A Model for Scale-Degree Reinterpretation:

Melodic Structure, Modulation, and Cadences in the Chorale Harmonizations of J. S. Bach

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Tonic-Key Tunnel Vision

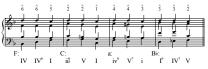
Gauldin (2009) laments that graduate students trying to harmonize a chorale in the style of J. S. Bach have a sort of tonic-key tunnel vision, i.e., they tend to avoid cadences that involve modulation.

As a result of tonic-key tunnel vision, these student harmonizations lack the tonal variety of a Bach setting.

Scale-Degree Reinterpretation

To combat tonic-key tunnel vision, Gauldin introduces the concept of scale-degree reinterpretation; the process of reinterpreting the final notes of a phrase as diatonic scale degrees in some key other than tonic.

Some examples of a reinterpreted phrase ending:



But scale-degree reinterpretation creates a large number of cadence and modulation possibilities. For example:

Local scale-degrees	Local Key	Cadence Type
6-6-5	I	Plagal
6-6-5	I	Half
6-6-5	I	Imperfect Authentic
2-2-1	V	Perfect Authentic
2-2-1	V	Deceptive
2-2-1	V	Imperfect Authentic
4-4-3	iii	Imperfect Authentic
4-4-3	iii	Deceptive
4-4-3	iii	Plagal
3-3-2	IV	Half

Some of these key and cadence options must be more typical, but which? Gauldin does not offer guidelines for when and how to use scale-degree reinterpretation.

A Corpus Study

To determine how melodic structure, cadence type, and key areas interact in the Bach chorales, I conducted a corpus study. The goal was to create a more tailored approach to scale-degree reinterpretation.

Encoding

For every chorale, the scale-degree content of the melody was encoded for the last three beats of each cadence

1	2.3.2.	2.2.1.	4.3.2.	3.3.1.	2.3.2.	2.2.1.
2	b76.5.	7.6.5.	2.3.2.	2.#12.	4.3.2.	3.2.1.
3	5.b32.	b32.1.	b71.2.	1.7.1.	4.b32.	
4	6.5.4.	5.6.5.	1.6.5.	5.4.3.	6.7.1.	
5	4.4.3.	2.2.1.	3.2.1.	3.#45.	4.4.3.	(etc.)
6	5.5.3.	3.2.3.	6.6.5.	2.2.1.		
7	2.2.3.	2.2.1.	7.7.6.	6.6.5.	3.3.1.	(etc.)
8	2.2.1.	4.4.b3	2.2.1.	4.4.5.	5.5.4.	(etc.)
9	5.#45.	2.2.1.	3.3.2.	6.#56.	2.2.2.	2.2.1.
10	b71.2.	b7b65.	4 2 1	2 1 b7	5 5 5	

A custom shorthand encoded cadences. This shorthand included information about:

- The local key area
- The traditional cadence classification
 - e.g., HF = Half Cadence
 - IA = Imperfect Authentic Cadence
- The chordal member of the soprano at cadence



Cadence encodings for each phrase of the chorales were stored in a separate tab-delimited text file:

1	I-HF5	I-PA1	I-HF5	I-SS5	I-HF5	I-PA1
2	V-PA1	V-PA1	I-HF5	ii-PA1	I-HF5	I-PA1
3	i-HF5	i-PA1	v-PH1	i-PA1	i-HF5	
4	IV-PA1	V-PA1	V-PA1	ii-HF5	I-PA1	
5	I-IA3	I-PA1	I-PA1	V-PA1	ii-HF5	(etc.)
6	I-IA3	I-IA3	V-PA1	I-PA1		
7	I-IA3	I-PA1	vi-PA1	V-PA1	I-SS5	(etc.)
8	i-PA1	III-PA1	i-PA1	III-IA3	iv-PA1	(etc.)
9	V-PA1	I-PA1	ii-PA1	vi-PA1	V-IA5	I-PA1
10	i-HF5	i-HF1	i-PA1	VTT-PA1	i-HF1	

Some Specific Results

Cadence types in the chorales are limited, despite the various contrapuntal and harmonic cadential possibilities.

