Triadic harmonization

Introduction

GeCo-Tool can generate not only scales and interval structures, but also their harmonic realizations.

In this document, scales and modal systems are harmonized through the superimposition of diatonic thirds. Each table is built from the parent collection of the corresponding scale or modal family. For example, the table of the church modes is derived from C major: Ionian begins on C, Dorian begins on D, Phrygian begins on E, and so on. Because GeCo-Tool operates through cyclic interval structures (cycles of tuples), triads are represented as closed cycles. The interval class is the same to Forte's set theory, except that here the triadic structure is closed to the octave. Clearly, for instrument practice, the triads can be played either as individual notes (arpeggios of the chord) or by playing the three notes as a chord (for harmonic instruments).

For example, the C major triad:

$$C\ E\ G\ C$$

is encoded as:

$$4\ 3\ 5$$

where:

$$4 + 3 + 5 = 12$$

The closing interval is required because GeCo continues generating notes until the starting pitch-class is reached again. Thus, all triads in this document are represented as closed K=3 structures.

For each closed triad, the two cyclic inversions are also shown. For example:

$$C\ E\ G\ C$$

produces:

$$E\ G\ C\ E$$

and:

$$G\ C\ E\ G$$

These inversions preserve the same pitch-class content while changing the starting point of the closed GeCo cycle.

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Triadic Signatures

Here we provide a table with the intervallic content (triadic signatures) of the principal chord structures commonly encountered in Western music.

The additional column *Class* groups the structures according to their intervallic organization. This classification is particularly useful within GeCo-Tool because it highlights families of related interval structures independently of tonal function.

Quality	**Closed Triad**	**Seq.**	**1st Inv.**	**Seq.**	**2nd Inv.**	**Seq.**	**Symbol**	**Class**
Major	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	C	Major

Quality	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Symbol	Class
Minor	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Cm	Minor
Diminished	C Eb Gb C	3 3 6	Eb Gb C Eb	3 6 3	Gb C Eb Gb	6 3 3	Cdim	Symmetric
Augmented	C E G# C	4 4 4	E G# C E	4 4 4	G# C E G#	4 4 4	C+	Symmetric
Suspended 2nd	C D G C	2 5 5	D G C D	5 5 2	G C D G	5 2 5	Csus2	Suspended
Suspended 4th	C F G C	5 2 5	F G C F	2 5 5	G C F G	5 5 2	Csus4	Suspended
Quartal	C F Bb C	5 5 2	F Bb C F	5 2 5	Bb C F Bb	2 5 5	C quartal	Quartal
Quintal	C G D C	7 7 10	G D C G	7 10 7	D C G D	10 7 7	C quintal	Quintal

Part I: Canonical Triadic Harmonization

The following collections are heptatonic scales that admit a traditional harmonization through the superimposition of diatonic thirds. The resulting triads correspond closely to established harmonic practice and therefore may be interpreted both as conventional harmonic structures and as GeCo interval signatures.

Triadic Harmonization of Modes Derived from C Major

Parent collection: C Major parent collection

C D E F G A B C

Semitone sequence:

2 2 1 2 2 2 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
Ionian (C)	**C E G** C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
Dorian (D)	**D F A** D	3 4 5	F A D F	4 5 3	A D F A	5 3 4	Minor	Dm
Phrygian (E)	**E G B** E	3 4 5	G B E G	4 5 3	B E G B	5 3 4	Minor	Em
Lydian (F)	**F A C** F	4 3 5	A C F A	3 5 4	C F A C	5 4 3	Major	F
Mixolydian (G)	**G B D** G	4 3 5	B D G B	3 5 4	D G B D	5 4 3	Major	G
Aeolian (A)	**A C E** A	3 4 5	C E A C	4 5 3	E A C E	5 3 4	Minor	Am
Locrian (B)	**B D F** B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Note again that the triad is shown here with an additional note, since GeCo-Tools requires the closing of the intervallic structure with the initial note. The triad is shown in bold as an example.

Triadic Harmonization of Modes of A Harmonic Minor

Parent collection: A Harmonic Minor parent collection

A B C D E F G# A

Semitone sequence:

2 1 2 2 1 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
Harmonic Minor (A)	A C E A	3 4 5	C E A C	4 5 3	E A C E	5 3 4	Minor	Am
Locrian #6 (B)	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim
Ionian #5 (C)	C E G# C	4 4 4	E G# C E	4 4 4	G# C E G#	4 4 4	Augmented	C+
Dorian #4 (D)	D F A D	3 4 5	F A D F	4 5 3	A D F A	5 3 4	Minor	Dm
Phrygian Dominant (E)	E G# B E	4 3 5	G# B E G#	3 5 4	B E G# B	5 4 3	Major	E
Lydian #2 (F)	F A C F	4 3 5	A C F A	3 5 4	C F A C	5 4 3	Major	F
Ultra Locrian (G#)	G# B D G#	3 3 6	B D G# B	3 6 3	D G# B D	6 3 3	Diminished	G#dim

Triadic Harmonization of Modes of A Melodic Minor

Parent collection: A Melodic Minor parent collection

A B C D E F# G# A

Semitone sequence:

2 1 2 2 2 2 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
Melodic Minor (A)	A C E A	3 4 5	C E A C	4 5 3	E A C E	5 3 4	Minor	Am
Dorian b2 (B)	B D F# B	3 4 5	D F# B D	4 5 3	F# B D F#	5 3 4	Minor	Bm
Lydian Augmented (C)	C E G# C	4 4 4	E G# C E	4 4 4	G# C E G#	4 4 4	Augmented	C+
Lydian Dominant (D)	D F# A D	4 3 5	F# A D F#	3 5 4	A D F# A	5 4 3	Major	D
Mixolydian b6 (E)	E G# B E	4 3 5	G# B E G#	3 5 4	B E G# B	5 4 3	Major	E
Locrian #2 (F#)	F# A C F#	3 3 6	A C F# A	3 6 3	C F# A C	6 3 3	Diminished	F#dim
Altered / Super Locrian (G#)	G# B D G#	3 3 6	B D G# B	3 6 3	D G# B D	6 3 3	Diminished	G#dim

