BI-HEXAPHONIC TENSION AND EXPERIENTIAL AFFORDANCES

Mauri Kaipainen, PhD

Overview

- BI-HEXAPHONY
- POLY-DOMINANCY
- PHENOMENOLOGICAL APPROACH TO MUSIC ANALYSIS
- BI-HEXAPHONIC PITCH ORGANIZATION
- EXPERIENTIAL SENSE-MAKING OF BI-HEXAPHONIC MUSIC PROGRESSION

Motivation

1) Why does Schönberg sound occasionally *diatonic* to me despite his deliberate ambiguity?

2) How to compose:

- Without tonic centers, keys, major, mi[illegible]
- With *pitch-class tension*
- Ambiguity, leaving room for the experience

Bi-hexaphony

Motivation

Introspection of experience

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2) How to compose:

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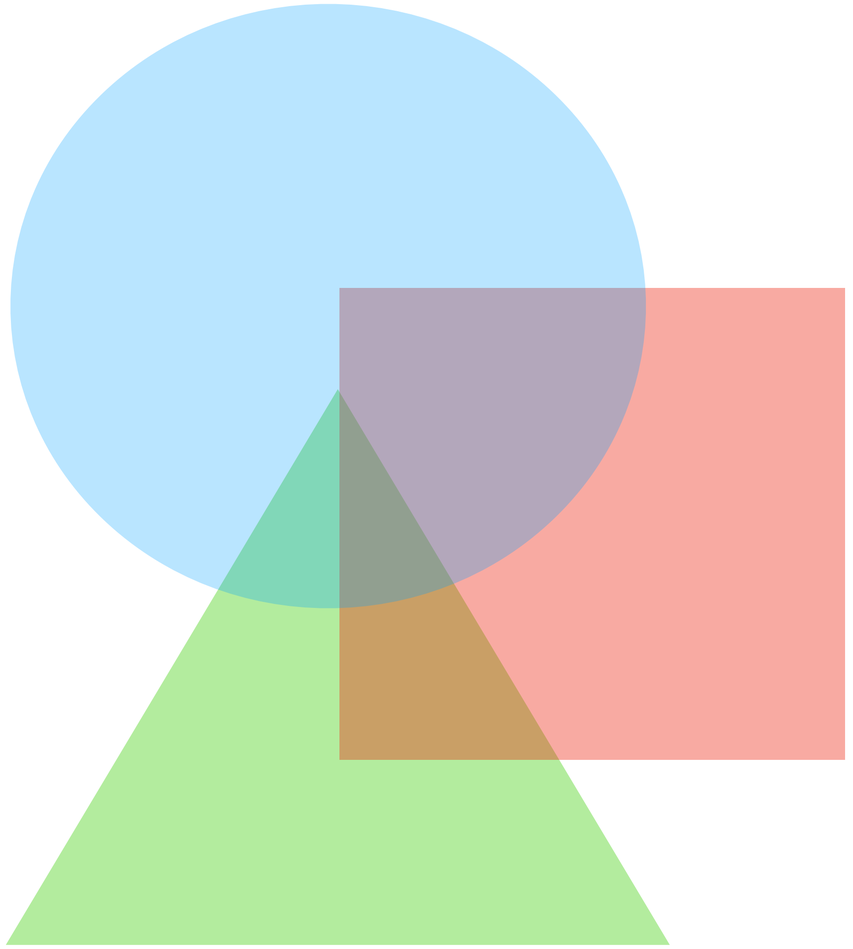
Bi-hexaphony

Three pillar epistemology of experience

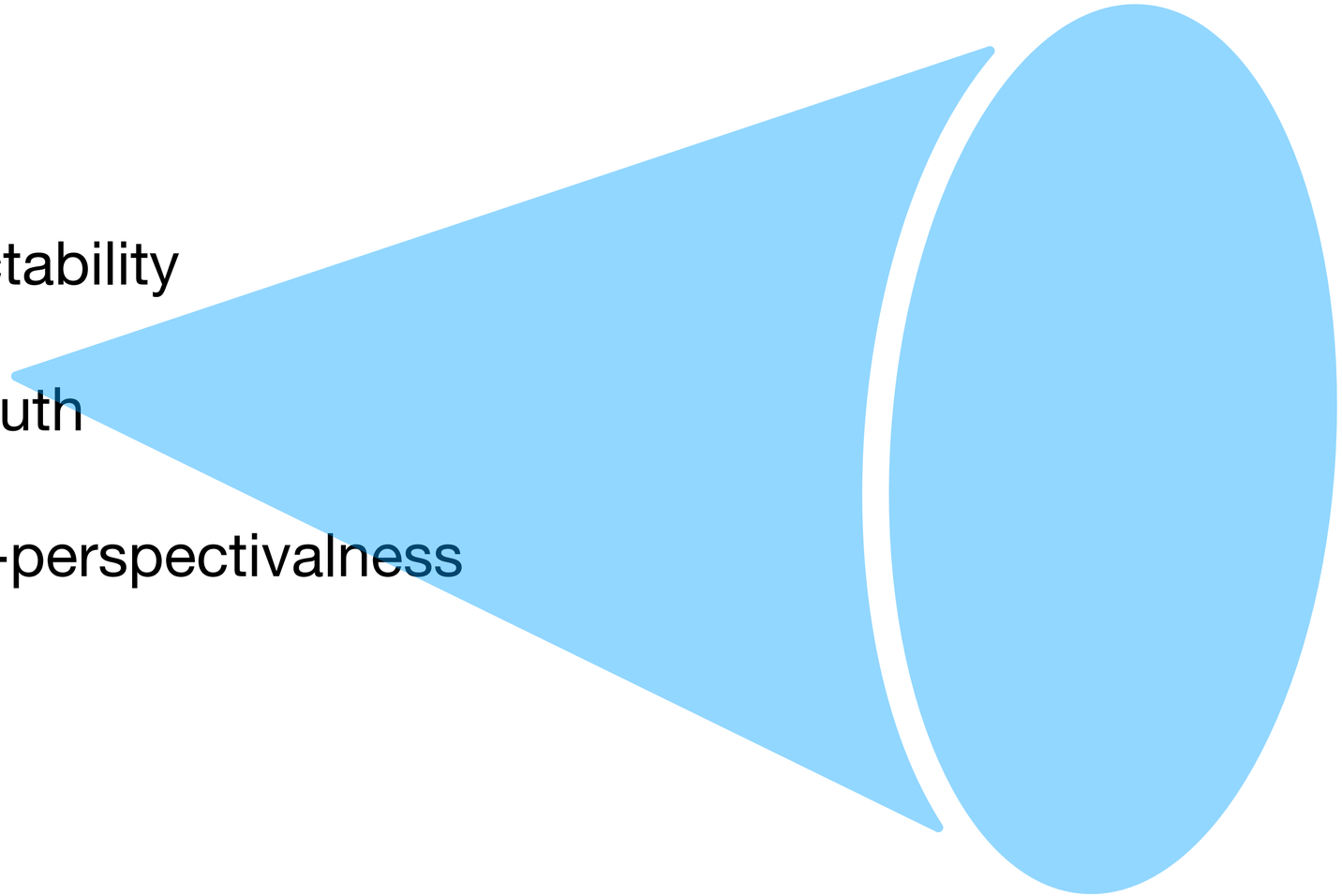
Holistic experience: Individually felt, shared in terms of body and culture

Three-pillar epistemology, studying experience from three angles:

- Introspection
- Psychophysiology
- Shared code: Notation and music analysis



Very short history of ambiguity



Predictability

One truth

Mono-perspectivalness

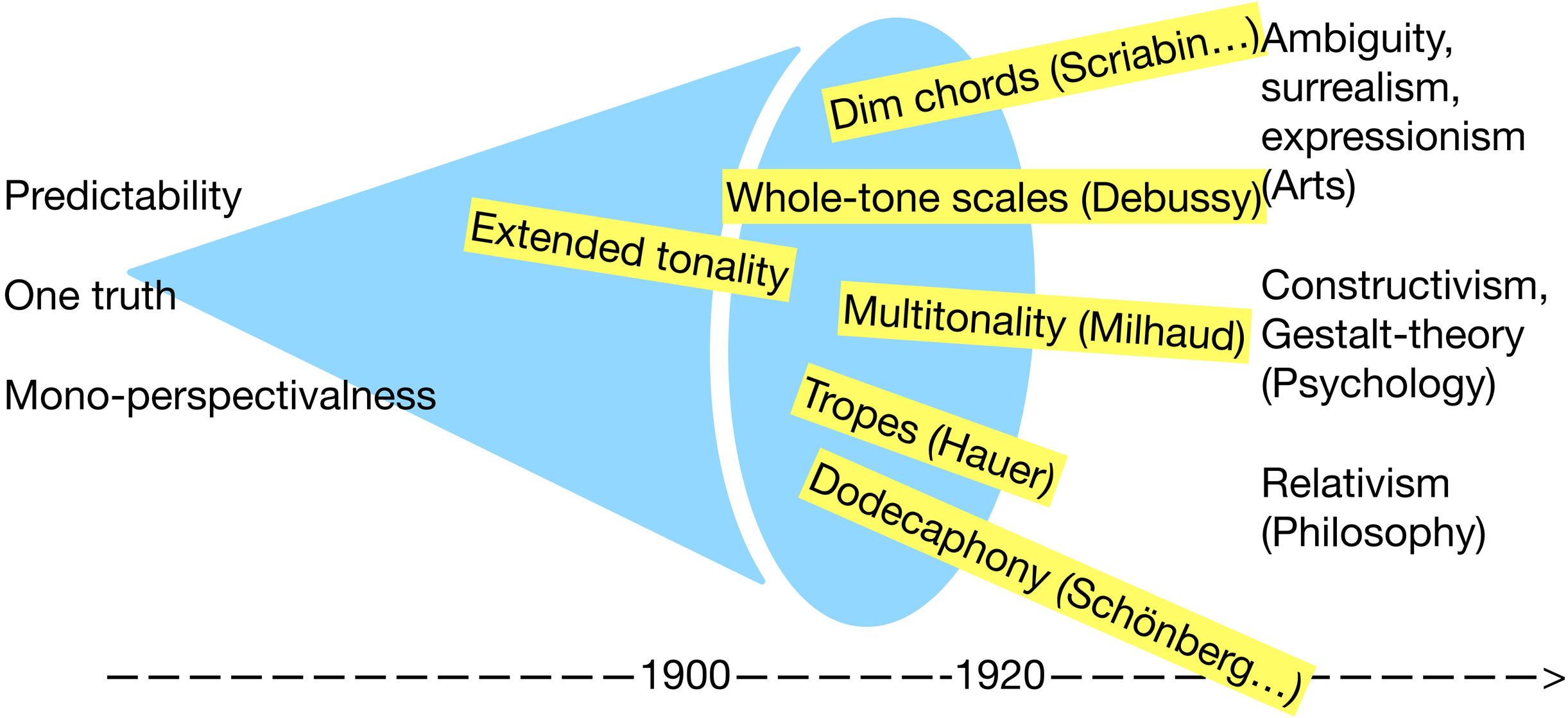
Ambiguity, surrealism, expressionism (Arts)

Constructivism, Gestalt-theory (Psychology)

Relativism (Philosophy)

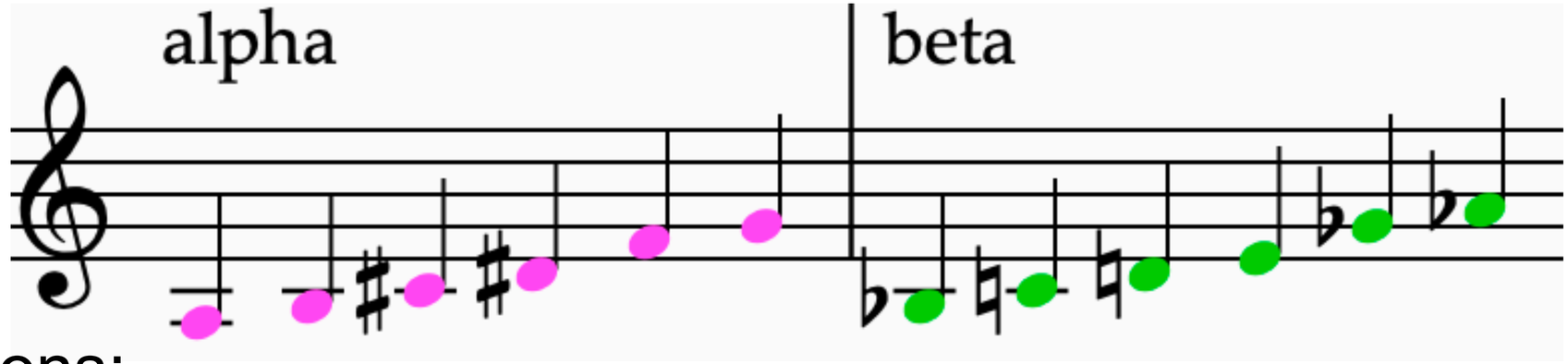
1900

Very short history of ambiguity



BI-HEXAPHONY

Bi-hexaphony



Conventions:

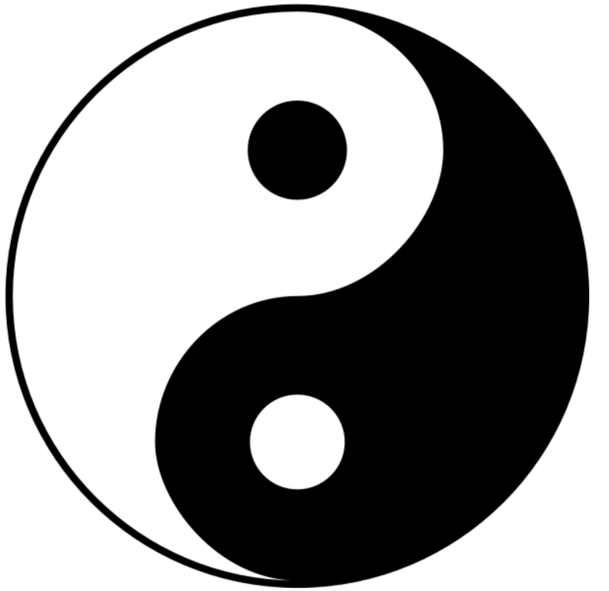
- Alpha: notated with # accidentals
- Beta: notated with b accidentals

