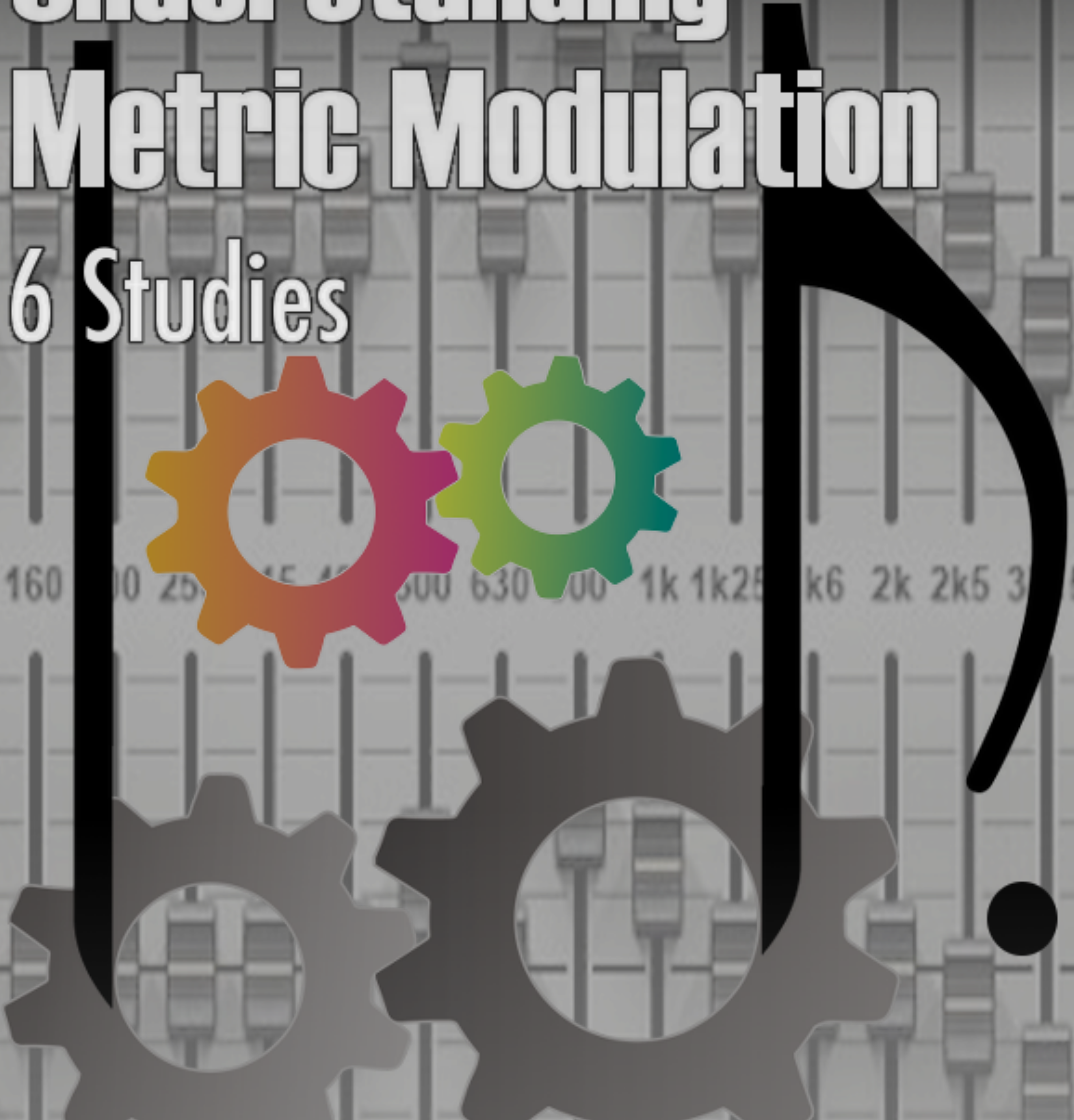
Understanding Metric Modulation

6 Studies



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Metric Modulation

One of the main elements that drummers need to consider to achieve a thorough knowledge of drum theory, is definitely the study of metric modulation.