Triadic Harmonization of Modes of C Harmonic Major

Parent collection: C Harmonic Major parent collection

C D E F G Ab B C

Semitone sequence:

2 2 1 2 1 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
Harmonic Major (C)	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
Dorian b5 (D)	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
Phrygian b4 (E)	E G B E	3 4 5	G B E G	4 5 3	B E G B	5 3 4	Minor	Em
Lydian b3 (F)	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
Mixolydian b2 (G)	G B D G	4 3 5	B D G B	3 5 4	D G B D	5 4 3	Major	G
Lydian Augmented #2 (Ab)	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
Locrian bb7 (B)	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Triadic Harmonization of Neapolitan Major Modes

Parent collection: C Neapolitan Major parent collection

C Db Eb F G A B C

Semitone sequence:

1 2 2 2 2 2 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
Neapolitan Major (C)	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
Mode II (Db)	Db F A Db	4 4 4	F A Db F	4 4 4	A Db F A	4 4 4	Augmented	Db+
Mode III (Eb)	Eb G B Eb	4 4 4	G B Eb G	4 4 4	B Eb G B	4 4 4	Augmented	Eb+
Mode IV (F)	F A C F	4 3 5	A C F A	3 5 4	C F A C	5 4 3	Major	F
Mode V (G)	G B Db G	4 2 6	B Db G B	2 6 4	Db G B Db	6 4 2	Hybrid	G hyb
Mode VI (A)	A C Eb A	3 3 6	C Eb A C	3 6 3	Eb A C Eb	6 3 3	Diminished	Adim
Mode VII (B)	B Db F B	2 4 6	Db F B Db	4 6 2	F B Db F	6 2 4	Hybrid	B hyb

Triadic Harmonization of Neapolitan Minor Modes

Parent collection: C Neapolitan Minor parent collection

C Db Eb F G Ab B C

Semitone sequence:

1 2 2 2 1 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
Neapolitan Minor (C)	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
Mode II (Db)	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
Mode III (Eb)	Eb G B Eb	4 4 4	G B Eb G	4 4 4	B Eb G B	4 4 4	Augmented	Eb+
Mode IV (F)	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
Mode V (G)	G B Db G	4 2 6	B Db G B	2 6 4	Db G B Db	6 4 2	Hybrid	G hyb
Mode VI (Ab)	Ab C Eb Ab	4 3 5	C Eb Ab C	3 5 4	Eb Ab C Eb	5 4 3	Major	Ab
Mode VII (B)	B Db F B	2 4 6	Db F B Db	4 6 2	F B Db F	6 2 4	Hybrid	B hyb

Part II: Harmonization of Non-Heptatonic Collections

A Note on Harmonization and Non-Heptatonic Collections

The concept of scale harmonization through the superimposition of thirds is deeply rooted in the Western tonal tradition. In major and minor tonal systems, scales are typically interpreted not only as melodic structures but also as sources of harmonic material. The familiar sequence of triads obtained from the major scale is one of the most characteristic features of tonal music theory. The same concept is then extended to higher voicings, for instance the seventh is a major third above the fifth in a major seven chord (C E G B), a ninth is a minor third above the seventh (C E G B D) and so forth. In this sense, the structure of the tonal system and the circle of fifths to derive all the different keys, makes the structure somehow simple.

However, this approach cannot always be extended uncritically to other musical systems. Many non-Western traditions, including Arabic, Turkish, Persian, Indian, and numerous folk traditions throughout the world, do not historically employ harmonic practices based on functional triads derived from scales. Instead, these musical cultures often emphasize melodic development, modal behavior, characteristic motives, ornamentation, and specific pathways through a modal space.

For example, Arabic *maqam*, Turkish *makam*, Persian *dastgah*, and Indian *raga* systems are generally understood as melodic frameworks rather than harmonic structures. Consequently, the question:

> "Which triads can be derived from this scale?"

is often not a traditional musicological question within those systems. Similarly, non-heptatonic collections such as pentatonic, blues, bebop, whole-tone, and diminished scales do not always possess a universally accepted method of harmonization. In many cases, multiple harmonic interpretations are possible, and different musicians may derive very different chordal structures from the same pitch collection.

For this reason, the harmonizations presented in this document should not always be interpreted as representations of historical or traditional harmonic practice. Instead, GeCo-Tool adopts an interval-based perspective. Given a pitch collection, GeCo generates harmonic structures through a simple cyclic selection rule:

> one note selected, one note skipped, one note selected, one note skipped, one note selected.

The resulting triads are therefore interval constructions generated from the internal organization of the pitch collection itself. Further explorations of this concept will open other possibilities for harmonization.

This approach allows every scale or modal collection to be explored within a unified mathematical framework, regardless of its cultural origin or historical context. In this sense, GeCo does not attempt to reproduce traditional harmonic practices. Rather, it provides a method for investigating the intervallic and structural possibilities contained within a collection of pitches.

Consequently, the harmonizations shown in this document should be viewed as computational models and interval structures rather than normative harmonic realizations.

This distinction is particularly important for pentatonic, blues, bebop, symmetric, and non-Western modal collections, where the resulting triads often reveal structural relationships that are not normally discussed within traditional theoretical frameworks.

Unlike heptatonic scales, the following collections do not possess a universally accepted traditional harmonization. The triads presented here are generated automatically according to a cyclic third-selection rule:

one note selected, one note skipped, one note selected, one note skipped, one note selected.

The resulting structures should therefore be interpreted as algorithmic interval constructions rather than conventional harmonic functions.