=> Enharmonic equivalence

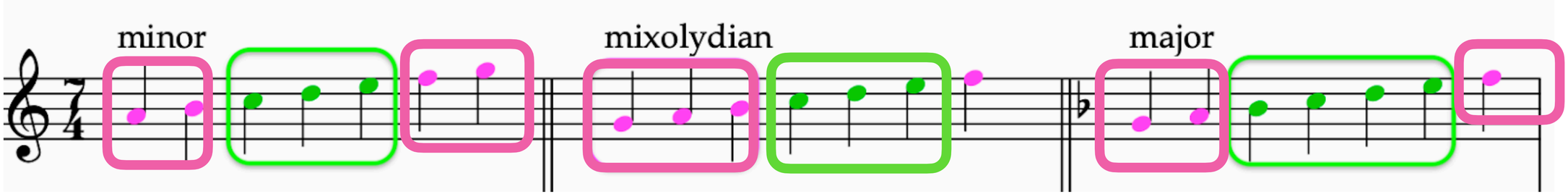
Bi-hexaphony

Two symmetric:

- Sets
- “Keys”
- Harmonic functions
- **Polydominancies** for each other



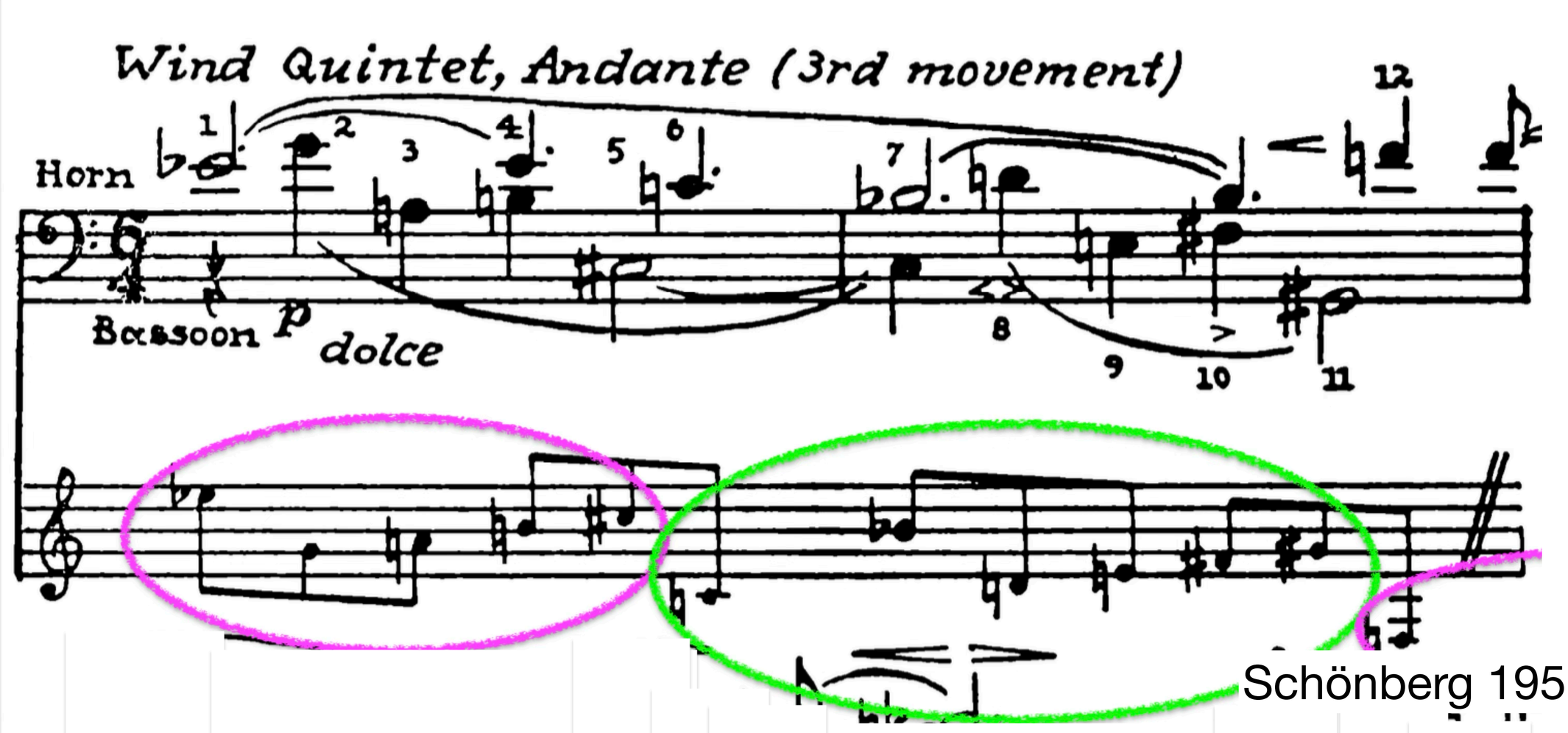
Omnipresence of bi-hexaphony: Diatonic music



All septatonic scales comprise of alpha and beta *cells, limited by transitions to other hexaphony*

Omnipresence of bi-hexaphony: Dodecaphony

All twelve-tone rows can be broken into hexaphonies.

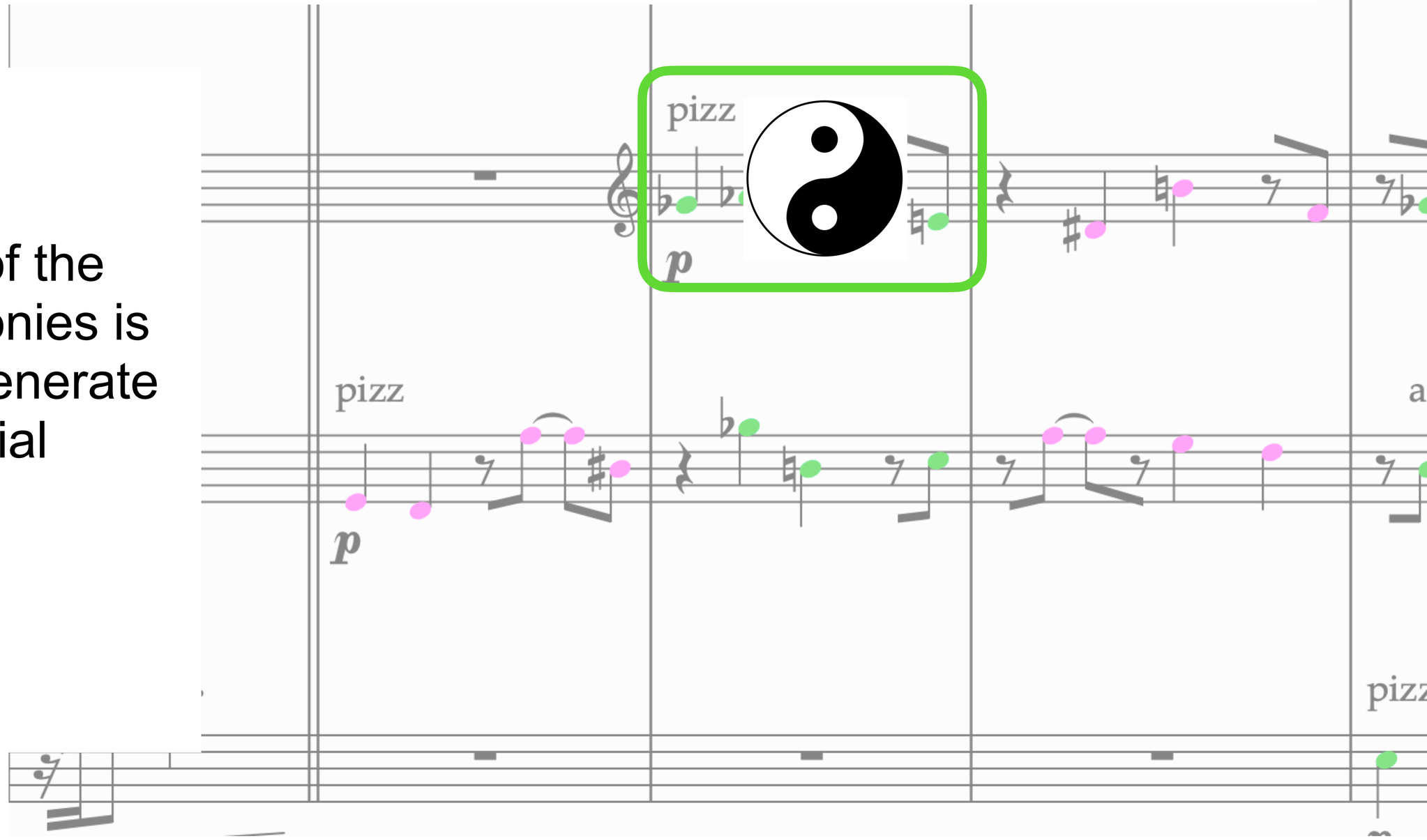


Schönberg 1951, 124

Bi-hexaphonic tension

Hypothesis:

Separation of the two hexaphonies is enough to generate an experiential tension



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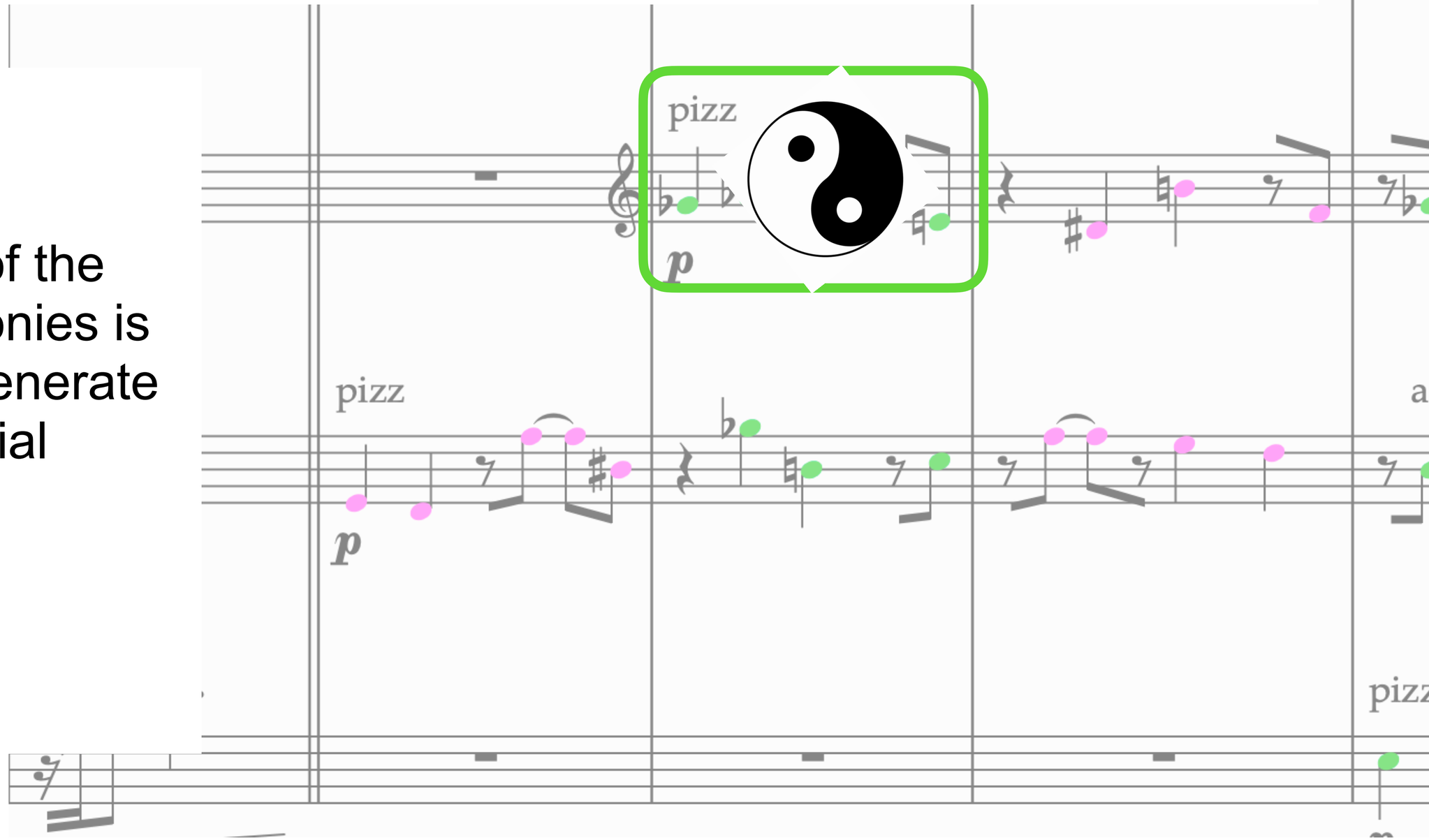