In this free lesson I'd like to share with you an in-depth analysis of all the concepts necessary to grasp how metric modulation works, and even the mathematical formula to derive the exact tempo changes involved.

This subject is directly related to rhythmic illusions and polyrhythms because in some cases the resulting effects are exactly the same.

Rhythmic illusions are mainly used when our intent is to modify the perceived pulse for a limited number of bars before going back to the original rhythm, and therefore we use them to play around the beat without actually changing it.

Metric modulation, on the other hand, is used when at some point the pulse changes permanently, from there onward.

Simply put, we have a metric modulation when, starting from a specific point of the song, we assign to the pulse a new note value which has some kind of mathematical relationship with the first one.

For instance, the note value of the modulated beat could be half of the initial one: every quarter note would therefore become an eighth note, causing a doubling of the speed of execution.

Or, from a certain point on, we could decide that each eighth note becomes a quarter. Doing this results in a half time feel.

The reason is that we need to make a distinction between the way we modify the pulse and the result we hear, since there is an inverse relationship between the pulse value before and after modulation, and the emerging effect.

By halving the duration of the beat we get a doubling of the perceived speed, and vice versa.
This happens because, going for example from quarters to eighths, we now have two eighth notes in the same space in which we initially had a quarter note, and so we are playing twice the number of notes, thus getting the double time effect.

Switching from eighths to quarters, we now have one note where before we had two, hence obtaining a halving of the tempo.

So, as we can see, metric modulation practically means that whatever was happening in a certain space is now occurring in a different space, determined by the new value of the pulse.

This metric shifting can be based on any of the existing note values and also on any mathematical relationship, which is where things get really interesting.

For instance, after the modulation an eighth note could become a dotted eighth or an eighth note triplet.

Conversely eighth note triplets could, following the modulation, become sixteenth notes.
We can combine any two of all available note values.

Obviously when the relationships between the two rates are more complicated things become harder to figure out.
But fortunately we can use a mathematical formula to derive the exact final bpm.

These techniques allow us to change speed in the middle of a composition, while maintaining the underlying pulse, since the durations of the two beats, before and after the modulation, are always arithmetically connected.

This has significant implications in terms of creative possibilities, because it allows to imagine unusual arrangements that involve the use of the same ideas over different grids.
Or, as mentioned before, to change speed while keeping a common denominator underneath the whole thing.

Sometimes, more simply, the arrangement of a piece of music requires a change of tempo and metric modulation is the tool that gets the job done.

On the next pages we have a few examples of the most popular metric modulations, so that we can see how they work.

To better understand how the modulation affects the beat we can play these exercises on the Ride while keeping the metronome or the Hi-Hat played with the left foot going in the background, as reference to identify where the initial pulse is.

In doing this we are going to be listening to both pulse durations on the Ride, before and after the modulation, while the consistent Hi-Hat beat will help us understand how they are related, and the effect that we achieve by changing meter.

In the first example the relationship between the two pulses is that each eighth note of the initial tempo becomes a sixteenth note after the modulation.

This means that if we set the metronome to 100 bpm and we play an eighth note beat, following the modulation, in the same exact space initially taken up by two eighth notes, we are now playing four sixteenths.

If we tap the new tempo while listening to the same rhythm played after the modulation, we notice that we have gone from 100 bpm to 200 bpm.

In the second example the opposite happens. Each eighth note becomes a quarter note.

Using the same method as before, by setting the metronome to 100 bpm and playing a basic eighth note rhythm, after the modulation we notice that in the space originally occupied by two eighths we now have just one quarter note.
This means that if we tap the new tempo on the metronome we are going to see that now we are playing at 50 bpm, getting the half time effect we mentioned before.

Therefore an intuitive way to determine the second tempo is to divide the first one by the relationship between the two note values involved, after and before the shift.

Going from eighths to quarters, given that a quarter note has twice the duration of an eighth note, we can calculate the final bpm through dividing by two (in fact, in our prior example, we went from 100 bpm to 50 bmp).

Synthesizing these reasonings, we can boil them down to a useful formula that will be extremely helpful in the more advanced scenarios.

