

4

The Foundation for Harmony and Tonality

In this chapter, we extend our analysis briefly to chords performed in succession over time.

4.1 Basic chord progressions in the major scale

Consider the movement from a tonic major triad in root position to a dominant major triad in root position (I – V), one of the most basic chord progressions in tonal music. Assume that the chord progression occurs without any rest between the chords (Figure 4.1). The dominant triad retains one pitch from the tonic triad but adds two new pitches, which are the two non-chordal pitches that are closest to the tonic triad by spectral weight (Figure 4.2).

0 0-4-7	→	7 0-4-7						
		0 7-11-2						Spectral chord progression
I	→	V						

Figure 4.1 I – V spectral chord progression.

0-4-7 Spectral pitches and weights									
7	4	0	11	2	8	5	10	6	9
150.00	133.33	100.00	83.33	82.50	33.33	20.00	20.00	12.50	12.50

Figure 4.2 Spectral pitches and weights for a major triad in root position (0-4-7).

Next, consider the movement from a tonic major triad in root position to a subdominant major triad in root position (I – IV), another basic chord progression in tonal music. Again, assume that the chord progression occurs without any rest between the chords (Figure 4.3). The subdominant triad retains one pitch from the tonic triad but adds two new pitches, which are the two non-chordal pitches that are the closest root candidates to the tonic triad by weight (Figure 4.4).

0 0-4-7	→	5 0-4-7							
		0 5-9-0							Root chord progression
I	→	IV							

Figure 4.3 I – IV root chord progression.

0-4-7 Root candidates and weights									
0	4	7	9	5	2	3	8	6	10
275.00	100.00	100.00	81.67	72.92	37.92	33.33	33.33	20.00	12.50

Figure 4.4 Root candidates and weights for a major triad in root position (0-4-7).

It is clear that the I – V and I – IV chord progressions reflect the psychoacoustic processing of spectral pitches and root candidates in the brain. The weights of the spectral pitches or root candidates, respectively, which are added as fundamental pitches in the second chord, are higher than the weights of the spectral pitches and root candidates of all other pitches (including those not shown in the spectral pitch or root candidate series).

These chord progressions sound good for two reasons. First, there is harmonic consistency between the first and second chords in the sense that the fundamental pitches are structurally similar to one another (both are major triads) [27]. Second, there is harmonic consistency between the first and second chords in the sense that the second chord is closely related to the first chord by minimal psychoacoustic distance, measured by the weights of the spectral pitches and root candidates of the first chord.

Now, consider the common I-IV-V-I chord progression. Again, we will use triads in root position. (Although this analysis may also be performed with inversions, there may be changes to root clarity which would need to be taken into account). Assume that each chord progression occurs without any rest between the chords.

First, consider the progression of each chord to the next chord, as pairs. The I – IV and V – I changes are root chord progressions that each adds pitches that are the closest root candidates of the preceding chord.

0 0-4-7	→	0 5-9-0					Root chord progression
		5 0-4-7	→	5 2-6-9			Mixed spectral (2, 6) and root (9, 6) progression. Pitch 6 is a weak fit. As pitch 6 is the leading note (11) of the 0 major scale, this weakness might underlie its “desire” to be resolved by a stronger tonic pitch.
				7 0-4-7	→	7 5-9-0	Root chord progression
						0 0-4-7	
I	→	IV	→	V	→	I	Complete chord progression

Figure 4.5

Above, the IV – V change adds pitches that are either spectral pitches or root candidates, which are set out in bold below.

0-4-7 Spectral pitches and weights									
7	4	0	11	2	8	5	10	6	9
150.00	133.33	100.00	83.33	82.50	33.33	20.00	20.00	12.50	12.50

Figure 4.6

0-4-7 Root candidates and weights									
0	4	7	9	5	2	3	8	6	10
275.00	100.00	100.00	81.67	72.92	37.92	33.33	33.33	20.00	12.50

Figure 4.7

Second, consider the I-IV-V-I chord progression in terms of how each chord relates to the original tonic chord.

0 0-4-7	→	0 5-9-0					Root chord progression
		0 5-9-0	→	0 7-11-2			Spectral chord progression
				0 7-11-2	→	0 0-4-7	Return to the fundamental pitches of the tonic chord.
I	→	IV	→	V	→	I	Complete chord progression

Figure 4.8

When the tonic environment is considered, it is clear that the I-IV-V-I chord progression is based on repeated tonic pitches together with spectral pitches and root candidates that are closest to the tonic triad by weight.

0-4-7 Spectral pitches and weights									
7	4	0	11	2	8	5	10	6	9
150.00	133.33	100.00	83.33	82.50	33.33	20.00	20.00	12.50	12.50

Figure 4.9

0-4-7 Root candidates and weights									
0	4	7	9	5	2	3	8	6	10
275.00	100.00	100.00	81.67	72.92	37.92	33.33	33.33	20.00	12.50

Figure 4.10

Again, it is clear that the psychoacoustic processing in the brain – of the spectral pitches and root candidates of the tonic chord – is deeply embedded in the I-IV-V-I chord progression. This chord progression sounds good because there is harmonic consistency between the subdominant and dominant chords and final tonic chord in terms of structural similarity to, and minimal psychoacoustic distance from, the original tonic chord.

WHAT ABOUT NATURAL MINOR? (0-2-3-5-7-8-10) i-iv-v-i

4.2 Basic chord progressions in the natural minor scale

0-3-7 Spectral pitches and weights

7	0	3	10	2	4	11	5	1	9
183.33	100.00	100.00	70.00	62.50	33.33	33.33	32.50	20.00	12.50

Figure 4.11

0-3-7 Root candidates and weights

0	3	5	7	8	11	2	9	1	10
175.00	155.56	123.75	100.00	97.22	33.33	20.00	20.00	12.50	12.50

Figure 4.12

0 0-3-7	→	0 7-10-2					Spectral chord progression
i	→	v					

Figure 4.13

0 0-3-7	→	0 5-8-0					Root chord progression
i	→	iv					

Figure 4.14

Analysis based on each individual chord of the i-iv-v-i chord progression shows that it can be played at moderate or slow speed and the chords will sound like they belong.

0 0-3-7	→	0 5-8-0					Root chord progression
		5 0-3-7	→	5 2-5-9			Mixed spectral (2, 9) and root (5, 9) progression. Pitch 9 is a weak fit.
				7 0-3-7	→	7 5-8-0	Root chord progression
						0 0-3-7	
i	→	iv	→	v	→	i	Complete chord progression

Figure 4.15

Analysis based on the spectral pitches and root candidates of the original tonic chord shows that the i-iv-v-i chord progression can be played at high speed and the chords will also sound like they belong.

0 0-3-7	→	0 5-8-0					Root chord progression
		0 5-8-0	→	0 7-10-2			Spectral chord progression
				0 7-10-2	→	0 0-3-7	Return to the fundamental pitches of the tonic chord.
i	→	iv	→	v	→	i	Complete chord progression

Figure 4.16