Bi-hexaphonic tension

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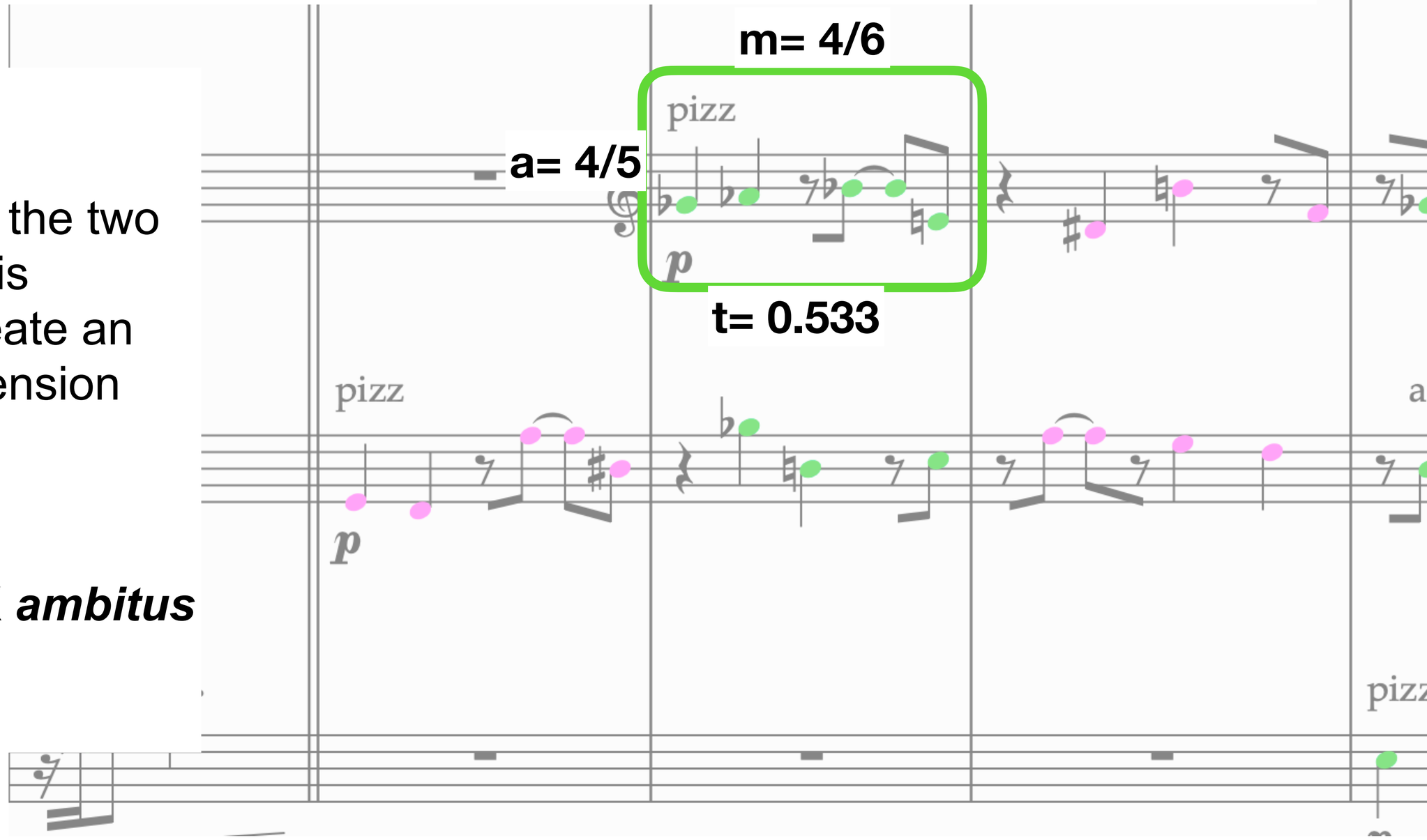
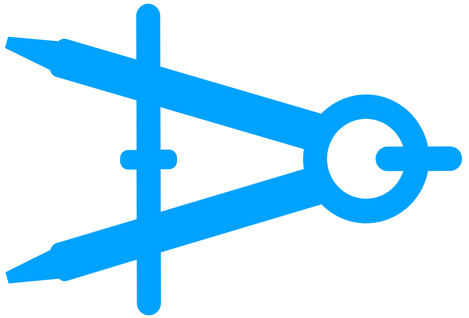
Separation of the two hexaphonies is enough to create an experiential tension

Formula:

t= *maturity* X *ambitus*

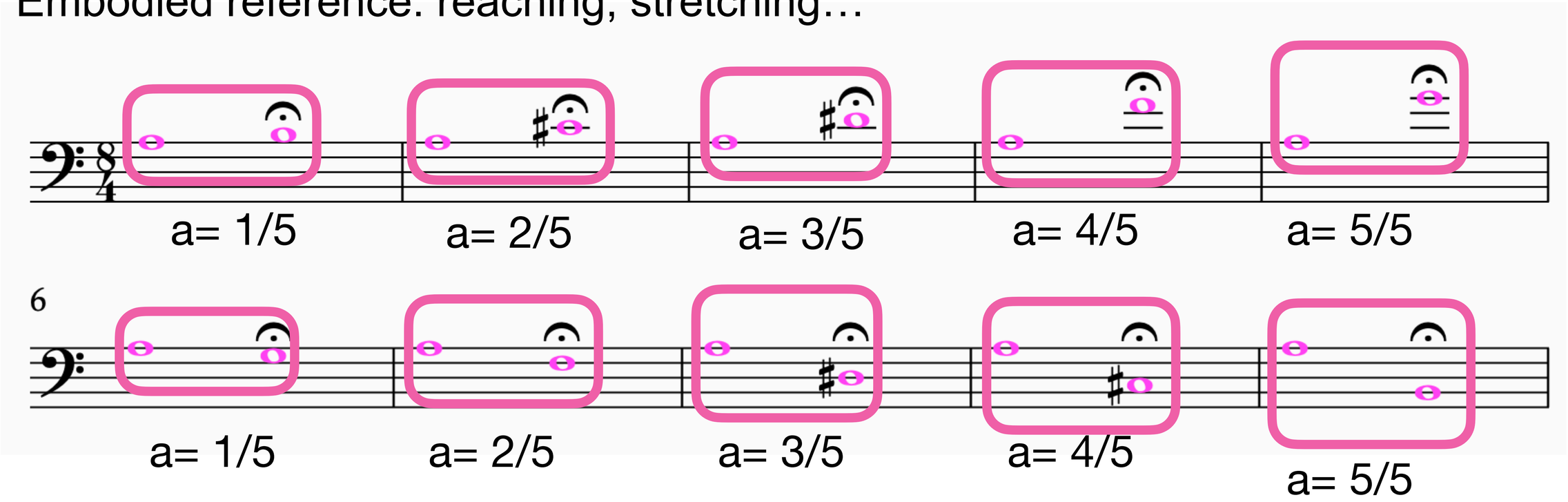


Cell ambitus



Cell ambitus = the range of expression in number of whole-tones / 5

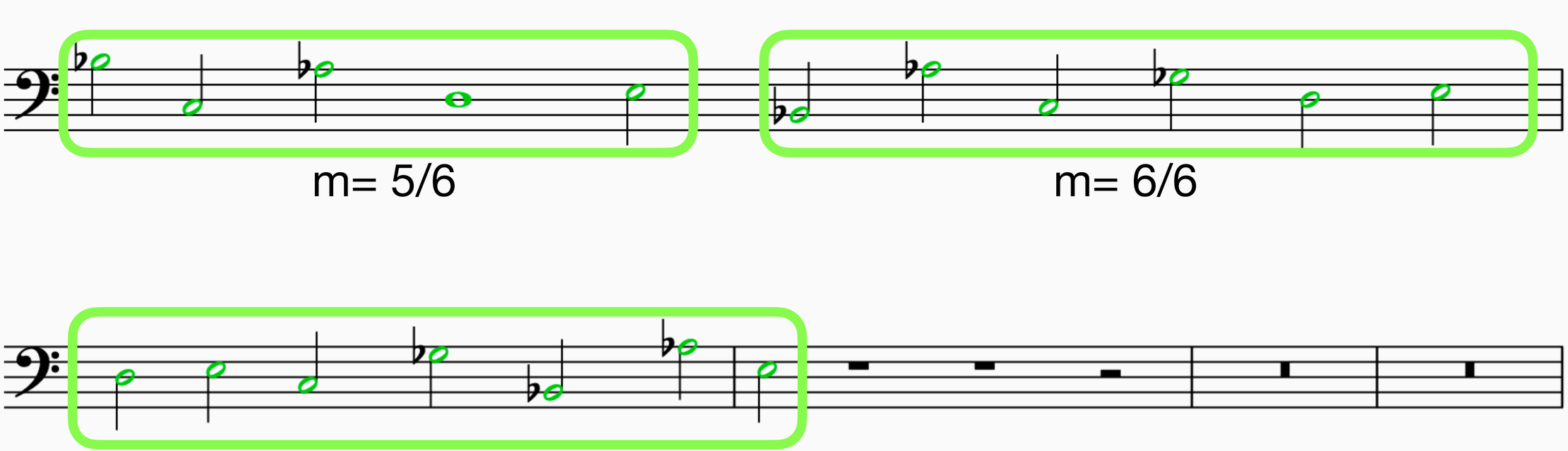
Embodied reference: reaching, stretching…



Cell maturity

Maturity = the number of tones played out / 6

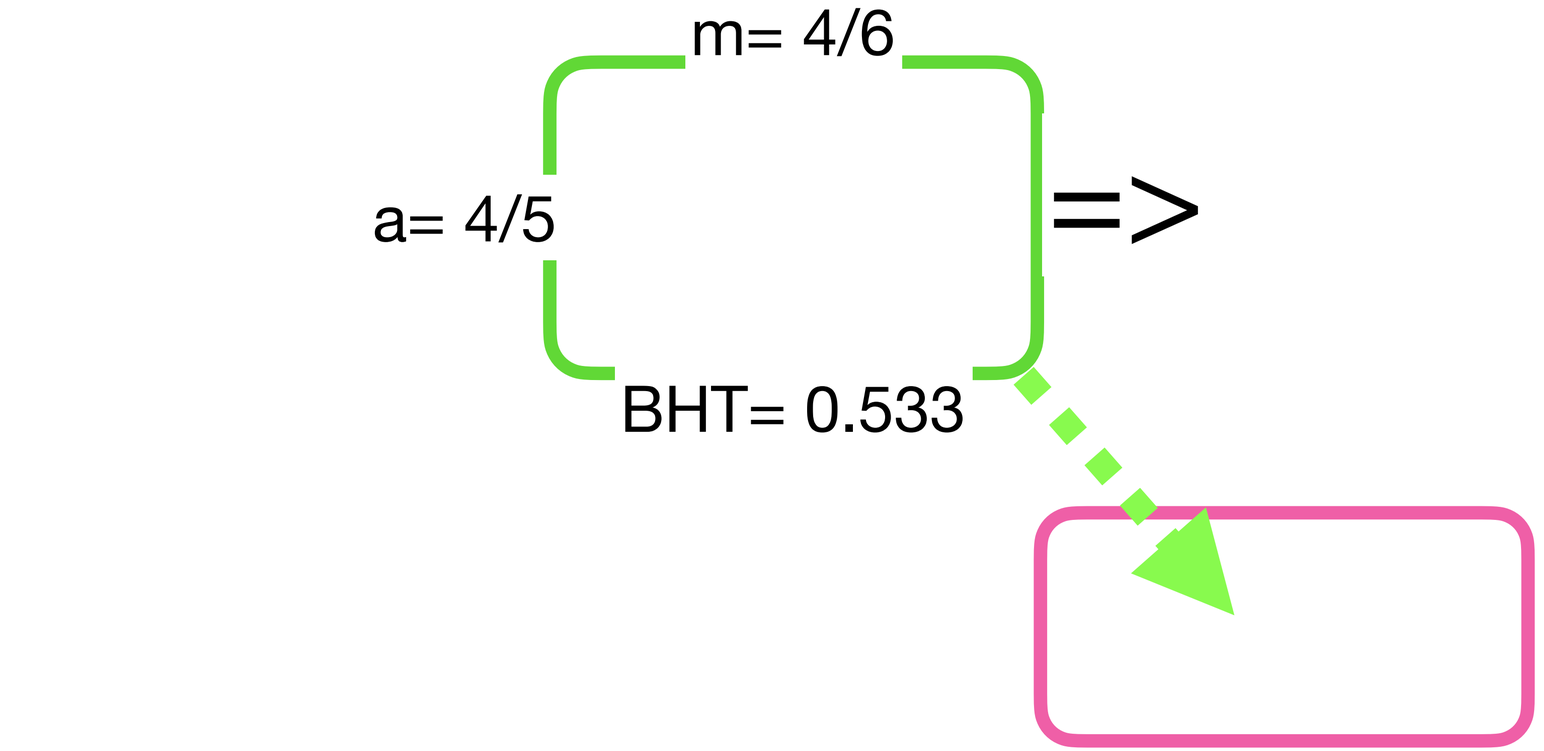
Embodied reference: Spatial and temporal completeness, readiness, fullness



Bi-hexaphonic tension

The stronger the tension:

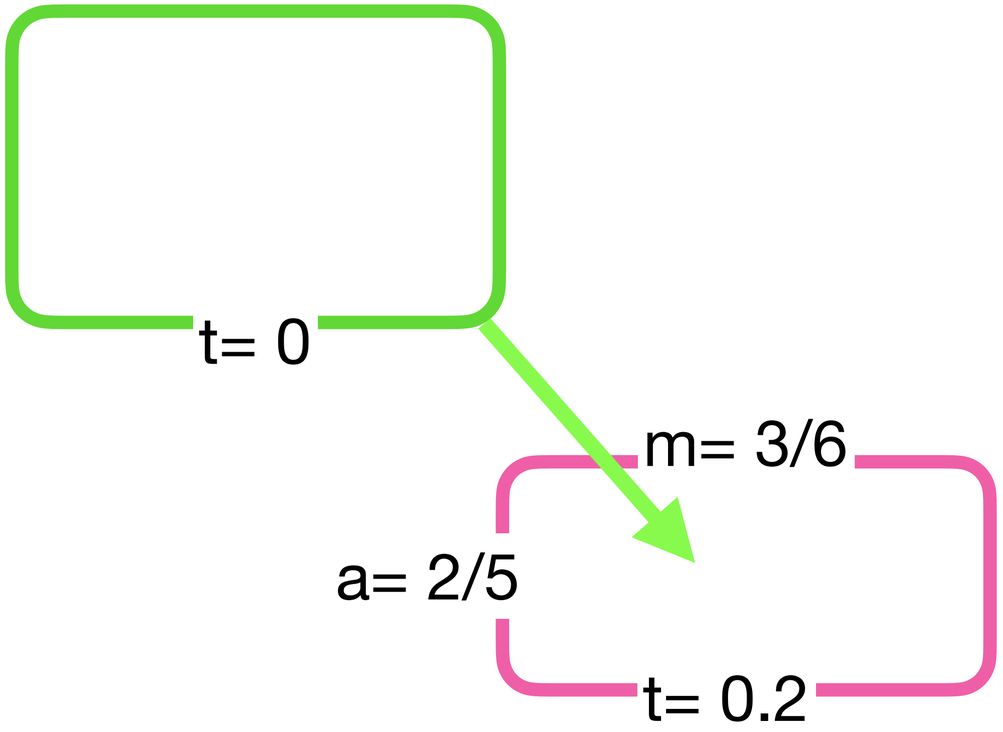
- The more urgent the need for resolution
- The more ambiguous the the anticipated resolution