Triadic Harmonization of Major Pentatonic

Parent collection: C Major Pentatonic

C D E G A C

Semitone sequence:

2 2 3 2 3

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E A C	4 5 3	E A C E	5 3 4	A C E A	3 4 5	Hybrid	C hyb
2	D G C D	5 5 2	G C D G	5 2 5	C D G C	2 5 5	Quartal	D quartal
3	E A D E	5 5 2	A D E A	5 2 5	D E A D	2 5 5	Quartal	E quartal
4	G C E G	5 4 3	C E G C	4 3 5	E G C E	3 5 4	Hybrid	G hyb
5	A D G A	5 5 2	D G A D	5 2 5	G A D G	2 5 5	Quartal	A quartal

Triadic Harmonization of Minor Pentatonic

Parent collection: C Minor Pentatonic

C Eb F G Bb C

Semitone sequence:

3 2 2 3 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C F Bb C	5 5 2	F Bb C F	5 2 5	Bb C F Bb	2 5 5	Quartal	C quartal
2	Eb G C Eb	4 5 3	G C Eb G	5 3 4	C Eb G C	3 4 5	Hybrid	Eb hyb
3	F Bb Eb F	5 5 2	Bb Eb F Bb	5 2 5	Eb F Bb Eb	2 5 5	Quartal	F quartal
4	G C F G	5 5 2	C F G C	5 2 5	F G C F	2 5 5	Quartal	G quartal
5	Bb Eb G Bb	5 4 3	Eb G Bb Eb	4 3 5	G Bb Eb G	3 5 4	Hybrid	Bb hyb

Triadic Harmonization of Major Blues

Parent collection: C Major Blues

C D Eb E G A C

Semitone sequence:

2 1 1 3 2 3

Note on Blues Harmonization The blues collections contain both major and minor inflections and therefore allow several possible harmonic interpretations.

The harmonization presented below follows the GeCo cyclic third-selection rule:

> one note is selected, the following note is skipped, the next note is selected, and the process is repeated cyclically.

For example, the C Major Blues collection contains both

C Eb G

and

C E G

which represent different harmonic interpretations of the same pitch collection. The following tables should therefore be understood as algorithmic interval structures rather than prescriptive blues harmony.

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
2	D E A D	2 5 5	E A D E	5 5 2	A D E A	5 2 5	Suspended 2nd	Dsus2
3	Eb G C Eb	4 5 3	G C Eb G	5 3 4	C Eb G C	3 4 5	Hybrid	Eb hyb
4	E A D E	5 5 2	A D E A	5 2 5	D E A D	2 5 5	Quartal	E quartal
5	G C Eb G	5 3 4	C Eb G C	3 4 5	Eb G C Eb	4 5 3	Hybrid	G hyb
6	A D E A	5 2 5	D E A D	2 5 5	E A D E	5 5 2	Suspended 4th	Asus4

Triadic Harmonization of Minor Blues

Parent collection: C Minor Blues

C Eb F Gb G Bb C

Semitone sequence:

3 2 1 1 3 2

Note on Blues Harmonization The blues collections contain both major and minor inflections and therefore allow several possible harmonic interpretations.

The harmonization presented below follows the GeCo cyclic third-selection rule:

> one note is selected, the following note is skipped, the next note is selected, and the process is repeated cyclically.

For example, the C Major Blues collection contains both

C Eb G

and

C E G

which represent different harmonic interpretations of the same pitch collection. The following tables should therefore be understood as algorithmic interval structures rather than prescriptive blues harmony.

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C F G C	5 2 5	F G C F	2 5 5	G C F G	5 5 2	Suspended 4th	Csus4
2	Eb Gb Bb Eb	3 4 5	Gb Bb Eb Gb	4 5 3	Bb Eb Gb Bb	5 3 4	Minor	Ebm
3	F G C F	2 5 5	G C F G	5 5 2	C F G C	5 2 5	Suspended 2nd	Fsus2
4	Gb Bb Eb Gb	4 5 3	Bb Eb Gb Bb	5 3 4	Eb Gb Bb Eb	3 4 5	Hybrid	Gb hyb
5	G C F G	5 5 2	C F G C	5 2 5	F G C F	2 5 5	Quartal	G quartal
6	Bb Eb Gb Bb	5 3 4	Eb Gb Bb Eb	3 4 5	Gb Bb Eb Gb	4 5 3	Hybrid	Bb hyb

Triadic Harmonization of Jazz Blues / Combined Blues

Parent collection: C Jazz Blues / Combined Major-Minor Blues

$$C\ D\ Eb\ E\ F\ Gb\ G\ A\ Bb\ C$$

Semitone sequence:

2 1 1 1 1 1 2 1 2

Note on Blues Harmonization The blues collections contain both major and minor inflections and therefore allow several possible harmonic interpretations.

The harmonization presented below follows the GeCo cyclic third-selection rule:

> one note is selected, the following note is skipped, the next note is selected, and the process is repeated cyclically.

For example, the C Major Blues collection contains both

$$C\ Eb\ G$$

and

$$C\ E\ G$$

which represent different harmonic interpretations of the same pitch collection. The following tables should therefore be understood as algorithmic interval structures rather than prescriptive blues harmony.

