scales!

I hope you enjoyed this article.

Have Fun, Cheers

Alisdair MacRae Birch, NY March 2003

More information on this and other links can be obtained from my web site <http://www.alisdair.com/>



Alisdair MacRae Birch is a British musician and jazz guitarist currently teaching and playing in NY. He has performed through out Europe and West Africa, appeared on TV and radio and played in theatre orchestras.

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References

1995 Ernest Cholakias of Numerical Sound (<http://www.numericalsound.com/>) "An Analysis of Swing Characteristics of 16 well known Jazz Drummers". Published online.

Anders Friberg (<http://www.acoustics.org/137th/friberg.html>) & J Sundström of the Royal Institute of Technology in Stockholm, Sweden(1999). "Jazz drummers' swing ratio in relation to tempo". Published online as Acoustical Society of America ASA/EAA/DAGA '99 Berlin Meeting Lay Language Papers. (<http://www.acoustics.org/press/137th/friberg.html>)

A Friberg, and A Sundström, (2002). "Swing ratios and ensemble timing in jazz performance: Evidence for a common rhythmic pattern." Music Perception 19(3), 333-349 (http://www.speech.kth.se/music/performance/Texts/ensemble_swing.htm)