Transition: Tension release

Tension released by transition to other BH

- Via transitive intervals
- Begins to accumulate again
- Not a dominant-tonic release, but…

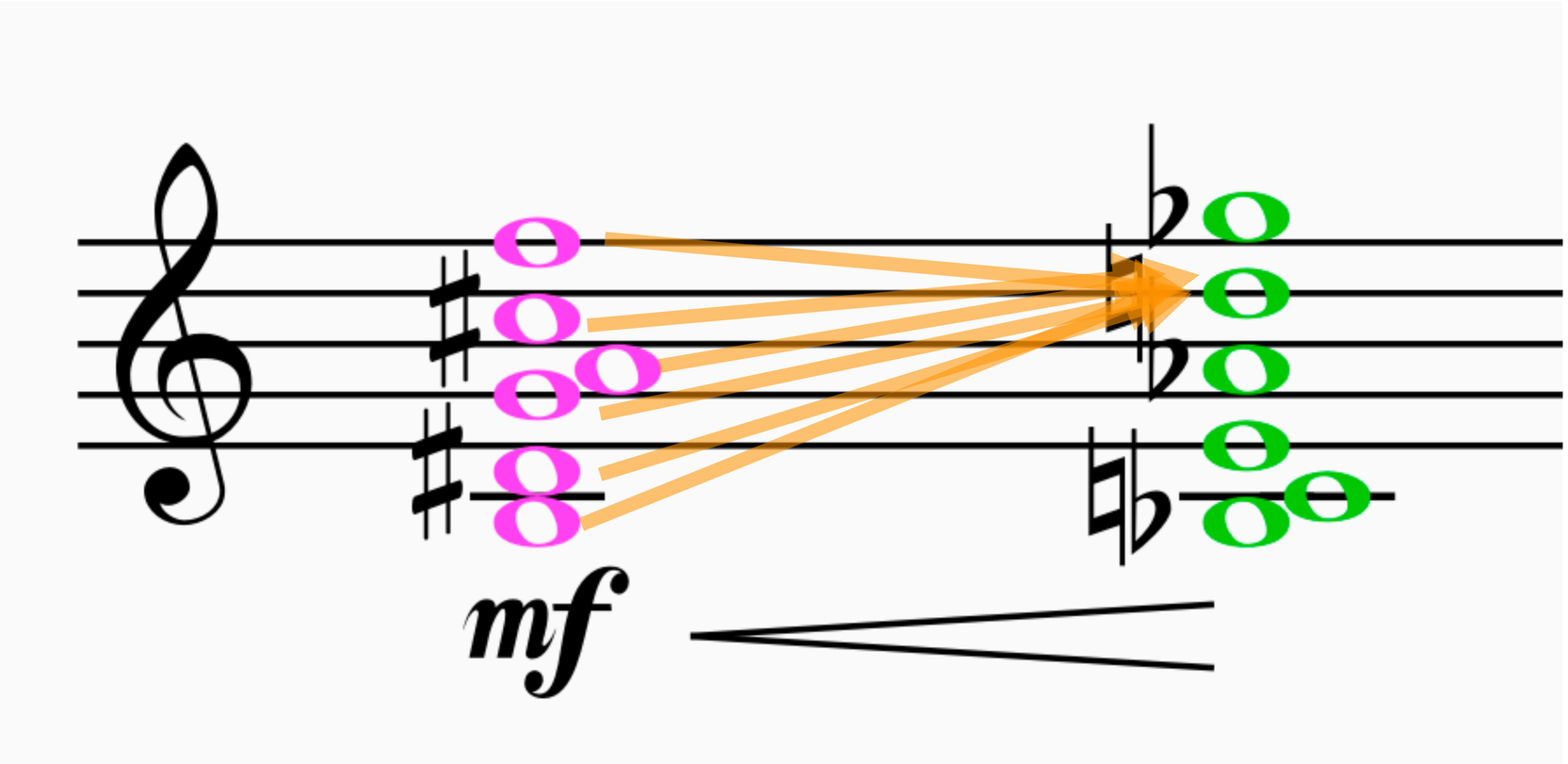


Transitive intervals

Intervals leading to a given tone in next hexaphony:

- Semitone (leading tone)
- Minor third
- Fourth
- Fifth
- Sixth
- Seventh

Ascending/descending



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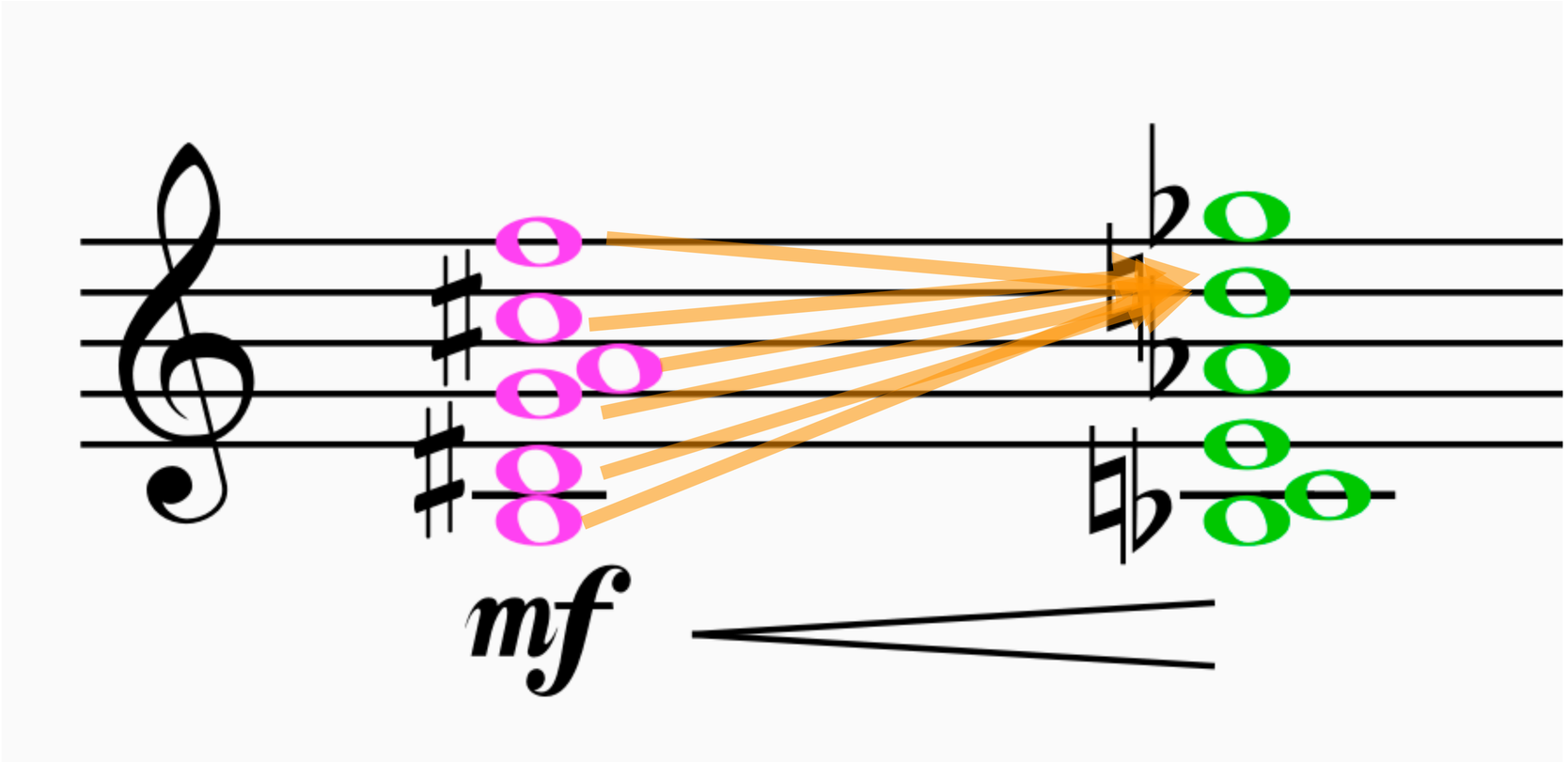

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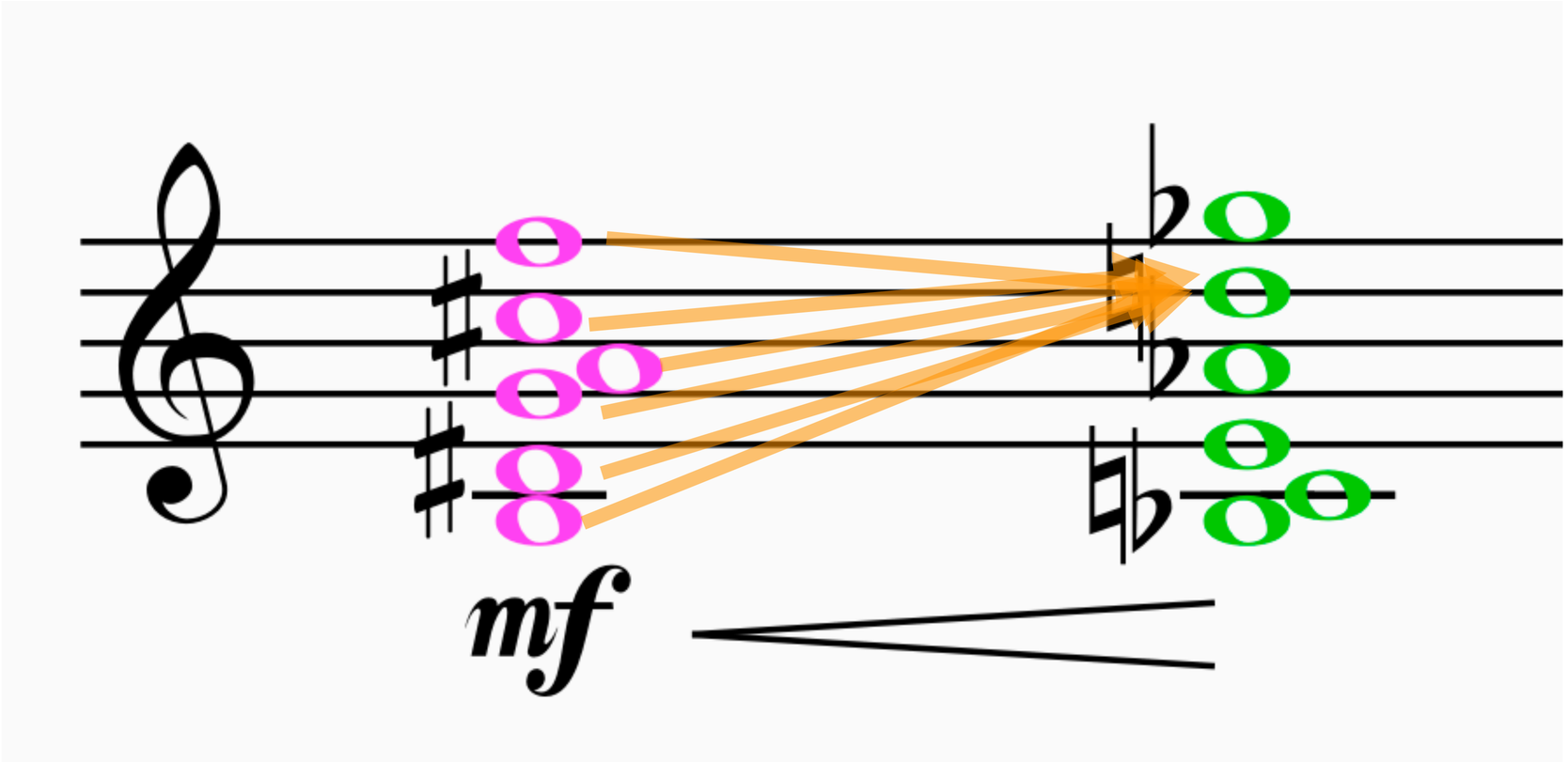
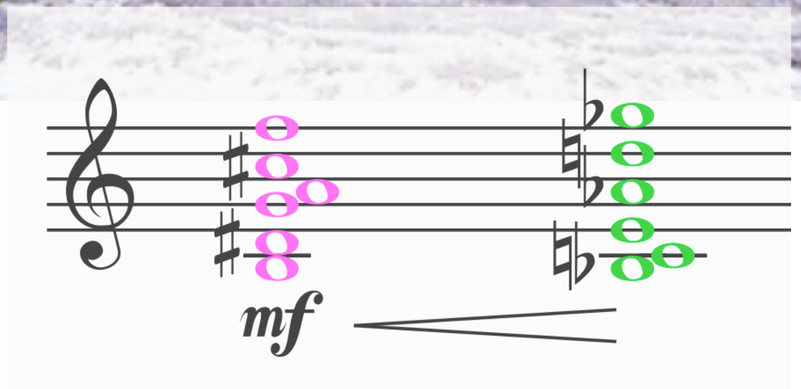