Given a starting bpm value, we can achieve the new tempo simply through dividing the initial one by the proportion existing between the two pulses:

$t2 = t1 : (p2 : p1)$

In which:

- t1 is the starting bpm.
- t2 is the final bpm, the one after the modulation.
- p1 is the value of the starting pulse.
- p2 is the value of the final pulse, the one after the modulation.

Let's check out if it works with the examples of the next page, using round bpm numbers to make things easier to understand.

Here is the direct link to the YouTube video in which I demonstrate the 6 cases discussed.

1) t2 = 100 : (1/16 : 1/8) = 200 bpm

2) t2 = 100 : (1/4 : 1/8) = 50 bpm

3) In example number 3 we have a very common type of modulation, in which eighth notes become dotted eighths, that have a total value of 3 sixteenths:

t2 = 100 : (3/16 : 1/8) = 67 bpm

4) In case number 4 we have a situation in which every eighth note after the modulation becomes a quarter note triplet.

Using the method explained, let's start by setting the metronome to an initial tempo of 150 bpm.

Here, from a mathematical standpoint, the situation is a bit more complicated, but the equation remains the same, and we just have to keep in mind that a quarter note triplet has a value equal to 2/3 of a quarter.

Then we can proceed as usual, using our formula:

t2 = t1 : (p2: p1) = 150 : {(2/3 x 1/4) : 1/8} = 112.5 bpm

5) What's great about this formula is that it works for any modulation we can think of.

Eighth note triplets are now eighths? No problem:

Starting with a tempo of 100 bpm

t2 = t1 : (p2: p1) = 100 : {1/8 : (2/3 x 1/8)} = 67 bpm

6) Let's wrap this up with this last example, in which the modulation goes from sixteenths to eighth note triplets:

Starting with an initial tempo of 80 bpm

t2 = t1 : (p2: p1) = 80 : {(2/3 x 1/8) : 1/16)} = 60 bpm

Let's experiment and have fun creating our own modulations!

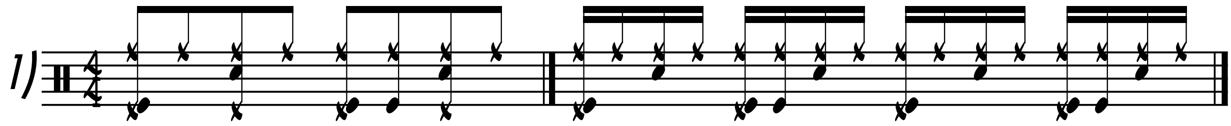
This is powerful stuff!

Related resources:

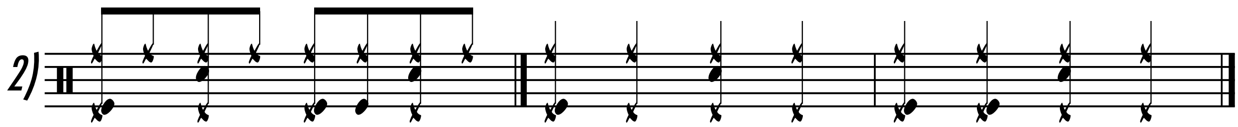
'Theory & Concepts' – Altitude Drumming – Volume 1

Metric Modulation

Effect: doubling the speed ♪ = ♬

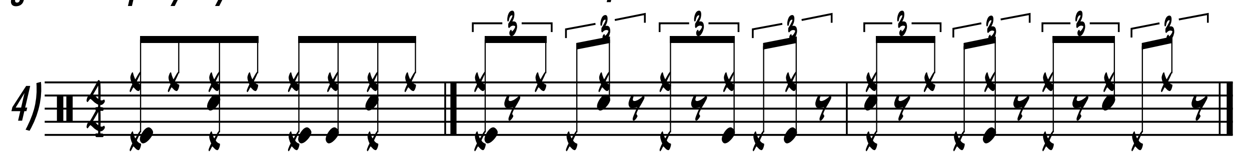


Effect: halving the speed ♪ = ♩



Effect: 3 against 4 polyrhythm ♪ = ♪.

Effect: 2 against 3 polyrhythm ♪ = ♩ note triplet



Effect: 3 against 2 polyrhythm ♪ note triplet = ♪

Effect: 4 against 3 polyrhythm ♬ = ♪ note triplet