Root Interval Schemas in Rock Music (Script)

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\\ = PowerPoint click

We have all encountered that one student who is never quite satisfied with academic attempts to analyze rock music. After you reluctantly call on his raised hand, he might say something like, “But I don’t hear it like that,” or, “Aren’t we overthinking this?” or “I’m certain the guy who wrote this wasn’t thinking about roman numerals.” This student believes that Rock and popular music are fundamentally *not systematic* – that their composers don’t follow scripted rules about voice leading and harmonic function. Part of the initial impetus for this project was an attempt to take this objection seriously. As analysts, why should we expect tools that were designed to explain the music of the Western common practice to work just as well when applied to music composed under quite different creative circumstances?

\\ Figure 1 shows a transcription of the song “Fortunate Son” by Creedence Clearwater Revival. If this talk was about music from the classical tradition, I would not have had to make this transcription, but it was necessary because Rock music is primarily an “aural” tradition, and secondarily an “oral” tradition, and only at some remote level does notation play its part. When Rock musicians do transcribe and analyze their own music, they frequently use lead-sheet notation, \\ which reduces each chord used in a song to its chordal root and its quality. This is a good enough *prescriptive notation* for the purposes of most Rock musicians. One could easily use the reduction to produce a noise that resembles the song. But for those of us who wish to analyze and explain this music, not just perform it, we would also hope to give a *descriptive notation* that captures more of how the music sounds to our ears. After all, not all G major triads sound the same. Some are stable and some are in motion, and we have different expectations about each chord’s tendencies and behavior.

So, analysts often employ a roman numeral reduction to describe the harmony. \\ This notation implicitly contains all the information from the lead sheet reduction, but also shows the harmonies’ placement within the diatonic scale. *This* particular G major triad sounds stable because it is a I chord; while some other G major chord sounds active because it plays some other role in the scale. An analyst in the Schenkerian tradition would go even further, saying that “not all I chords sound alike either,” and that an ideal description of a chord’s function would include its entire linear context. Of course, the more abstract our analysis becomes, the more likely it will be for our skeptical Rock student to disengage from the conversation. He would prefer to simply listen to the music. \\

\\ While there is general consensus that harmony in Rock music functions differently than in the music of the common practice, at present the literature is divided on how best to express that difference. Ken Stephenson, in his book *What to Listen for in Rock Music* (2002), conceptualizes the problem in terms of root motion and conjectures that in Rock music, root motion up the circle of fifths is just as normative as motion down the circle of fifths. Drew Nobile (2016), by contrast, proposes modeling function on the syntactic ordering of harmonies, rather than on a notion of intrinsic function based on a chord’s placement in the diatonic scale. Nobile therefore divorces roman numerals from harmonic function. Finally, Stefanie Acevedo (2018), in her forthcoming dissertation, proposes a model dealing with expectations arising from the harmonic entropy associated with specific chords.

In this paper, we propose a model that takes the intervals between chord roots, rather than the chords themselves, as the building blocks of a harmonic analysis. We propose that patterns of root intervals are likely to be entrained as schemas for listeners and performers alike through statistical learning. Statistical learning is the process that your brain uses to implicitly keep track of auditory patterns after repeated exposure. First demonstrated by Saffran et al, with respect to linguistic patterns, the mechanism of statistical learning has since been applied to tonal musical patterns, atonal patterns, and even artificially constructed grammars. In other words, a listener’s expectation of a musical pattern is directly proportional to the degree of past exposure to that pattern. These expectations congeal as more-or-less precise schemas that provide a mental framework for organizing incoming musical information. Robert Gjerdingen has married historical research about late-eighteenth century music pedagogy with schema theory, showing how schema formation arises out of pedagogical practice. So what can we surmise about the schema formation that would occur in the pedagogical situation of 20th-century Rock musicians?

Imagine any of the countless Rock guitarists of the 60s or 70s who taught themselves to play by “woodshedding,” or playing along with primarily blues recordings. These musicians would have learned that there is nothing wrong with a V-VI-I progression, also known as a Blues Cadence, where we encounter the functional progression (or as some call it a “retrogression”) Dominant – Subdominant – Tonic. In fact, they would think of it as highly idiomatic. \\ This progression occurs in the refrain from “Fortunate Son,” which we just heard. As shown here, \\ the progression can be renotated in terms of root intervals. The interval between the G and F roots of the first two chords spans ten ascending semitones. This renotation reveals that the progression “I-bVII-IV” from the verses of the song are in fact a simple transposition of the Blues Cadence from the refrain. Leonard Meyer might have referred to such a transposition of a familiar schema as a “migration.” The similarity of the two progressions is not at all obvious when viewed at the level of Roman numerals, but becomes clear when measured in root intervals.

