2
The Nature of Chords

2.1 What is the sound of a chord?

The sound of a chord consists, collectively, of several components:

- The performed pitches of the chord, which are represented in our method as a member of a transpositional set class;
- The harmonic similarity (hsim) of the performed pitches;
- The spectral pitches of the performed pitches, weighted by timbre;
- The root candidates of the chord, weighted by timbre and adjusted for subharmonic enhancement;
- The degree of root clarity or root ambiguity of the chord.

These components are set out in the first four layers of our method in Appendix A (The Method for Evaluating and Comparing the Sound of Chords).

The members of each transpositional set class (inversions) share the same unique set of performed pitches in transpositional twelve-point circular space.

The harmonic similarity of each chord tends to be unique when compared to other chords in the same transpositional set class or to other chords in different transpositional set classes. Nonetheless, a chord may have the same harmonic similarity as one or more other chords.

The members of each transpositional set class (inversions) share the same unique set of spectral pitches in transpositional twelve-point circular space.

A chord may have the same degree of root clarity or root ambiguity as other chords. Chords that are members of one transpositional set class, which is identified by the letter A or B, may share the same degree of root clarity or root ambiguity with chords that are members of another transpositional set classes that is related to it by inversion through reflection, and which is identified by the other letter (for example, see TSC3-4A and TSC3-4B in Appendix A (The Method for Evaluating and Comparing the Sound of Chords)). However, the degree of root clarity or root ambiguity between some transpositional set classes that are related by inversion through reflection may differ (for example, see: TSC3-8A and TSC3-8B; and TSC3-11A and TSC3-11B).

2.2 The harmonic similarity and root clarity of selected chords

It can be useful to compare the harmonic similarity and root clarity (or root ambiguity) of chords by plotting them a grid. The condensed charts below group chords together whose harmonic similarity and root clarity (or root ambiguity) fall within the ranges indicated. Where two or more chords fall within one cell, the harmonic similarity and root clarity of the chords in a cell are at least somewhat similar, but should not be presumed to be identical in any way.

Figure 2.1 is a condensed chart of the harmonic similarity and root clarity of single pitches (0) and of all intervals (0-1… 0-11).

Most	to 100%							0				
	to 97.5%											
	to 95%											
Similarity to the harmonic series	to 92.5%											
	to 90%											
	to 87.5%											
	to 85%											
	to 82.5%											
	to 80%											
	to 77.5%											
	to 75%											
	to 72.5%											
	to 70%											
	to 67.5%						0-7					
	to 65%											
	to 62.5%											
	to 60%											
	to 57.5%											
	to 55%											
	to 52.5%											
	to 50%						0-5					
	to 47.5%		0-9									
	to 45%											
	to 42.5%											
	to 40%					0-4						
	to 37.5%											
	to 35%		0-3									
	to 32.5%		0-6									
	to 30%			0-10		0-8						
	to 27.5%											
	to 25%											
	to 22.5%			0-2								
	to 20%		0-11									
	to 17.5%											
Less	to 15%											
	to 12.5%		0-1									
		0% three equal roots	0% two equal roots	>0% to 20%	>20% to 40%	>40% to 60%	>60% to 80%	>80% to 100%	>100% to 120%	>120% to 140%	>140% to 160%	>160% to 180%
		Ambiguous roots		Least ←				**Root clarity** →				Most

Figure 2.1 Condensed chart of the harmonic similarity and root clarity of single pitches and intervals.

Figure 2.2 is a condensed chart of the harmonic similarity and root clarity of all major triads in root position and their inversions (0-4-7, 0-5-9 and 0-3-8), minor triads in root position and their inversions (0-3-7, 0-4-9 and 0-5-8), augmented triads (0-4-8), diminished triads and their inversions (0-3-6, 0-3-9 and 0-6-9), the suspended triad (0-5-7) and its inversions (the Ilerici chord (0-2-7) and the perfect quartal trichord (0-5-10)), and the chromatic cluster (0-1-2).

Similarity to the harmonic series		0% three equal roots	0% two equal roots	>0% to 20%	>20% to 40%	>40% to 60%	>60% to 80%	>80% to 100%	>100% to 120%	>120% to 140%	>140% to 160%	>160% to 180%
More	to 67.5%											
	to 65%											
	to 62.5%											
	to 60%											
	to 57.5%											
	to 55%											
	to 52.5%											
	to 50%											
	to 47.5%			0-3-7 0-4-9	0-2-7 0-5-7							0-4-7 0-5-9
	to 45%				0-5-10							
	to 42.5%											
	to 40%			0-5-8								0-3-8
	to 37.5%	0-4-8				0-3-9 0-6-9						
	to 35%					0-3-6						
	to 32.5%											
	to 30%											
	to 27.5%											
	to 25%											
	to 22.5%											
	to 20%											
	to 17.5%			0-1-2								
Less	to 15%											
	to 12.5%											
		Ambiguous roots		Least ←				**Root clarity**				→ Most

Figure 2.2 Condensed chart of the harmonic similarity and root clarity of major, minor, augmented, diminished, and suspended triads (including the perfect quartal trichord and the Ilerici chord), and the chromatic cluster.