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb F C	3 2 7	Eb F C Eb	2 7 3	F C Eb F	7 3 2	Hybrid	C hyb
2	D E Gb D	2 2 8	E Gb D E	2 8 2	Gb D E Gb	8 2 2	Hybrid	D hyb
3	Eb F G Eb	2 2 8	F G Eb F	2 8 2	G Eb F G	8 2 2	Hybrid	Eb hyb
4	E Gb A E	2 3 7	Gb A E Gb	3 7 2	A E Gb A	7 2 3	Hybrid	E hyb
5	F G Bb F	2 3 7	G Bb F G	3 7 2	Bb F G Bb	7 2 3	Hybrid	F hyb
6	Gb A C Gb	3 3 6	A C Gb A	3 6 3	C Gb A C	6 3 3	Diminished	Gbdim
7	G Bb D G	3 4 5	Bb D G Bb	4 5 3	D G Bb D	5 3 4	Minor	Gm
8	A C Eb A	3 3 6	C Eb A C	3 6 3	Eb A C Eb	6 3 3	Diminished	Adim
9	Bb D E Bb	4 2 6	D E Bb D	2 6 4	E Bb D E	6 4 2	Hybrid	Bb hyb

Triadic Harmonization of Major Bebop

Parent collection: C Major Bebop

C D E F G Ab A B C

Semitone sequence:

2 2 1 2 1 1 2 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
3	E G A E	3 2 7	G A E G	2 7 3	A E G A	7 3 2	Hybrid	E hyb
4	F Ab B F	3 3 6	Ab B F Ab	3 6 3	B F Ab B	6 3 3	Diminished	Fdim
5	G A C G	2 3 7	A C G A	3 7 2	C G A C	7 2 3	Hybrid	G hyb
6	Ab B D Ab	3 3 6	B D Ab B	3 6 3	D Ab B D	6 3 3	Diminished	Abdim
7	A C E A	3 4 5	C E A C	4 5 3	E A C E	5 3 4	Minor	Am
8	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Triadic Harmonization of Dominant Bebop

Parent collection: C Dominant Bebop

C D E F G A Bb B C

Semitone sequence:

2 2 1 2 2 1 1 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	D F A D	3 4 5	F A D F	4 5 3	A D F A	5 3 4	Minor	Dm
3	E G Bb E	3 3 6	G Bb E G	3 6 3	Bb E G Bb	6 3 3	Diminished	Edim
4	F A B F	4 2 6	A B F A	2 6 4	B F A B	6 4 2	Hybrid	F hyb
5	G Bb C G	3 2 7	Bb C G Bb	2 7 3	C G Bb C	7 3 2	Hybrid	G hyb
6	A B D A	2 3 7	B D A B	3 7 2	D A B D	7 2 3	Hybrid	A hyb
7	Bb C E Bb	2 4 6	C E Bb C	4 6 2	E Bb C E	6 2 4	Hybrid	Bb hyb
8	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Triadic Harmonization of Minor Bebop / Dorian Bebop

Parent collection: C Minor Bebop / Dorian Bebop

C D Eb F G Ab A Bb C

Semitone sequence:

2 1 2 2 1 1 1 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
2	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
3	Eb G A Eb	4 2 6	G A Eb G	2 6 4	A Eb G A	6 4 2	Hybrid	Eb hyb
4	F Ab Bb F	3 2 7	Ab Bb F Ab	2 7 3	Bb F Ab Bb	7 3 2	Hybrid	F hyb
5	G A C G	2 3 7	A C G A	3 7 2	C G A C	7 2 3	Hybrid	G hyb
6	Ab Bb D Ab	2 4 6	Bb D Ab Bb	4 6 2	D Ab Bb D	6 2 4	Hybrid	Ab hyb
7	A C Eb A	3 3 6	C Eb A C	3 6 3	Eb A C Eb	6 3 3	Diminished	Adim
8	Bb D F Bb	4 3 5	D F Bb D	3 5 4	F Bb D F	5 4 3	Major	Bb

Triadic Harmonization of Melodic Minor Bebop

Parent collection: C Melodic Minor Bebop

C D Eb F Gb G A B C

Semitone sequence:

2 1 2 1 1 2 2 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb Gb C	3 3 6	Eb Gb C Eb	3 6 3	Gb C Eb Gb	6 3 3	Diminished	Cdim
2	D F G D	3 2 7	F G D F	2 7 3	G D F G	7 3 2	Hybrid	D hyb
3	Eb Gb A Eb	3 3 6	Gb A Eb Gb	3 6 3	A Eb Gb A	6 3 3	Diminished	Ebdim
4	F G B F	2 4 6	G B F G	4 6 2	B F G B	6 2 4	Hybrid	F hyb
5	Gb A C Gb	3 3 6	A C Gb A	3 6 3	C Gb A C	6 3 3	Diminished	Gbdim
6	G B D G	4 3 5	B D G B	3 5 4	D G B D	5 4 3	Major	G
7	A C Eb A	3 3 6	C Eb A C	3 6 3	Eb A C Eb	6 3 3	Diminished	Adim
8	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Triadic Harmonization of Harmonic Minor Bebop

Parent collection: C Harmonic Minor Bebop

C D Eb F G Ab A B C

Semitone sequence:

2 1 2 2 1 1 2 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
2	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
3	Eb G A Eb	4 2 6	G A Eb G	2 6 4	A Eb G A	6 4 2	Hybrid	Eb hyb
4	F Ab B F	3 3 6	Ab B F Ab	3 6 3	B F Ab B	6 3 3	Diminished	Fdim
5	G A C G	2 3 7	A C G A	3 7 2	C G A C	7 2 3	Hybrid	G hyb
6	Ab B D Ab	3 3 6	B D Ab B	3 6 3	D Ab B D	6 3 3	Diminished	Abdim
7	A C Eb A	3 3 6	C Eb A C	3 6 3	Eb A C Eb	6 3 3	Diminished	Adim
8	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Triadic Harmonization of Bebop Locrian

Parent collection: C Bebop Locrian

C Db Eb F Gb G Ab Bb C

Semitone sequence:

1 2 2 1 1 1 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb Gb C	3 3 6	Eb Gb C Eb	3 6 3	Gb C Eb Gb	6 3 3	Diminished	Cdim
2	Db F G Db	4 2 6	F G Db F	2 6 4	G Db F G	6 4 2	Hybrid	Db hyb
3	Eb Gb Ab Eb	3 2 7	Gb Ab Eb Gb	2 7 3	Ab Eb Gb Ab	7 3 2	Hybrid	Eb hyb
4	F G Bb F	2 3 7	G Bb F G	3 7 2	Bb F G Bb	7 2 3	Hybrid	F hyb
5	Gb Ab C Gb	2 4 6	Ab C Gb Ab	4 6 2	C Gb Ab C	6 2 4	Hybrid	Gb hyb
6	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
7	Ab C Eb Ab	4 3 5	C Eb Ab C	3 5 4	Eb Ab C Eb	5 4 3	Major	Ab
8	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