\\ Each of our schemas is notated as a pair of integers separated by a dash. The first integer refers to the initial root interval between two chords, and the second refers to the subsequent root interval. Remember that these *two* intervals describe a *three-chord* progression. For example, the 10-7 schema from “Fortunate Son” shown above. These integers may take the values 1 through 11, reflecting root motion in ascending semitones. We excluded the possibility of an interval 0, since this wouldn’t indicate harmonic *motion* per se. One way of reading the schema is as an if-then statement. “If you hear 10, then expect 7.” This interpretation of the model captures the assumptions about statistical learning that are at the basis of this study, and it neatly coincides with Leonard Meyer’s notion of schemas as an implication and realization. The first interval implicates and the second one realizes.

The first benefit of this approach is that it allows us to sidestep analytical ambiguities associated with roman numeral and scalar interpretations of popular music. Although it is clearly not a Rock song, “Get Lucky” by Daft Punk is an illustrative example \\. Those of you who attended SCSMT 2015 at Loyola University in New Orleans might remember Steven Rings’s Keynote address, “Tonics Phenomenological, Empirical, and Theoretical,” in which he challenged the audience to interpret the tonic of this song. \\ According to the Wikipedia page, “’Get Lucky’ is composed in the key of F-sharp minor,” but there are other plausible modal interpretations. \\ In addition to the F-sharp Aeolian interpretation, \\ it is also possible to hear an absent-tonic progression in the key of A major, while Rings argued for a B Dorian interpretation. By focusing on the space between chords, rather than a chord’s functional relationship to a tonic scale degree, a root interval approach affords analysts a way of discussing chord behavior and syntax without first resolving the modal ambiguities that are characteristic of much Rock and popular music. \\ [Show of hands].

The most common kind of modal ambiguity in Rock music is the confusion between Mixolydian and Ionian modes, probably because of Rock music’s frequent use of the flat-7 chord. A classic example is “Sweet Home Alabama” by Lynyrd Skynyrd \\. This song uses only three chords, D major, C major, and G major triads, that can be interpreted in G Ionian or D Mixolydian modes. This is equivalent to the two versions of the 10-7 root interval schema that we encountered earlier in “Fortunate Son.” Do we hear this progression as a Blues Cadence in the key of G, or do we hear it as what Nicole Biamonte calls a “Double Plagal Progression,” in the key of D. Here is a poll from the website “The Gear Page” \\ asking users to debate and vote on what key the song is in. The poll has been running since 2011 and the comments thread is over 30 pages long. Currently, \\ the poll stands at 61% to 39% in favor of hearing the progression as a Blues Cadence in the key of G. As we listen, I invite you to try to hear the progression both ways. \\ \\ [show of hands]

\\ In order to identify the different kinds of root interval schemas, we conducted an exploratory analysis of two corpora of Rock songs. The first was the Temperley/De Clercq RS200 corpus, which consists of 200 songs from Rolling Stone magazine’s 500 greatest Rock songs of all time list. The second was the McGill Billboard corpus, compiled by Burgoyne, Wild, and Fujinaga, and based on songs from the Billboard charts. Since the RS200 corpus is based on journalists’ criteria of “great” songs, while the Billboard corpus is based on popularity, we can have confidence that they together form a representative sampling of Rock music due to their complementary selection criteria.

\\ Figure 3 is a bar graph that gives a rough overview of our findings. The height of each bar represents the frequency of each initial interval in the RS200 corpus. The colored regions within each bar represent the proportion of each subsequent interval, given the initial interval. This graph allows us to visualize, as an example, the fact that given an initial root interval of five ascending semitones, then the most likely subsequent root interval would be another five ascending semitones, shown in green. Notice that this graph does not include the octave complements for each initial interval. The octave complement was the most likely subsequent interval by a healthy margin for every initial interval. This means that after progressing from one chord to another, the most likely thing to happen was to go directly back to the first chord. It suggests that our corpus has a large number of repeated two-chord vamps, rather than the three chord progressions that are the object of our study, which is why the octave complements were removed.