Bi-hexaphonic transition as affordance* for experiential tension resolution



*Gibson, J.J. (1977). The Theory of Affordances

POLYDOMINANCY

Polydominancy

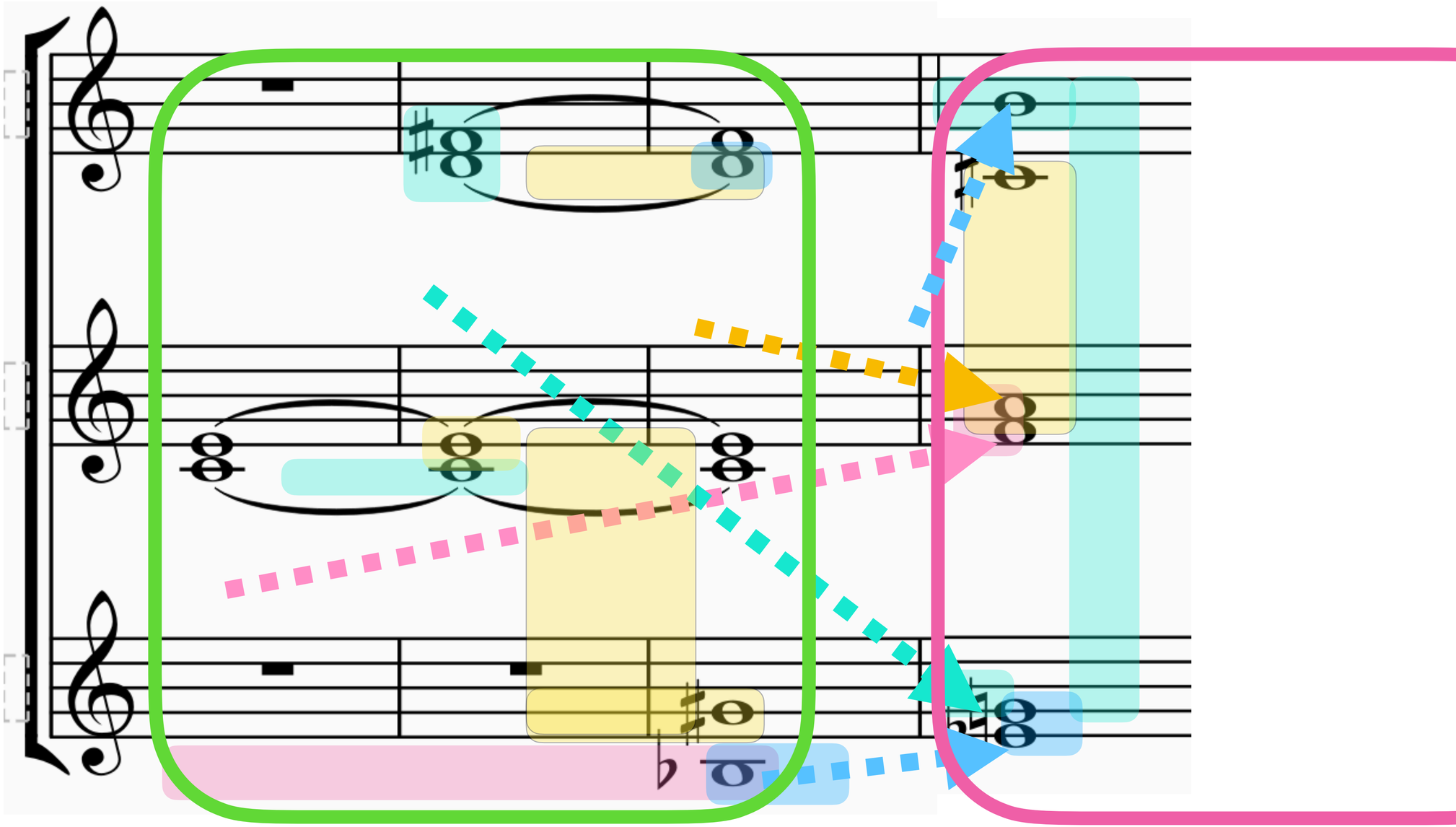
Harmonic ambiguity: Bi-hexaphonic transition can always be interpreted as leading to **multiple alternative paths of dominants.**

- Generic property of bi-hexaphony
- An experiential choice among alternatives
- Not deliberately composed, but inherent in the organisation

Polydominancy

No fifths in a BH cell:

=> Consider **dyadic** harmonic implications & dim sevenths/ augmented sixths



Beta

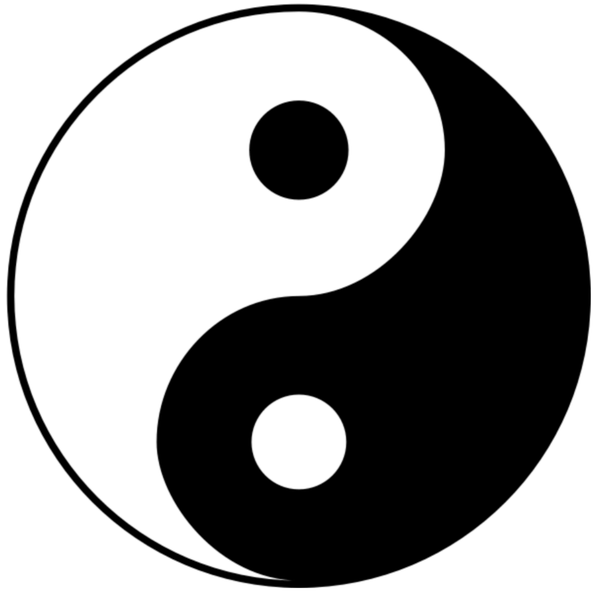
Alpha

Polydominancy

Alpha and beta are polydominants of each other.

Alpha = D(beta)
Beta = D(alpha)

=> Ambiguity

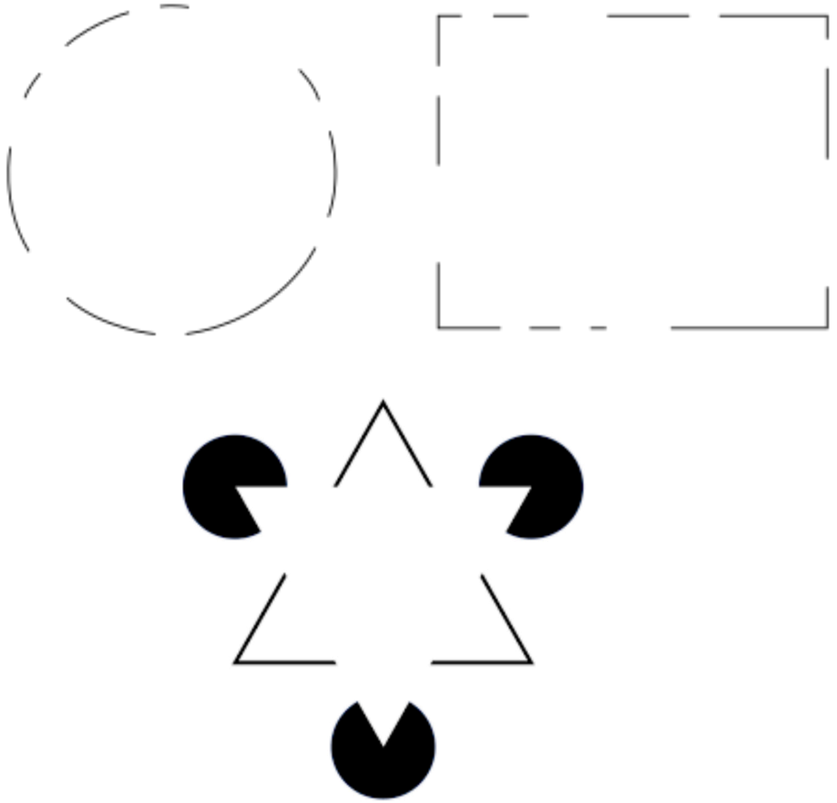


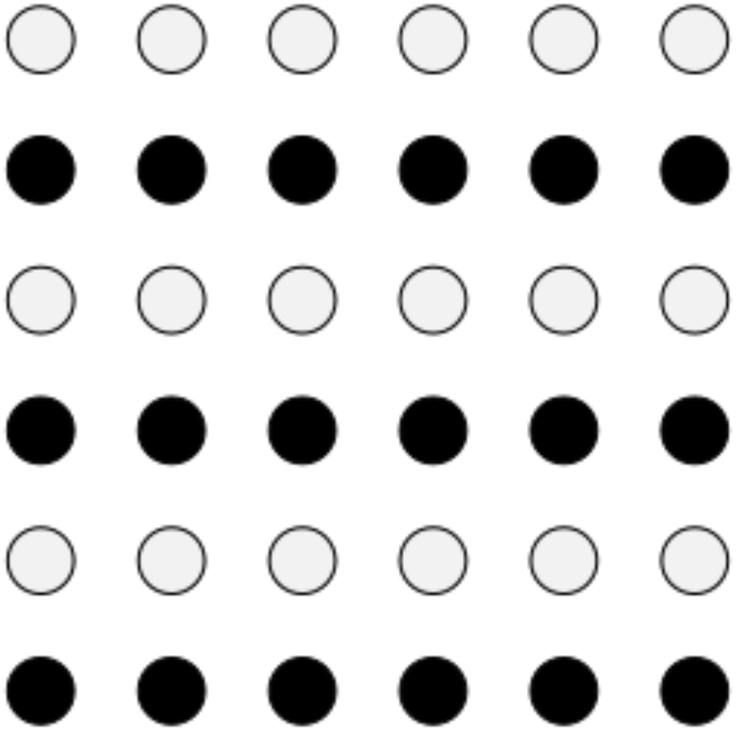
Experiential freedom of experience:

- Connecting dots
- Drawing red threads
- Autonarrating

Polydominancy affords pattern construction

Gestalt -theory: The mind constructs patterns out of hints





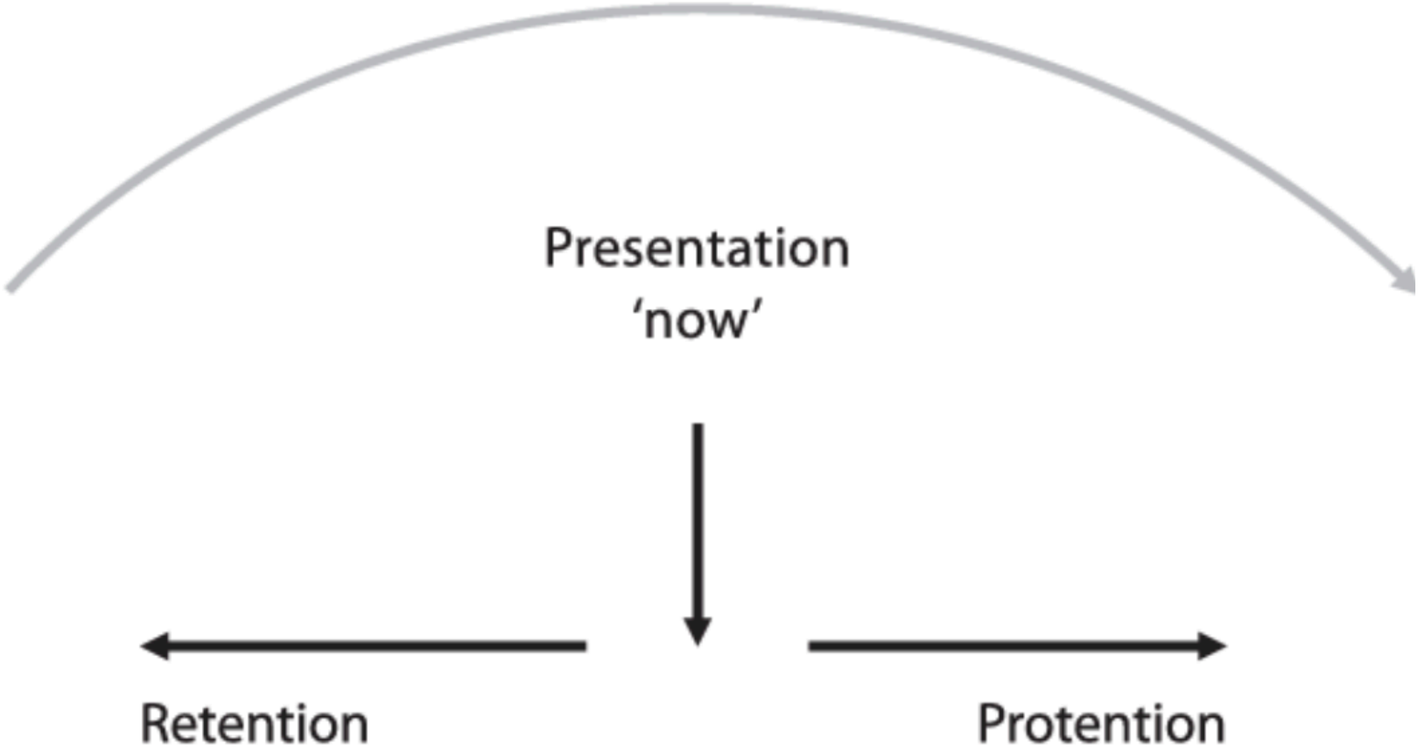
Wertheimer, Max (1912). "Experimentelle Studien über das Sehen von Bewegung"

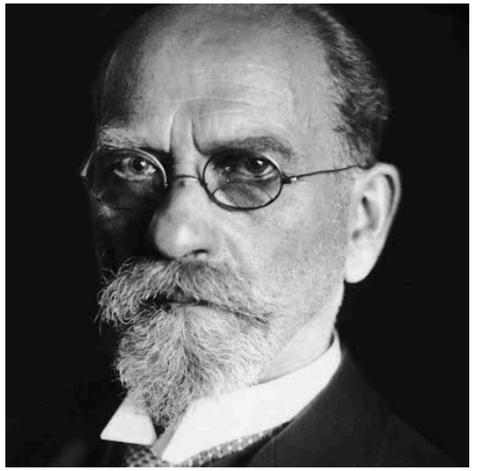
PHENOMENOLOGICAL APPROACH TO MUSIC ANALYSIS

For myself, I cannot begin to take an interest in the phenomenon of music except insofar as it emanates from the integral man. I mean from a man armed with the resources of his senses, his psychological faculties, and his intellectual equipment.

Stravinsky, Igor. Poetics of music in the form of six lessons. Vol. 66. Harvard University Press, 1970. P. 27

Structure of temporal experience





Edmund Husserl (2012). On the phenomenology of the consciousness of internal time (OR. 1893-1917)

Experience is holistic

- Humans share experiences due to common embodied foundation - already **pre-**verbally
- Cognitions, feelings and experience are aspects of one and the same system

=> Even experience of time is holistic

Maurice Merleau-Ponty. (1962). Phenomenology of Perception. (OR. 1949)

Neurophenomenology

- Temporal experience has a systemic structure, develops further Husserl's theory
- Shared experience is observable by means of psychophysiology

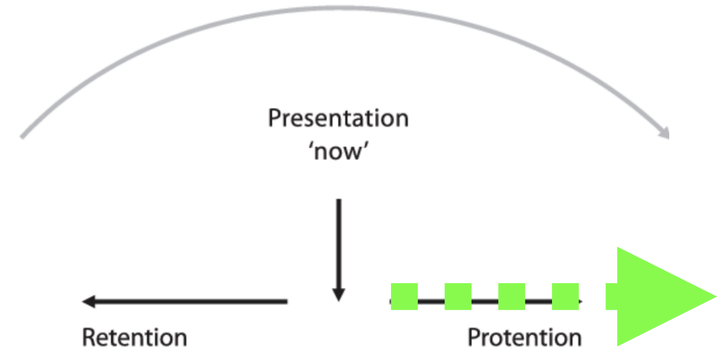
Fransisco Varela (1999). The Specious Present: A Neurophenomenology of Time Consciousness.