Triadic Harmonization of Bebop Altered

Parent collection: C Bebop Altered

C Db Eb E F# G# Bb B C

Semitone sequence:

1 2 1 2 2 2 1 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb F# C	3 3 6	Eb F# C Eb	3 6 3	F# C Eb F#	6 3 3	Diminished	Cdim
2	Db E G# Db	3 4 5	E G# Db E	4 5 3	G# Db E G#	5 3 4	Minor	Dbm
3	Eb F# Bb Eb	3 4 5	F# Bb Eb F#	4 5 3	Bb Eb F# Bb	5 3 4	Minor	Ebm
4	E G# B E	4 3 5	G# B E G#	3 5 4	B E G# B	5 4 3	Major	E
5	F# Bb C F#	4 2 6	Bb C F# Bb	2 6 4	C F# Bb C	6 4 2	Hybrid	F# hyb
6	G# B Db G#	3 2 7	B Db G# B	2 7 3	Db G# B Db	7 3 2	Hybrid	G# hyb
7	Bb C Eb Bb	2 3 7	C Eb Bb C	3 7 2	Eb Bb C Eb	7 2 3	Hybrid	Bb hyb
8	B Db E B	2 3 7	Db E B Db	3 7 2	E B Db E	7 2 3	Hybrid	B hyb

Triadic Harmonization of Half-Whole Bebop Diminished

Parent collection: C Half-Whole Bebop Diminished

C Db Eb E F# G A Bb C

Semitone sequence:

1 2 1 2 1 2 1 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb F# C	3 3 6	Eb F# C Eb	3 6 3	F# C Eb F#	6 3 3	Diminished	Cdim
2	Db E G Db	3 3 6	E G Db E	3 6 3	G Db E G	6 3 3	Diminished	Dbdim
3	Eb F# A Eb	3 3 6	F# A Eb F#	3 6 3	A Eb F# A	6 3 3	Diminished	Ebdim
4	E G Bb E	3 3 6	G Bb E G	3 6 3	Bb E G Bb	6 3 3	Diminished	Edim
5	F# A C F#	3 3 6	A C F# A	3 6 3	C F# A C	6 3 3	Diminished	F#dim
6	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
7	A C Eb A	3 3 6	C Eb A C	3 6 3	Eb A C Eb	6 3 3	Diminished	Adim
8	Bb Db E Bb	3 3 6	Db E Bb Db	3 6 3	E Bb Db E	6 3 3	Diminished	Bbdim

Triadic Harmonization of Whole Tone

Parent collection: C Whole Tone

C D E F# G# A# C

Semitone sequence:

2 2 2 2 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G# C	4 4 4	E G# C E	4 4 4	G# C E G#	4 4 4	Augmented	C+
2	D F# A# D	4 4 4	F# A# D F#	4 4 4	A# D F# A#	4 4 4	Augmented	D+
3	E G# C E	4 4 4	G# C E G#	4 4 4	C E G# C	4 4 4	Augmented	E+
4	F# A# D F#	4 4 4	A# D F# A#	4 4 4	D F# A# D	4 4 4	Augmented	F#+
5	G# C E G#	4 4 4	C E G# C	4 4 4	E G# C E	4 4 4	Augmented	G#+
6	A# D F# A#	4 4 4	D F# A# D	4 4 4	F# A# D F#	4 4 4	Augmented	A#+

Triadic Harmonization of Chromatic Collection

Parent collection: C Chromatic

C Db D Eb E F F# G Ab A Bb B C

Semitone sequence:

1 1 1 1 1 1 1 1 1 1 1 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C D E C	2 2 8	D E C D	2 8 2	E C D E	8 2 2	Hybrid	C hyb
2	Db Eb F Db	2 2 8	Eb F Db Eb	2 8 2	F Db Eb F	8 2 2	Hybrid	Db hyb

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
3	D E F# D	2 2 8	E F# D E	2 8 2	F# D E F#	8 2 2	Hybrid	D hyb
4	Eb F G Eb	2 2 8	F G Eb F	2 8 2	G Eb F G	8 2 2	Hybrid	Eb hyb
5	E F# Ab E	2 2 8	F# Ab E F#	2 8 2	Ab E F# Ab	8 2 2	Hybrid	E hyb
6	F G A F	2 2 8	G A F G	2 8 2	A F G A	8 2 2	Hybrid	F hyb
7	F# Ab Bb F#	2 2 8	Ab Bb F# Ab	2 8 2	Bb F# Ab Bb	8 2 2	Hybrid	F# hyb
8	G A B G	2 2 8	A B G A	2 8 2	B G A B	8 2 2	Hybrid	G hyb
9	Ab Bb C Ab	2 2 8	Bb C Ab Bb	2 8 2	C Ab Bb C	8 2 2	Hybrid	Ab hyb
10	A B Db A	2 2 8	B Db A B	2 8 2	Db A B Db	8 2 2	Hybrid	A hyb
11	Bb C D Bb	2 2 8	C D Bb C	2 8 2	D Bb C D	8 2 2	Hybrid	Bb hyb
12	B Db Eb B	2 2 8	Db Eb B Db	2 8 2	Eb B Db Eb	8 2 2	Hybrid	B hyb

Triadic Harmonization of Diminished Whole-Half

Parent collection: C Diminished Whole-Half

C D Eb F Gb Ab A B C

Semitone sequence:

2 1 2 1 2 1 2 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb Gb C	3 3 6	Eb Gb C Eb	3 6 3	Gb C Eb Gb	6 3 3	Diminished	Cdim
2	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
3	Eb Gb A Eb	3 3 6	Gb A Eb Gb	3 6 3	A Eb Gb A	6 3 3	Diminished	Ebdim
4	F Ab B F	3 3 6	Ab B F Ab	3 6 3	B F Ab B	6 3 3	Diminished	Fdim
5	Gb A C Gb	3 3 6	A C Gb A	3 6 3	C Gb A C	6 3 3	Diminished	Gbdim
6	Ab B D Ab	3 3 6	B D Ab B	3 6 3	D Ab B D	6 3 3	Diminished	Abdim
7	A C Eb A	3 3 6	C Eb A C	3 6 3	Eb A C Eb	6 3 3	Diminished	Adim
8	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Triadic Harmonization of Diminished Half-Whole

Parent collection: C Diminished Half-Whole

C Db Eb E F# G A Bb C

Semitone sequence:

1 2 1 2 1 2 1 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb F# C	3 3 6	Eb F# C Eb	3 6 3	F# C Eb F#	6 3 3	Diminished	Cdim
2	Db E G Db	3 3 6	E G Db E	3 6 3	G Db E G	6 3 3	Diminished	Dbdim
3	Eb F# A Eb	3 3 6	F# A Eb F#	3 6 3	A Eb F# A	6 3 3	Diminished	Ebdim

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
4	E G Bb E	3 3 6	G Bb E G	3 6 3	Bb E G Bb	6 3 3	Diminished	Edim
5	F# A C F#	3 3 6	A C F# A	3 6 3	C F# A C	6 3 3	Diminished	F#dim
6	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
7	A C Eb A	3 3 6	C Eb A C	3 6 3	Eb A C Eb	6 3 3	Diminished	Adim
8	Bb Db E Bb	3 3 6	Db E Bb Db	3 6 3	E Bb Db E	6 3 3	Diminished	Bbdim

Triadic Harmonization of Hijaz

Parent collection: C Hijaz

C Db E F G Ab Bb C

Semitone sequence:

1 3 1 2 1 2 2

Note on Modal Approximations The following harmonizations are derived from twelve-tone approximations of modal systems used in Arabic, Turkish, Persian, and Middle Eastern musical traditions.

They should be interpreted as computational models suitable for GeCo-Tool rather than as representations of traditional harmonic practice.

Notes are shown using the nearest approximation within the twelve-tone equal temperament system.

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	E G Bb E	3 3 6	G Bb E G	3 6 3	Bb E G Bb	6 3 3	Diminished	Edim
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
6	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
7	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

Triadic Harmonization of Hijazkar

Parent collection: C Hijazkar

C Db E F G Ab B C

Semitone sequence:

1 3 1 2 1 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	E G B E	3 4 5	G B E G	4 5 3	B E G B	5 3 4	Minor	Em
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G B Db G	4 2 6	B Db G B	2 6 4	Db G B Db	6 4 2	Hybrid	G hyb
6	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
7	B Db F B	2 4 6	Db F B Db	4 6 2	F B Db F	6 2 4	Hybrid	B hyb

Triadic Harmonization of Bayati Approximation

Parent collection: C Bayati Approximation

C Db Eb F G Ab Bb C

Semitone sequence:

1 2 2 2 1 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	Eb G Bb Eb	4 3 5	G Bb Eb G	3 5 4	Bb Eb G Bb	5 4 3	Major	Eb
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
6	Ab C Eb Ab	4 3 5	C Eb Ab C	3 5 4	Eb Ab C Eb	5 4 3	Major	Ab
7	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

Triadic Harmonization of Nahawand

Parent collection: C Nahawand

C D Eb F G Ab Bb C

Semitone sequence:

2 1 2 2 1 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
2	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
3	Eb G Bb Eb	4 3 5	G Bb Eb G	3 5 4	Bb Eb G Bb	5 4 3	Major	Eb
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G Bb D G	3 4 5	Bb D G Bb	4 5 3	D G Bb D	5 3 4	Minor	Gm
6	Ab C Eb Ab	4 3 5	C Eb Ab C	3 5 4	Eb Ab C Eb	5 4 3	Major	Ab
7	Bb D F Bb	4 3 5	D F Bb D	3 5 4	F Bb D F	5 4 3	Major	Bb

Triadic Harmonization of Rast Approximation

Parent collection: C Rast Approximation

C D E F G A B C

Semitone sequence:

2 2 1 2 2 2 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	D F A D	3 4 5	F A D F	4 5 3	A D F A	5 3 4	Minor	Dm

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
3	E G B E	3 4 5	G B E G	4 5 3	B E G B	5 3 4	Minor	Em
4	F A C F	4 3 5	A C F A	3 5 4	C F A C	5 4 3	Major	F
5	G B D G	4 3 5	B D G B	3 5 4	D G B D	5 4 3	Major	G
6	A C E A	3 4 5	C E A C	4 5 3	E A C E	5 3 4	Minor	Am
7	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Triadic Harmonization of Saba Approximation

Parent collection: C Saba Approximation

C Db E F Gb A Bb C

Semitone sequence:

1 3 1 1 3 1 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E Gb C	4 2 6	E Gb C E	2 6 4	Gb C E Gb	6 4 2	Hybrid	C hyb
2	Db F A Db	4 4 4	F A Db F	4 4 4	A Db F A	4 4 4	Augmented	Db+
3	E Gb Bb E	2 4 6	Gb Bb E Gb	4 6 2	Bb E Gb Bb	6 2 4	Hybrid	E hyb
4	F A C F	4 3 5	A C F A	3 5 4	C F A C	5 4 3	Major	F
5	Gb Bb Db Gb	4 3 5	Bb Db Gb Bb	3 5 4	Db Gb Bb Db	5 4 3	Major	Gb
6	A C E A	3 4 5	C E A C	4 5 3	E A C E	5 3 4	Minor	Am
7	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