Consider, for example, the distribution of cadence types given a melodic phrase ending 6-6-5:

Cadence encoding	Sample Harmonization	Frequency
I-PL5	IV - IV - I	8.9%
I-HF1	IV - ii ⁶ - V	0
I-IA5	IV ⁶ - vii ⁰⁷ - I	0
V-PA1	ii ⁶ - V - I	83.3%
V-DE3	ii ⁶ - V - vi	1.1%
V-IA1	ii - V ⁶ - I	0
iii-IA3	iv ⁶ - V ⁷ - i	4.4%
iii-DE5	iv ⁶ - V ⁷ - VI	0
iii-PL3	iv - iv ⁶ - i	0
IV-HF5	I ⁶ - IV ⁷ - V	1.1%
NC (No cadence)	N/A	1.1%

As well, scale-degree reinterpretation is not always stylistically valid for certain melodic endings. For example, here is the distribution of possible cadence types given the melodic phrase ending 2-2-1 (excluding the last cadence of a chorale):

Cadence encoding	Frequency
(I or i)-PA1	93.5%
(I or i)-DE3	3.9%
(I or i)-IA1	0
(IV or iv)-PL5	0
(IV or iv)-HF1	0
(IV or iv)-IA5	0
(vi or VI)-IA3	< 1.0%
(vi or VI)-DE5	0
(vi or VI)-PL3	0
VII-HF5	< 1.0%
NC (No cadence)	1.3%

Raw Distributions

Excluding the final cadence of a chorale, we can view the distribution of cadences and key areas given the scaledegree of the soprano at the phrase ending.

For major-key chorales:

Scale	Most con	ımon	Second-most	common	Others	
Degree	cadence	#	cadence	#	#	Total
1	I-PA1	156	vi-IA3	35	57	248
2	I-HF5	110	ii-PA1	28	19	157
3	I-IA3	100	ii-HF5	36	27	163
4	IV-PA1	16	ii-IA3	10	10	36
5	V-PA1	151	I-PL5	12	49	212
6	vi-PA1	21	I-SS3	9	13	43
7	V-IA3	36	vi-HF5	17	8	61
Total		590		147	183	920

For minor-key chorales:

Scale	Most common		Second-most common		Others	
Degree	cadence	#	cadence	#	#	Total
1	i-PA1	151	i-DE3	15	31	197
2	i-HF5	111	VII-IA3	32	18	161
b3	III-PA1	110	i-IA3	9	22	141
4	iv-PA1	22	III-HF5	20	7	49
5	III-IA3	52	v-PA1	47	101	200
b6	iv-IA3	6	VI-PA1	2	1	9
ь7	VII-PA1	37	v-IA3	11	8	56
7	i-HF3	28	i-PH3	10	0	38
Total		517		146	188	851

Simplified Models

From these raw distributions, I posit simplified conceptual models for scale-degree reinterpretation.

For major-key chorales:

Scale Degree	Tonic	Dominant	Submediant	Subdominant	Supertonic
1	I-PA1		vi-IA3		
2	I-HF5			=	ii-PA1
3	I-IA3				ii-HF5
4				IV-PA1	ii-IA3
5		V-PA1		IV-HF5*	
6		V-HF5*	vi-PA1	IV-IA3*	ĺ
7		V/ IA2	wi LIES		

For minor-key chorales:

Scale Degree	Mediant	Tonic	Subtonic	Dominant	Subdominant
1		i-PA1	VII-HF5*		
2		i-HF5	VII-IA3		
b3	III-PA1	i-IA3		•	
4	III-HF5		•		iv-PA1*
5	III-IA3			v-PA1	iv-HF5
b6				(n/a)	iv-IA3
b 7			VII-PA1	v-IA3	

Effectiveness of Simplified Models

The success rate of the simplified models turns out to be highly predicated on the melodic interval leading into the cadential arrival.

Generic Melodic Interval at Cadence	Instances	Model Matches	Success Rate
Descending 2nd	1084	968	89.3%
Ascending 2nd	456	346	75.9%
Descending 3rd	137	85	62.0%
Ascending 3rd	1		
Descending 4th	14	8	
Ascending 4th	22	4	
Unison	47	12	25.5%

The extension of the simplified models via the addition of four special cases raises the overall success rate to 92.2%.

- 1) The deceptive cadence (2.5% of all fermata events). which is typically used as the penultimate cadence or for repeated melodic phrases.
- 2) The plagal "cadence" (2.8% of all fermata events), which is typically the result of upper-neighbor motion around scale-degree 5 or unison endings.
- 3) The subdominant stop (2.7% of all fermata events), which typically occurs within the tonic key and involves a descending melodic third.



4) Outer-voice expansion to the octave (IA, HF, and PH), which always includes half-step motion in an outer voice.



Note: Outer-voice contraction to the octave is a cadence type foreign to the Bach chorale style.

Conclusions and Advice

Based on these findings, we can offer some general advice to those trying to harmonize a chorale in the style of J. S. Bach with regard to scale-degree reinterpretation.

Basic advice: Interpret the melodic note at the phrase ending as scale-degree 1, 2, or 3 in some closely-related key area (especially via an authentic or half cadence).

- The phrase final melodic note is scale-degree 7 in a minor-key; then use a half-cadence in tonic.
- The melodic phrase ending involves upper-neighbor motion around scale-degree 5; then consider using a plagal cadence
- The melody ascends a whole step into the phrase ending; then consider using a phrygian cadence.

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