Protention in general

Holistic anticipation for the coming event:
Embodied anticipates (protends) events to unfold.

Metaphors and potential (hypothetical) simulation of tension-release:

- reaching
- stretching
- leaping
- catching



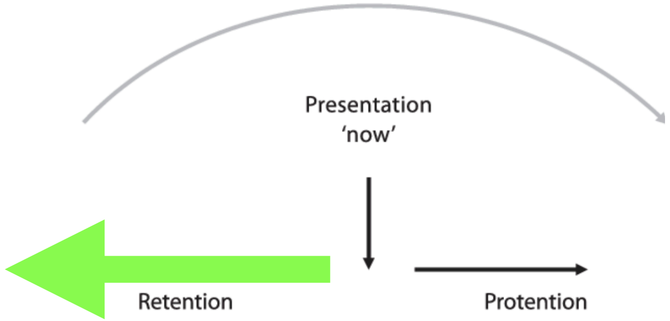
- Survival strategy

- Solid empirical ground in psychophysiology

Retention in general

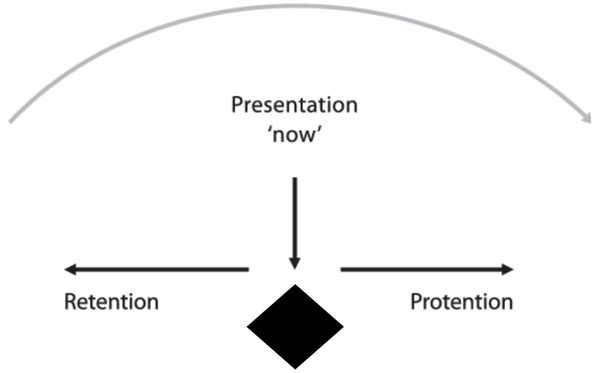
Retrospective sense-making:

- Gestalting, constructing patterns
- Preverbal, perceptual logic
- Serves to learn better protection
- Autonarration (Tikka, Kaipainen, Salmi 2023, Kauttonen et al. 2014)



Presentation now

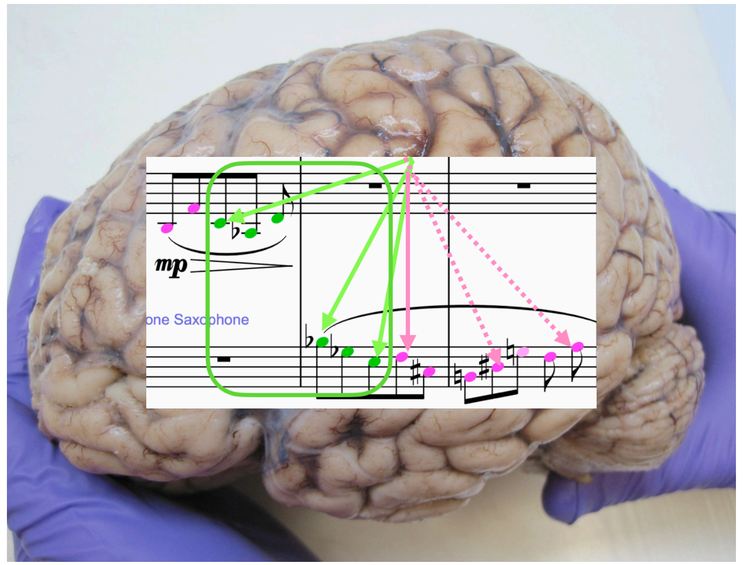
- Moment of nowness constantly mediating protection and retention, relating to what unfolds in the environment in the present context



Protention and retention in music

Subjective construction sense-making:

- ‘Mental voice-leading’
- ‘Mental harmonization’



=> Particularly interesting with music without obvious and agreed harmony

BI-HEXAPHONIC PITCH ORGANIZATION

Sequential principle

All tones of the current hexaphony (alpha or beta) shall be played out before transition to the other hexaphony in order to form a **mature** cell.

- No order (row) dictated
- All permutations allowed, depend on other consideration

Vertical principle

All simultaneously played tones belong to same hexaphony:

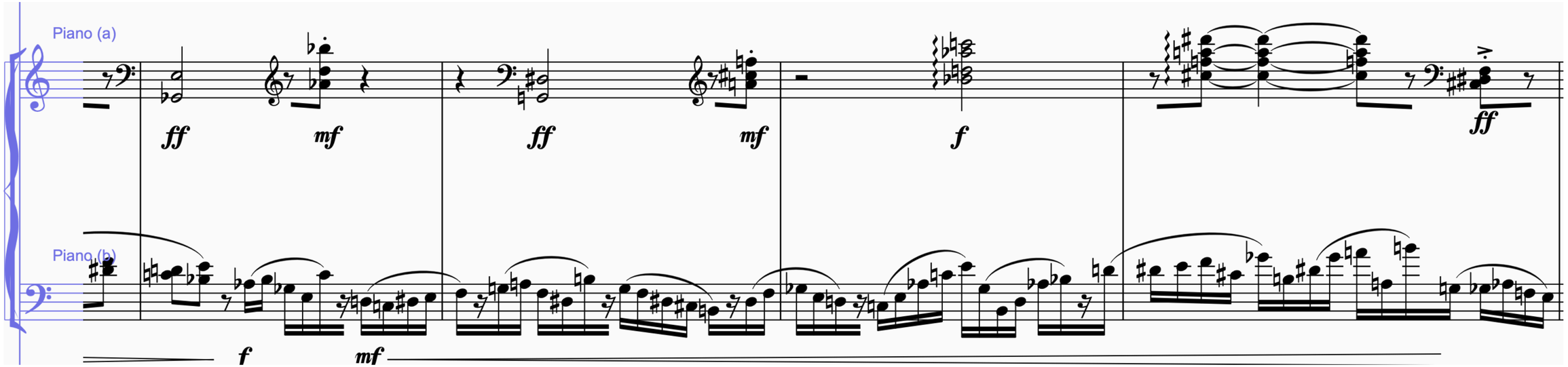
=> Hexachord *consonance*

=> Mixed: hexachord *dissonance*

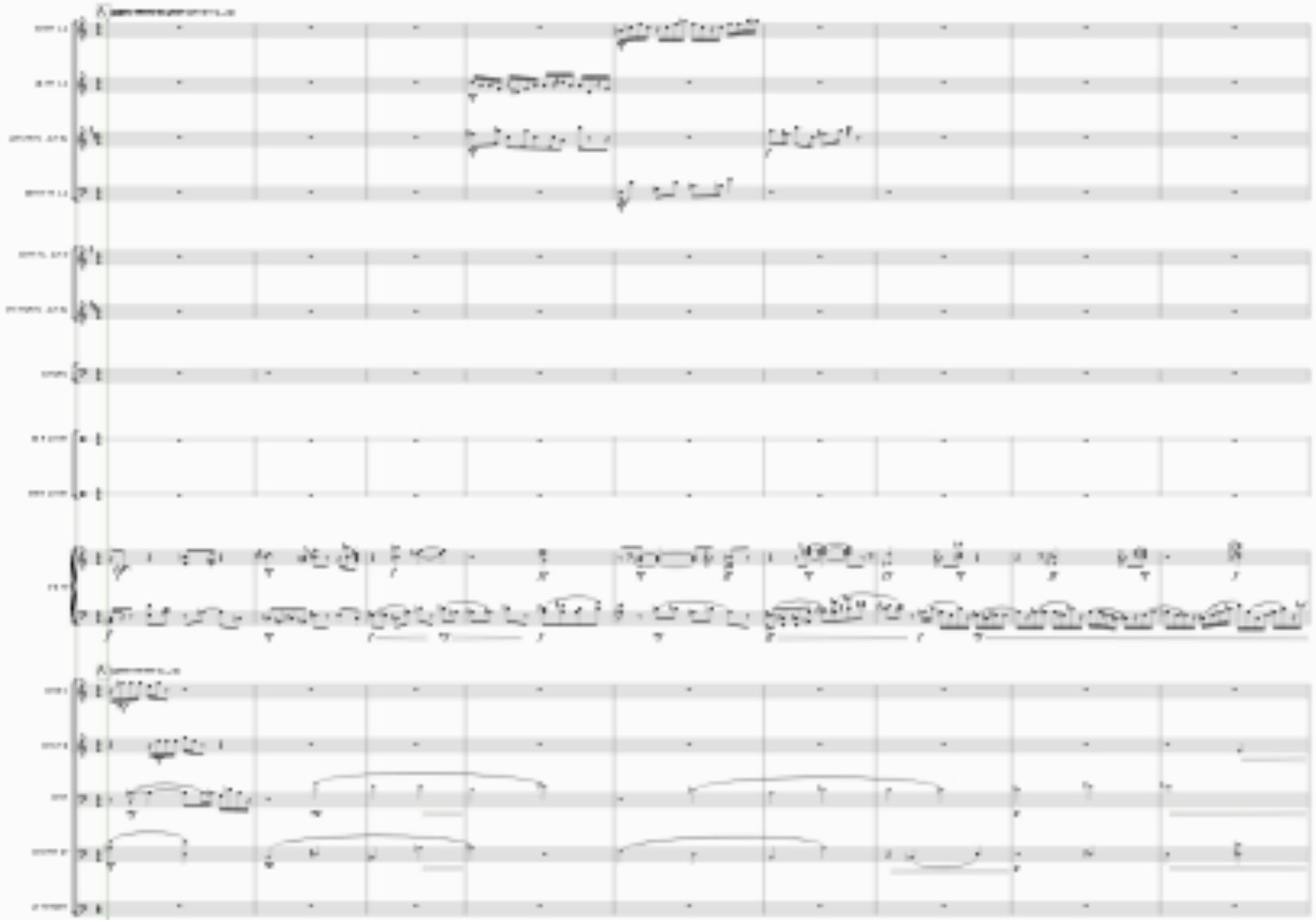
No vertical tone duplications allowed.

Hexaphonic consonance

Any chord construct of the hexaphony up to clusters of six has the consonant effect.



Piano concerto, Mvt 1: mark J-K (before cadenza)

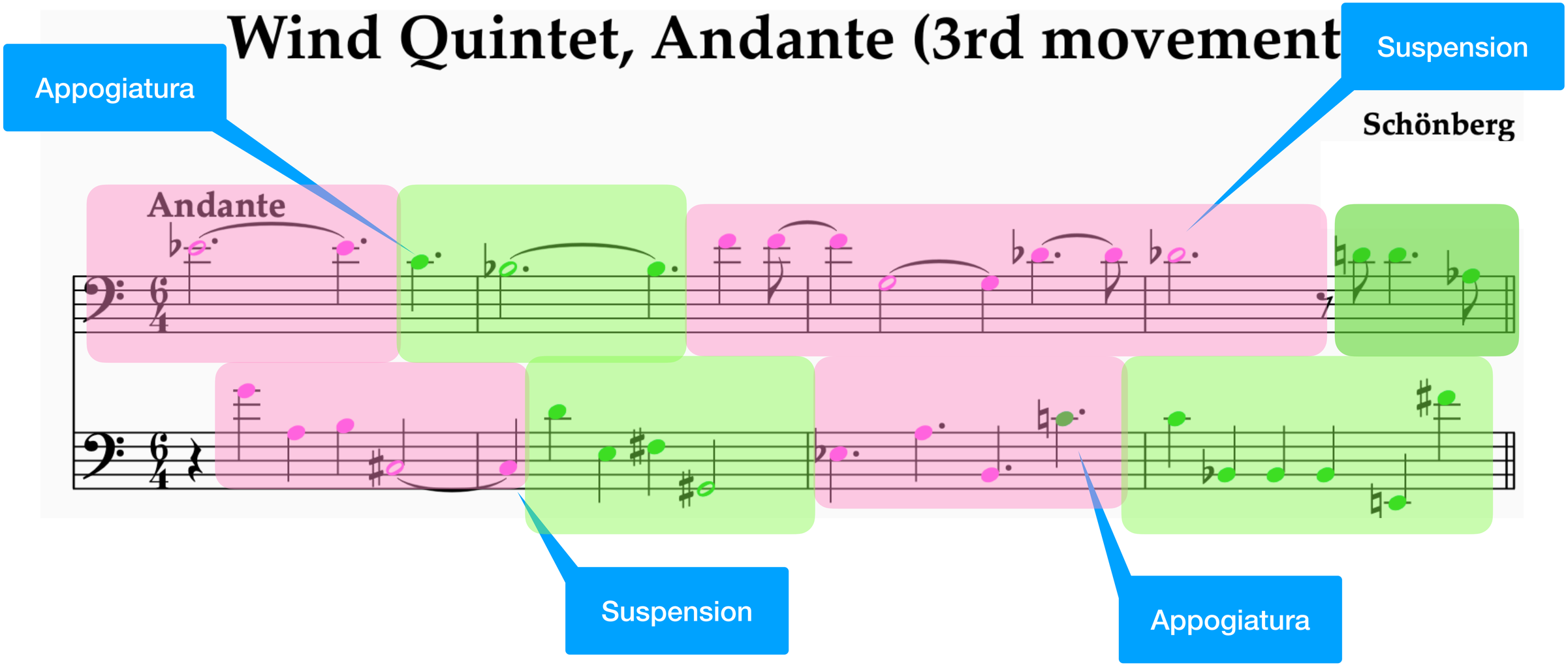


Hexaphonic dissonance

Overlapping hexaphonies.