Triadic Harmonization of Kurd

Parent collection: C Kurd

C Db Eb F G Ab Bb C

Semitone sequence:

1 2 2 2 1 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	Eb G Bb Eb	4 3 5	G Bb Eb G	3 5 4	Bb Eb G Bb	5 4 3	Major	Eb
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
6	Ab C Eb Ab	4 3 5	C Eb Ab C	3 5 4	Eb Ab C Eb	5 4 3	Major	Ab
7	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

Triadic Harmonization of Nikriz

Parent collection: C Nikriz

C Db E F G Ab B C

Semitone sequence:

1 3 1 2 1 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	E G B E	3 4 5	G B E G	4 5 3	B E G B	5 3 4	Minor	Em
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G B Db G	4 2 6	B Db G B	2 6 4	Db G B Db	6 4 2	Hybrid	G hyb
6	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
7	B Db F B	2 4 6	Db F B Db	4 6 2	F B Db F	6 2 4	Hybrid	B hyb

Triadic Harmonization of Huzzam Approximation

Parent collection: C Huzzam Approximation

C Db E F Gb Ab B C

Semitone sequence:

1 3 1 1 2 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E Gb C	4 2 6	E Gb C E	2 6 4	Gb C E Gb	6 4 2	Hybrid	C hyb
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	E Gb B E	2 5 5	Gb B E Gb	5 5 2	B E Gb B	5 2 5	Suspended 2nd	Esus2
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	Gb B Db Gb	5 2 5	B Db Gb B	2 5 5	Db Gb B Db	5 5 2	Suspended 4th	Gbsus4
6	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
7	B Db F B	2 4 6	Db F B Db	4 6 2	F B Db F	6 2 4	Hybrid	B hyb

Triadic Harmonization of Suznak

Parent collection: C Suznak

C D E F G Ab B C

Semitone sequence:

2 2 1 2 1 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
3	E G B E	3 4 5	G B E G	4 5 3	B E G B	5 3 4	Minor	Em
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
5	G B D G	4 3 5	B D G B	3 5 4	D G B D	5 4 3	Major	G
6	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
7	B D F B	3 3 6	D F B D	3 6 3	F B D F	6 3 3	Diminished	Bdim

Triadic Harmonization of Ussak Approximation

Parent collection: C Ussak Approximation

C Db Eb F G Ab Bb C

Semitone sequence:

1 2 2 2 1 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	Eb G Bb Eb	4 3 5	G Bb Eb G	3 5 4	Bb Eb G Bb	5 4 3	Major	Eb
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
6	Ab C Eb Ab	4 3 5	C Eb Ab C	3 5 4	Eb Ab C Eb	5 4 3	Major	Ab
7	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

Triadic Harmonization of Segah Approximation

Parent collection: C Segah Approximation

C Db E F G A Bb C

Semitone sequence:

1 3 1 2 2 1 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	Db F A Db	4 4 4	F A Db F	4 4 4	A Db F A	4 4 4	Augmented	Db+
3	E G Bb E	3 3 6	G Bb E G	3 6 3	Bb E G Bb	6 3 3	Diminished	Edim
4	F A C F	4 3 5	A C F A	3 5 4	C F A C	5 4 3	Major	F
5	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
6	A C E A	3 4 5	C E A C	4 5 3	E A C E	5 3 4	Minor	Am
7	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

Triadic Harmonization of Persian Scale

Parent collection: C Persian Scale

C Db E F Gb Ab B C

Semitone sequence:

1 3 1 1 2 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E Gb C	4 2 6	E Gb C E	2 6 4	Gb C E Gb	6 4 2	Hybrid	C hyb
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	E Gb B E	2 5 5	Gb B E Gb	5 5 2	B E Gb B	5 2 5	Suspended 2nd	Esus2
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	Gb B Db Gb	5 2 5	B Db Gb B	2 5 5	Db Gb B Db	5 5 2	Suspended 4th	Gbsus4
6	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
7	B Db F B	2 4 6	Db F B Db	4 6 2	F B Db F	6 2 4	Hybrid	B hyb

Triadic Harmonization of Byzantine / Double Harmonic

Parent collection: C Byzantine / Double Harmonic

C Db E F G Ab B C

Semitone sequence:

1 3 1 2 1 3 1

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	E G B E	3 4 5	G B E G	4 5 3	B E G B	5 3 4	Minor	Em
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G B Db G	4 2 6	B Db G B	2 6 4	Db G B Db	6 4 2	Hybrid	G hyb
6	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
7	B Db F B	2 4 6	Db F B Db	4 6 2	F B Db F	6 2 4	Hybrid	B hyb

Triadic Harmonization of Oriental Scale

Parent collection: C Oriental Scale

C Db E F Gb A Bb C

Semitone sequence:

1 3 1 1 3 1 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E Gb C	4 2 6	E Gb C E	2 6 4	Gb C E Gb	6 4 2	Hybrid	C hyb
2	Db F A Db	4 4 4	F A Db F	4 4 4	A Db F A	4 4 4	Augmented	Db+
3	E Gb Bb E	2 4 6	Gb Bb E Gb	4 6 2	Bb E Gb Bb	6 2 4	Hybrid	E hyb
4	F A C F	4 3 5	A C F A	3 5 4	C F A C	5 4 3	Major	F
5	Gb Bb Db Gb	4 3 5	Bb Db Gb Bb	3 5 4	Db Gb Bb Db	5 4 3	Major	Gb

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
6	A C E A	3 4 5	C E A C	4 5 3	E A C E	5 3 4	Minor	Am
7	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

Triadic Harmonization of Arabic Pentatonic Approximation

Parent collection: C Arabic Pentatonic Approximation

C D Eb G A C

Semitone sequence:

2 1 4 2 3

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb A C	3 6 3	Eb A C Eb	6 3 3	A C Eb A	3 3 6	Hybrid	C hyb
2	D G C D	5 5 2	G C D G	5 2 5	C D G C	2 5 5	Quartal	D quartal
3	Eb A D Eb	6 5 1	A D Eb A	5 1 6	D Eb A D	1 6 5	Hybrid	Eb hyb
4	G C Eb G	5 3 4	C Eb G C	3 4 5	Eb G C Eb	4 5 3	Hybrid	G hyb
5	A D G A	5 5 2	D G A D	5 2 5	G A D G	2 5 5	Quartal	A quartal

Triadic Harmonization of Turkish Huseyni Approximation

Parent collection: C Turkish Huseyni Approximation

C D Eb F G Ab Bb C

Semitone sequence:

2 1 2 2 1 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
2	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
3	Eb G Bb Eb	4 3 5	G Bb Eb G	3 5 4	Bb Eb G Bb	5 4 3	Major	Eb
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G Bb D G	3 4 5	Bb D G Bb	4 5 3	D G Bb D	5 3 4	Minor	Gm
6	Ab C Eb Ab	4 3 5	C Eb Ab C	3 5 4	Eb Ab C Eb	5 4 3	Major	Ab
7	Bb D F Bb	4 3 5	D F Bb D	3 5 4	F Bb D F	5 4 3	Major	Bb

Triadic Harmonization of Turkish Nihavent

Parent collection: C Turkish Nihavent

C D Eb F G Ab Bb C

Semitone sequence:

2 1 2 2 1 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C Eb G C	3 4 5	Eb G C Eb	4 5 3	G C Eb G	5 3 4	Minor	Cm
2	D F Ab D	3 3 6	F Ab D F	3 6 3	Ab D F Ab	6 3 3	Diminished	Ddim
3	Eb G Bb Eb	4 3 5	G Bb Eb G	3 5 4	Bb Eb G Bb	5 4 3	Major	Eb
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G Bb D G	3 4 5	Bb D G Bb	4 5 3	D G Bb D	5 3 4	Minor	Gm
6	Ab C Eb Ab	4 3 5	C Eb Ab C	3 5 4	Eb Ab C Eb	5 4 3	Major	Ab
7	Bb D F Bb	4 3 5	D F Bb D	3 5 4	F Bb D F	5 4 3	Major	Bb

Triadic Harmonization of Turkish Karcigar Approximation

Parent collection: C Turkish Karcigar Approximation

C Db E F G Ab Bb C

Semitone sequence:

1 3 1 2 1 2 2

Degree / Mode	Closed Triad	Seq.	1st Inv.	Seq.	2nd Inv.	Seq.	Quality	Symbol
1	C E G C	4 3 5	E G C E	3 5 4	G C E G	5 4 3	Major	C
2	Db F Ab Db	4 3 5	F Ab Db F	3 5 4	Ab Db F Ab	5 4 3	Major	Db
3	E G Bb E	3 3 6	G Bb E G	3 6 3	Bb E G Bb	6 3 3	Diminished	Edim
4	F Ab C F	3 4 5	Ab C F Ab	4 5 3	C F Ab C	5 3 4	Minor	Fm
5	G Bb Db G	3 3 6	Bb Db G Bb	3 6 3	Db G Bb Db	6 3 3	Diminished	Gdim
6	Ab C E Ab	4 4 4	C E Ab C	4 4 4	E Ab C E	4 4 4	Augmented	Ab+
7	Bb Db F Bb	3 4 5	Db F Bb Db	4 5 3	F Bb Db F	5 3 4	Minor	Bbm

How to

Each triad can be imported directly into GeCo-Tool through the provided parameter files.

For example:

```
GeCo-Tool | Generation Parameters
===================================
Start Note:     C
Sequence:       Multidimensional 4 3 5
Tempo:          constant (eighth)
Harmony:        none
```

The corresponding closed triad is:

C E G C

This representation allows GeCo to generate the triad and stop when the starting pitch-class is reached again.

Expanded Triadic Voicings

The same triadic structure may be realized in many different registral configurations. In GeCo-Tool, octave displacement changes the interval sequence while preserving the pitch-class content of the chord. Consequently, a triad should not be viewed as a single object but rather as a family of equivalent interval structures.

For example, the C major triad:

$$C\ E\ G$$

may be represented in close position:

$$C\ E\ G\ C$$

or expanded across one or more octaves.

C Major Triad

Voicing Type	Structure	GeCo Sequence
Close Position	C E G C	4 3 5
Open Position A	C G E' C'	7 9 8
Open Position B	C E G' C'	4 15 5
Open Position C	C G' E" C"'	19 21 20
Fully Expanded	C E' G" C"'	16 15 17

Cyclic Rotations of an Expanded Voicing

The expanded structure:

$$C\ G\ E'\ C'$$

corresponds to:

7 9 8

Its cyclic rotations generate:

Structure	GeCo Sequence
C G E' C'	7 9 8
G E' C' G'	9 8 7
E' C' G' E"	8 7 9

Practice Suggestions

Expanded voicings are particularly useful for:

- technical studies,
- interval training,
- arpeggio practice,
- contrary motion,
- register exploration,
- instrumental geometry,
- compositional experimentation.

From the GeCo perspective, all these structures belong to the same harmonic family even though they occupy very different regions of the instrument.

Conclusion

Triadic harmonization in GeCo-Tool provides a direct connection between traditional harmonic practice and cyclic interval generation.

Within GeCo, harmonic qualities may be interpreted as interval signatures:

$$\text{Major} = 4\ 3\ 5$$

$$\text{Minor} = 3\ 4\ 5$$

$$\text{Diminished} = 3\ 3\ 6$$

$$\text{Augmented} = 4\ 4\ 4$$

This perspective allows scales, modes, harmonic systems, and transformational processes to be explored within a unified interval-based framework.

The examples presented in this document may therefore be viewed simultaneously as harmonic structures, interval signatures, and GeCo generation models.