\\ Table 1 shows the frequency count of the nine most common root interval schemas. We see near the middle the familiar 10-7 schema from the “Fortunate Son” and “Sweet Home Alabama” progressions. These are the pairs of root intervals that we predict are most likely to be schematically entrained through statistical learning. Notice that of these, only the 5-9 schema includes an interval other than 2, 5, 7, or 10. All the others are recombinations of these most common intervals.

\\ Figure 4 shows a breakdown of the 10-7 schema and the ratios of each roman numeral version of the schema. A similar breakdown could be made for any of the schemas identified in the corpus. We see that by far the most common roman numeral versions are V-VI-I, the Blues Cadence, and I-bVII-IV, the Double Plagal progression. Biamonte notes that these two progressions are “homologous,” but Figure 4 shows the relative frequencies of all possible homologous versions. The Blues cadence occurs about twice as frequently as the Double Plagal. If exposure to the Blues Cadence and Double Plagal Progression is proportionate to their respective strength of expectation due to statistical learning, then one would predict, given an ambiguous 10-7 progression, that listeners would report interpreting the progression as a Blues Cadence about 66% of the time. \\ Recall the online poll from Gear Page, where listeners reported a 61% preference. This result may be coincidence, but it is too suggestive not to share.

\\ Returning to the table of the most frequent schemas, notice that some of the schemas share the same root intervals, such as \\ 2-5 and 5-2; and \\ 10-7 and 7-10. When we look closer at for instance the \\ 7-10 and 10-7 schemas, we see that the overwhelming amount of the time they pass through the same roman numerals. This suggests that these schemas are simply reorderings of the same underlying root interval pattern. It is easy to imagine a composer employing the idiomatic voice-leading of the Blues Cadence, but, as in “Baba O’Riley” by The Who, rearranging the three-chord progression so as to begin and end in a different metric position. \\ \\ This observation might lead us to combine the rotations into unordered pairs [2,5] and [7,10], which would now be the most frequent root interval patterns within the corpus.

But are the root interval patterns in Rock music really unique or characteristic of the repertoire? \\ Figure 5 shows the frequencies of each root interval from a corpus of 371 of J.S. Bach’s Chorale harmonizations \\ compared to the root intervals from the RS200 corpus \\. The billboard corpus, which is not shown, had an interval frequency profile that was nearly identical to the RS200. The first thing to jump out at us is that the profile of the rock corpus is highly symmetrical when comparing intervals with their octave complements, and that the Bach corpus is asymmetrical. Root motion by five ascending semitones is the same as motion downwards by seven, so when comparing intervals 5 and 7 we notice Bach’s preference to descend by perfect fifth rather than ascend. In support of a claim made by Stephenson (2002), the high degree of symmetry of the RS200 graph indicates that Rock composers have no such preference about ascending or descending versions of the same interval. Although it is difficult to account for each specific difference, this result gives us confidence that an approach to rock harmony based on root interval schemas at the least captures some of the essential differences between harmonic behaviors in common practice music and Rock music.

Finally, we’d like to end by revisiting the skeptical undergraduate student from the beginning of the talk. Would he find as much to complain about our approach as the more conventional analyses? \\ A commenter from the Gear Page forum mentioned above named Wareagle will serve as an ad hoc spokesman for this viewpoint.

*[However when it comes down to it, you just should go by ear, because if you’re jamming and thinking scales and notes and stuff it wont generally sound as good if its not on auto, as I said I learn the key and tonal center by knowing the chords of the song, and with that knowledge I can solo within, take it outside and bring it around … I don’t really think scales when I start to get going. However I know them in the back of my head so I know my map… you know?]*

Part of the difference in philosophy taken as a performance, as Wareagle clearly endorses, or as an autonomous, notated, thing. Wareagle does not mention roman numerals or any other analytical abstractions for determining his interpretation. Wareagle instead emphasizes implicit knowledge, developed through immersive exposure in the music-making process. Such implicit knowledge is best captured by a statistical learning approach rather than one that begins with tacit assumptions about what is analytically relevant for this repertoire and what is not. Root interval schemas represent a valid and unambiguous way of talking about harmonic behavior in Rock and pop music. Thank you.

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