Can be regarded as appogiaturas or suspensions

Hexaphonic dissonance



EXPERIENTIAL SENSE-MAKING OF BI-HEXAPHONIC MUSIC PROGRESSION

Protention and retention

Mental voice-leading and harmonisation

- Protentions are like hypotheses, to be confirmed of falsified
- Retention constructs the red line retrospectively

Protention and retention

Mental voice-leading and harmonisation

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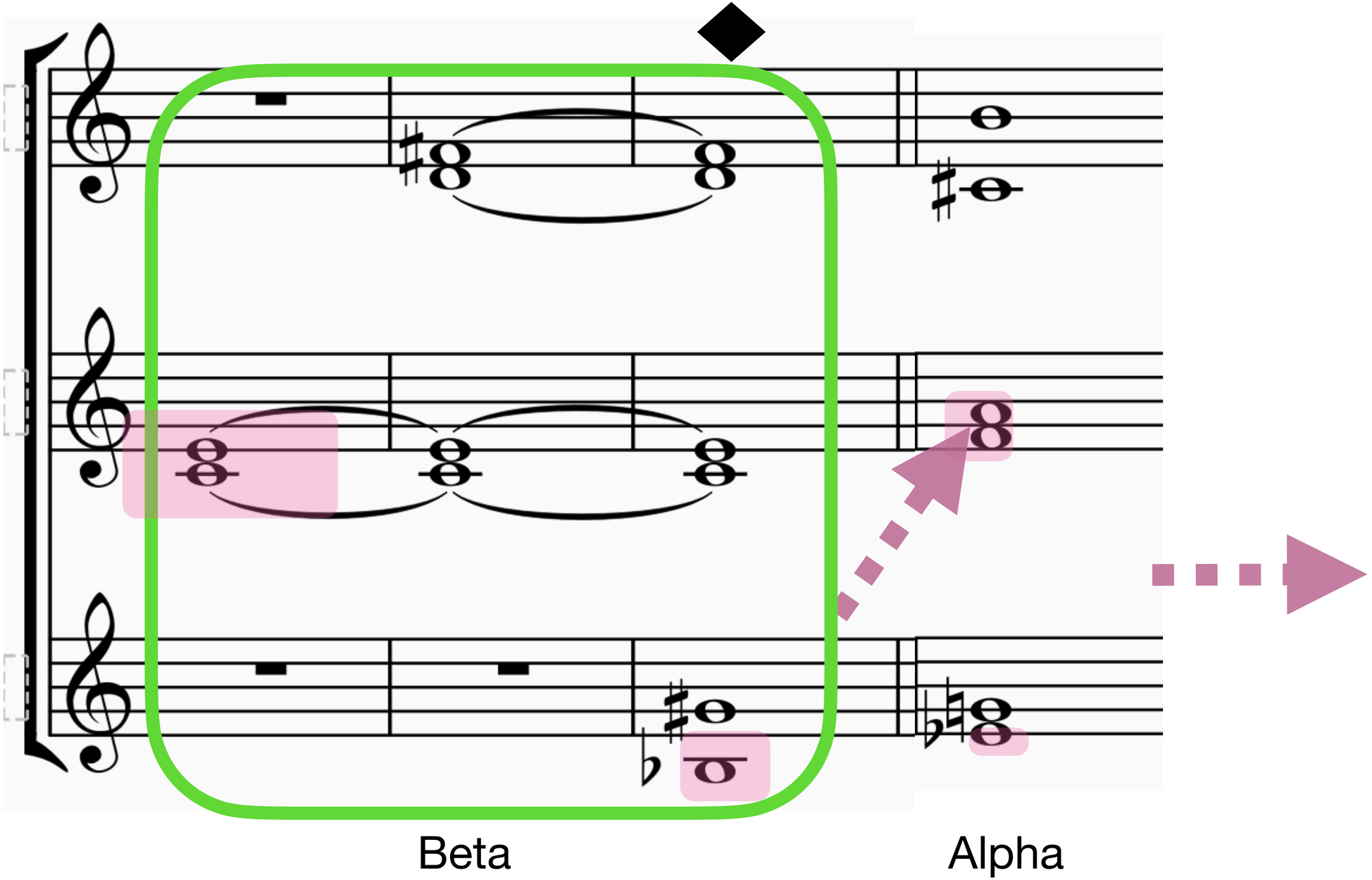
Protentive mental harmonisation

Selection among multiple

Dominance paths chosen to anticipate:

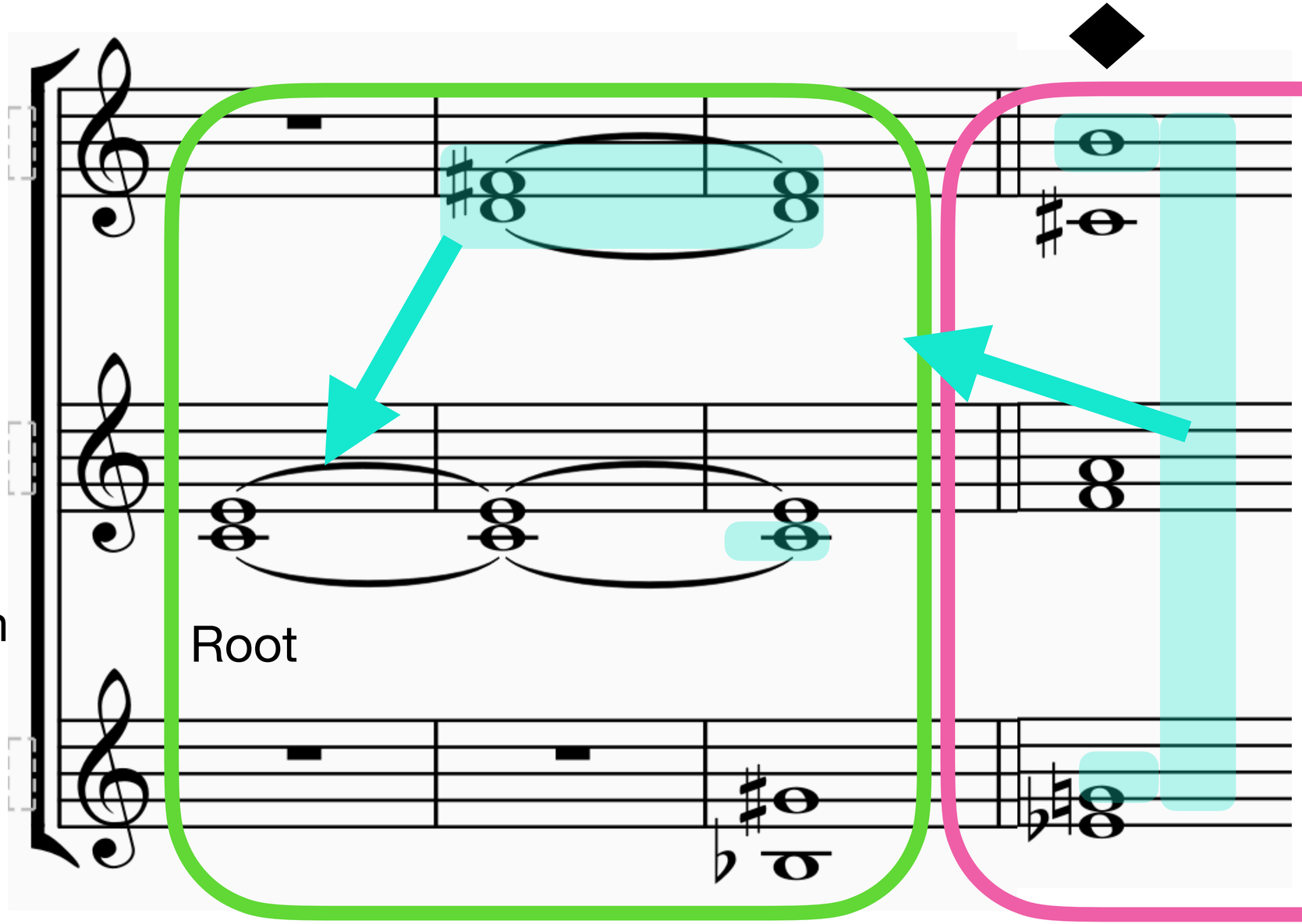
D7(F)



Retentive mental harmonisation

Retrospective explanation:

- Gestalting
- Autonarration

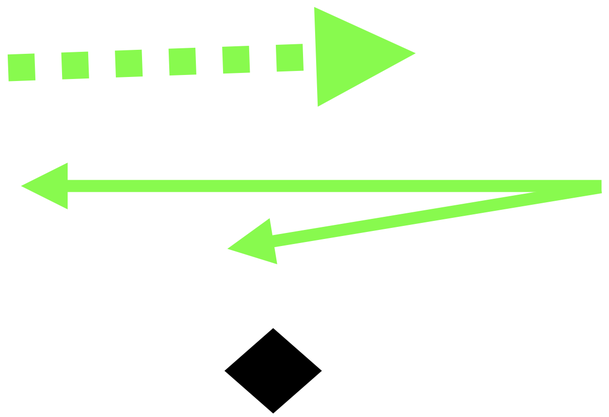


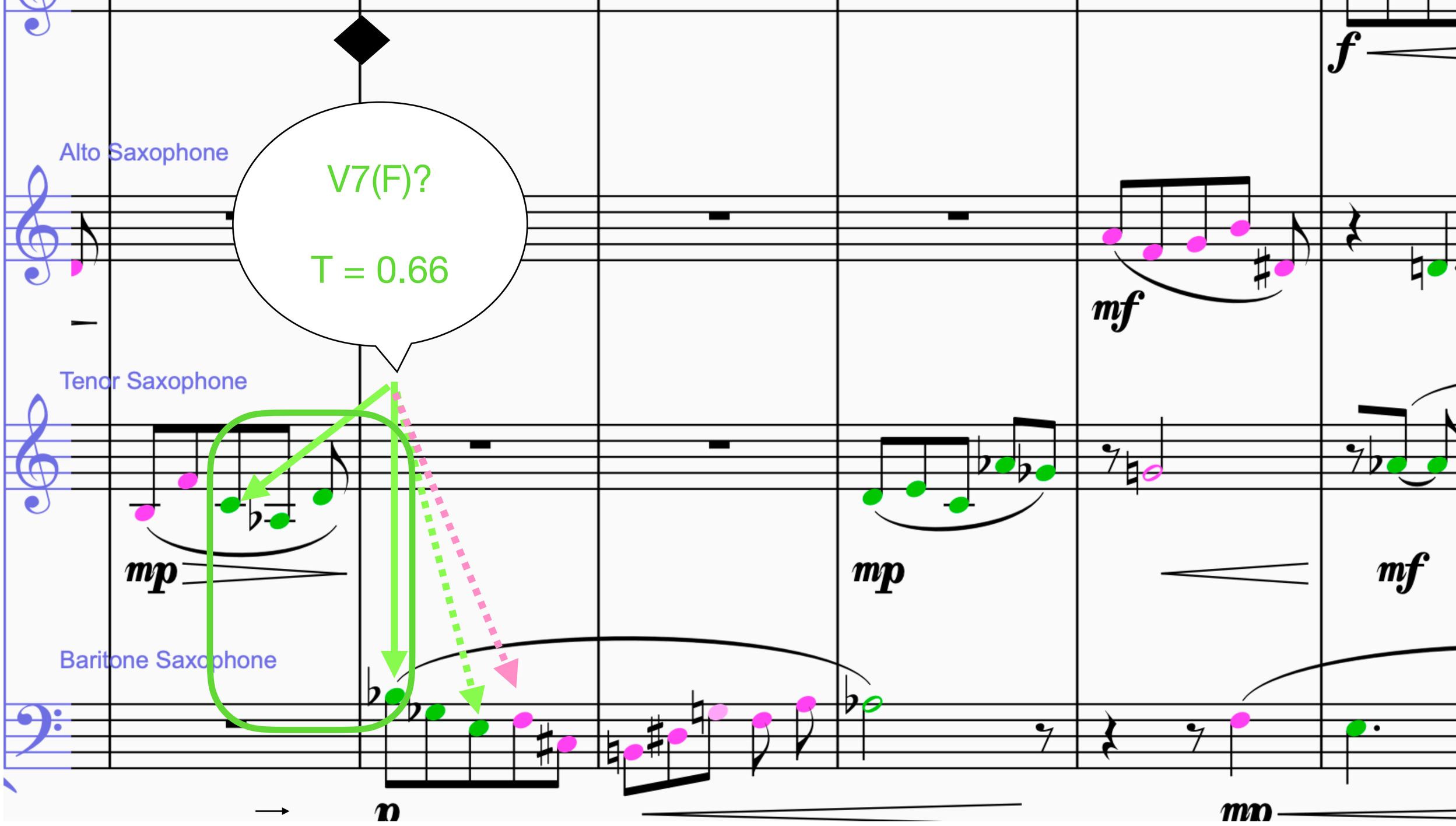
(Transitory) experience of tonic as reference point