Figure 2.3 is a condensed chart of the harmonic similarity and root clarity of several chords that divide the octave evenly or nearly evenly.

The octave is divided evenly by only five types of chords: tritones (0-6), augmented triads (0-4-8), diminished seventh chords (0-3-6-9), whole-tone scales as chords (0-2-4-6-8-10), and the chromatic scale as a chord (0-1-2-3-4-5-6-7-8-9-10-11). All of these chords have ambiguous roots, and that ambiguity is more pronounced than their degree of similarity to the harmonic series. The chromatic scale as a chord (0-1-2-3-4-5-6-7-8-9-10-11) has twelve equal roots and has the most ambiguous roots.

The octave is divided nearly evenly by perfect fourth intervals (0-5), perfect fifth intervals (0-7), minor triads in root position (0-3-7), minor triads in first inversion (0-4-9), minor triads in second inversion (0-5-8), major triads in root position (0-4-7), major triads in first inversion (0-3-8), major triads in second inversion (0-5-9), Tristan chords (0-3-6-10), major triad add six chords (0-4-7-9), dominant seventh chords (0-4-7-10), major seventh chords (0-4-7-11), pentatonic major scales as six ninth chords (0-2-4-7-9), dominant ninth chords (0-2-4-7-10), “Mystic” chords (0-2-4-6-9-10), dominant “sharp eleven” chords (0-2-4-6-7-10), and Dorian mode diatonic scales as chords (0-2-3-5-7-9-10). Other chords that divide the octave nearly evenly – such as rotations of chords with six or seven different pitches – are not shown.

Figure 2.3 shows that chords, which divide the octave nearly evenly, have greater similarity to the harmonic series and greater root clarity than chords that divide the octave evenly. This relationship holds true generally, but also applies specifically for all cardinalities (for all intervals, triads…).

Figure 2.3 also shows that there are significant differences among the harmonic similarity and root clarity of chords that divide the octave nearly evenly.

More	to 67.5%									0-7							
	to 65%															
	to 62.5%															
	to 60%															
	to 57.5%															
	to 55%															
	to 52.5%															
	to 50%									0-5							
	to 47.5%						0-3-7; 0-4-9								0-4-7; 0-5-9		
	to 45%						0-4-7-9		0-4-7-11								
Similarity to the harmonic series	to 42.5%						0-2-4-7-9										
	to 40%						0-5-8	0-3-6-10							0-3-8		0-4-7-10
	to 37.5%				0-4-8				0-2-3-5-7-9-10						0-2-4-7-10		
	to 35%	0-1-2-3-4-5-6-7-8-9-10-11		0-3-6-9	Even					0-2-4-6-9-10; 0-2-4-6-7-10							
	to 32.5%					0-6											
Less	to 30%		0-2-4-6-8-10														
		0% 12 equal roots	0% six equal roots	0% four equal roots	0% three equal roots	0% two equal roots	>0% to 20%	>20 % to 40%	>40 % to 60%	>60 % to 80%	>80 % to 100%	>100 % to 120%	>120 % to 140%	>140 % to 160%	>160 % to 180%	>180 % to 200%	>200 % to 220%
		Ambiguous roots					Least ← **Root clarity** → Most										

Figure 2.3 Condensed chart of the harmonic similarity and root clarity of selected chords that divide the octave evenly or nearly evenly.

2.3 What is the root position of a chord?

In every transpositional set class that does not have two or more ambiguous roots, there is one inversion in root position. It can be located in the corresponding "Root candidates and weights" chart for that transpositional set class in Appendix A. The first root candidate of the root position chord is always 0.

There are three exceptions to this basic, universal rule.

The first exception pertains to the five transpositional set classes that divide the octave evenly (TSC2-6 (0-6), TSC3-12 (0-4-8), TSC4-28 (0-3-6-9), TSC6-35 (0-2-4-6-8-10), and TSC12-1 (0-1-2-3-4-5-6-7-8-9-10-11)). The "Root candidates and weights" chart in Appendix A for these transpositional set classes must be interpreted carefully. The chart shows only one series of root candidates for that transpositional set class, and the first root candidate is always 0. In these five instances, the single series of root candidates is not intended to imply that there is only one root candidate for that transpositional set class. On the contrary, as each inversion of these chords rotates onto itself, every numbered point in the chord is competing equally to be in root position. In these five instances, the number of ambiguous inversions in root position is equal to the number of numbered points in the chord.

The second exception pertains to TSC3-10 (0-3-6, 0-3-9, and 0-6-9) and TSC4-27A (0-2-5-8, 0-3-6-10, 0-3-7-9, and 0-4-6-9). In these instances, the first root candidate of each chord is not a chordal pitch and is not 0. None of these chords are in root position. There may be other chords that fall within this exception.

The third exception applies to all other transpositional set classes that have two or more equal roots. The "Root candidates and weights" chart in Appendix A for these transpositional set classes will identify each inversion that is competing to be in root position. The first root candidate of each of these inversions is always 0. For an example, see TSC6-32 in Appendix A.