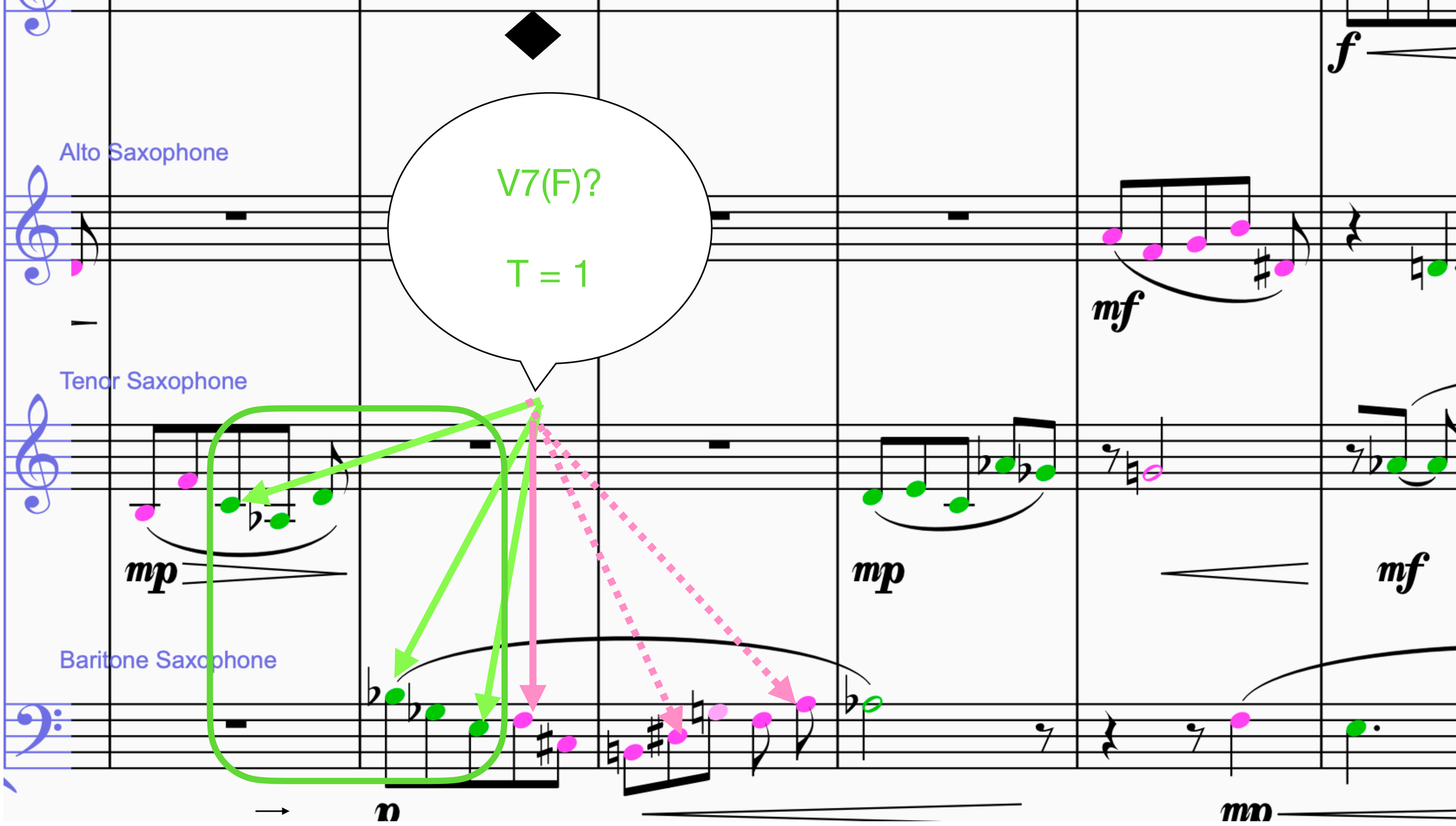
Beta

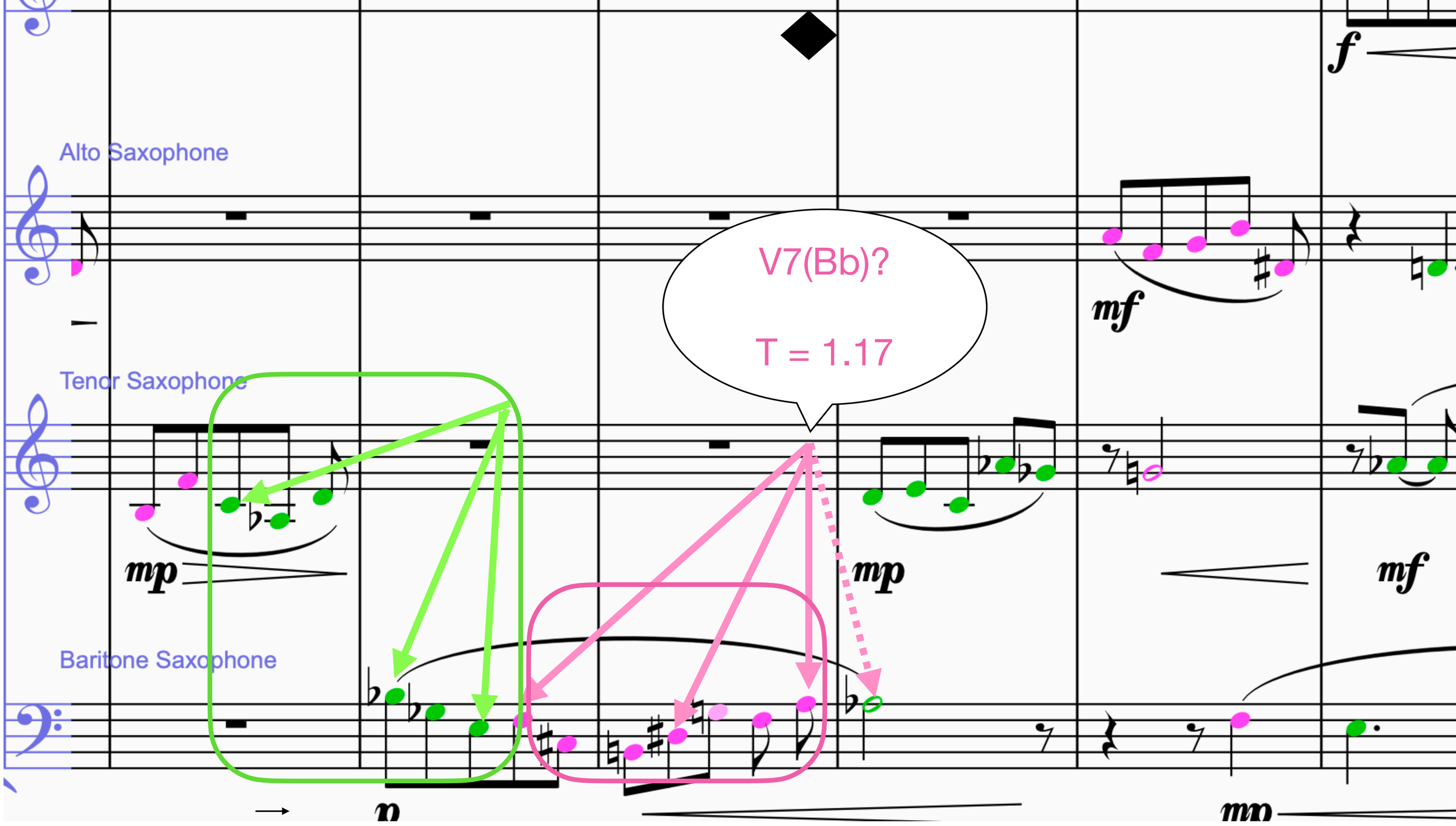
Alpha

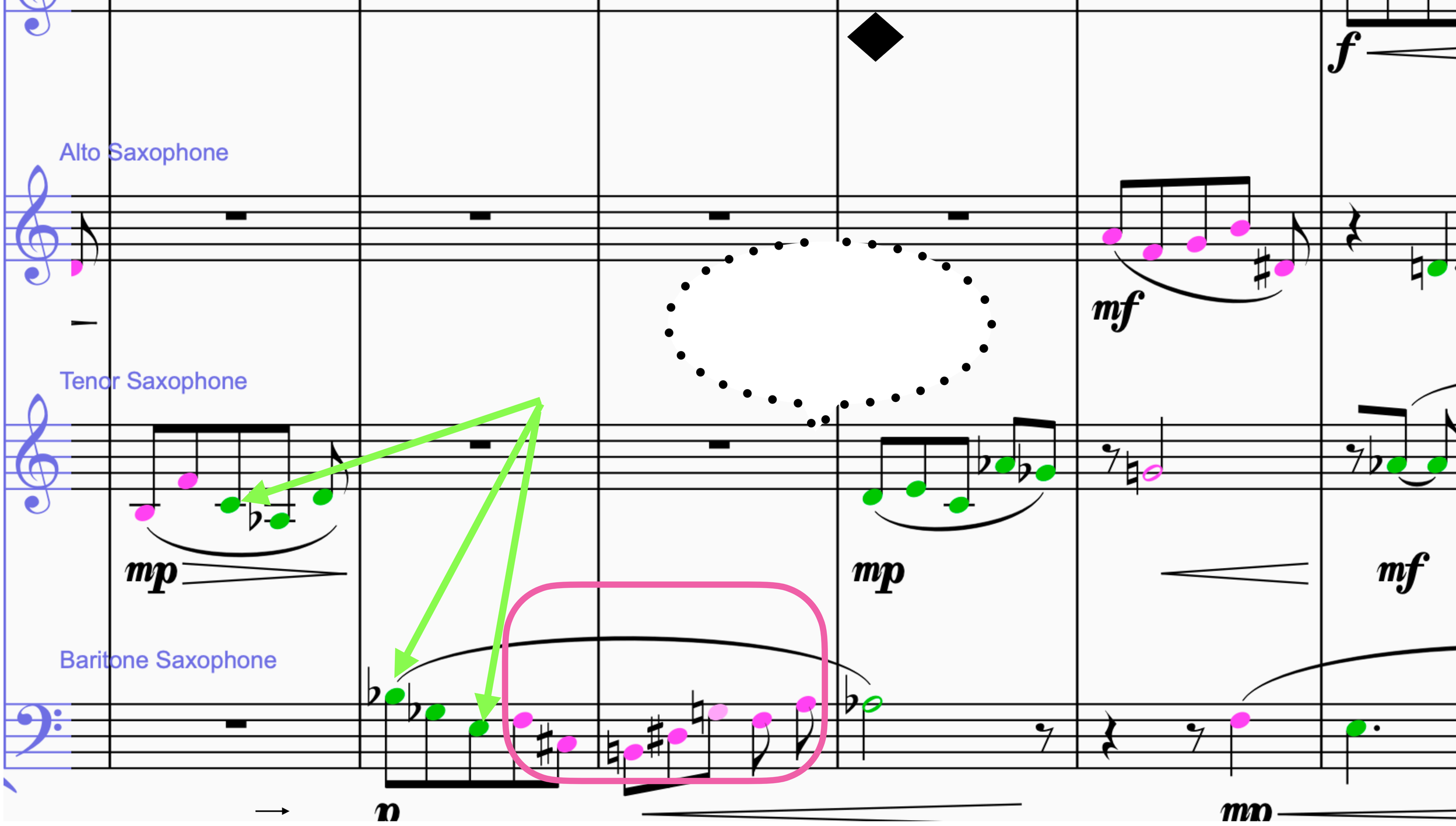
Protention - retention walkthrough

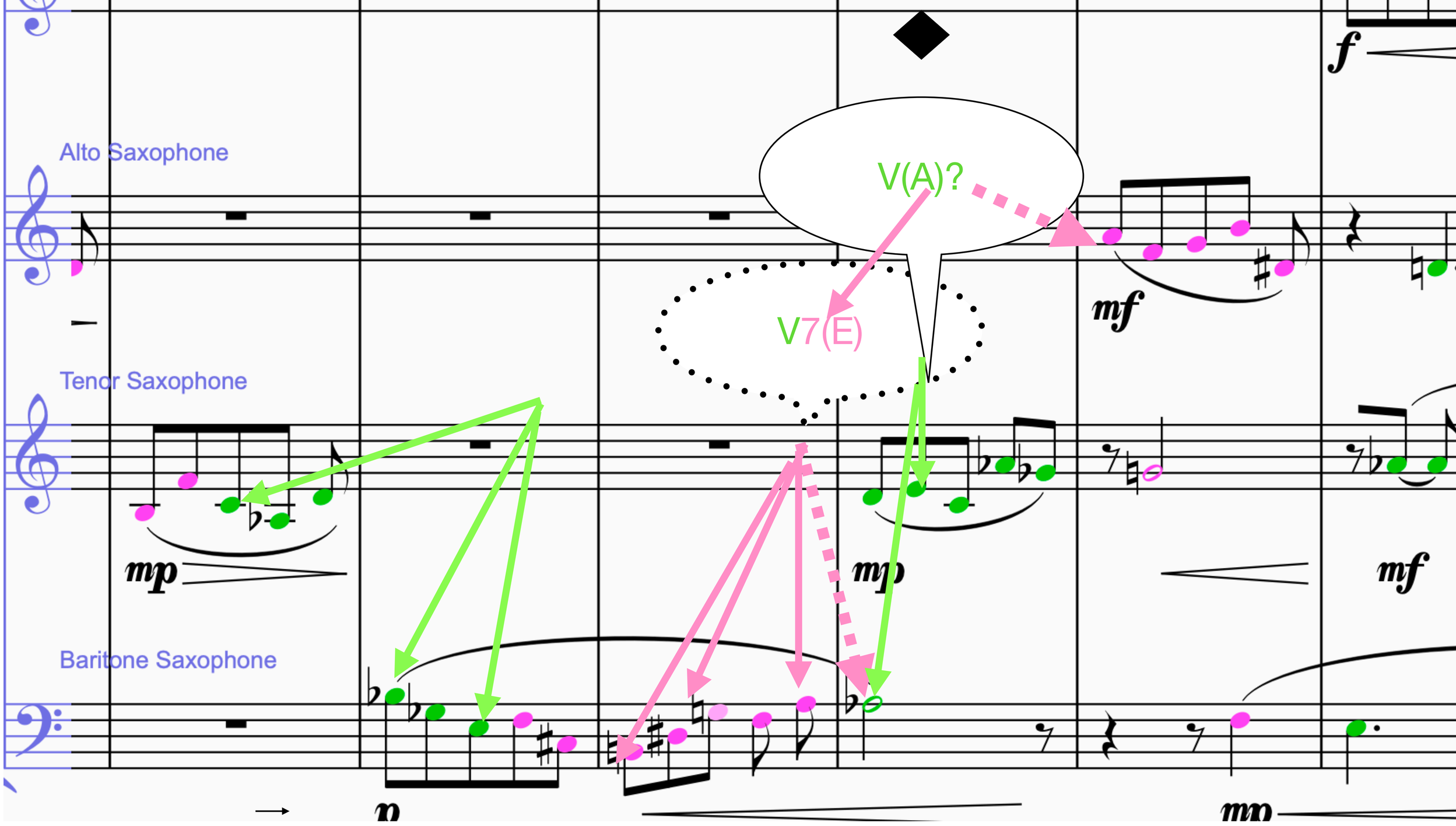



Alto Saxophone
Tenor Saxophone
Baritone Saxophone
V7(F)?
T = 0.66
mp
mf
mp
mf
f
p
mp


Alto Saxophone
Tenor Saxophone
Baritone Saxophone
V7(F)?
T = 1
f
mf
mp
mp
mf
p
mp


Alto Saxophone
Tenor Saxophone
Baritone Saxophone
V7(Bb)?
T = 1.17
mp
mf
f
p


Alto Saxophone
Tenor Saxophone
Baritone Saxophone
f
mf
mp
mp
mf
p
mp


Alto Saxophone
Tenor Saxophone
Baritone Saxophone
V(A)?
V7(E)
mp
mf
mp
mf
f
p
mp

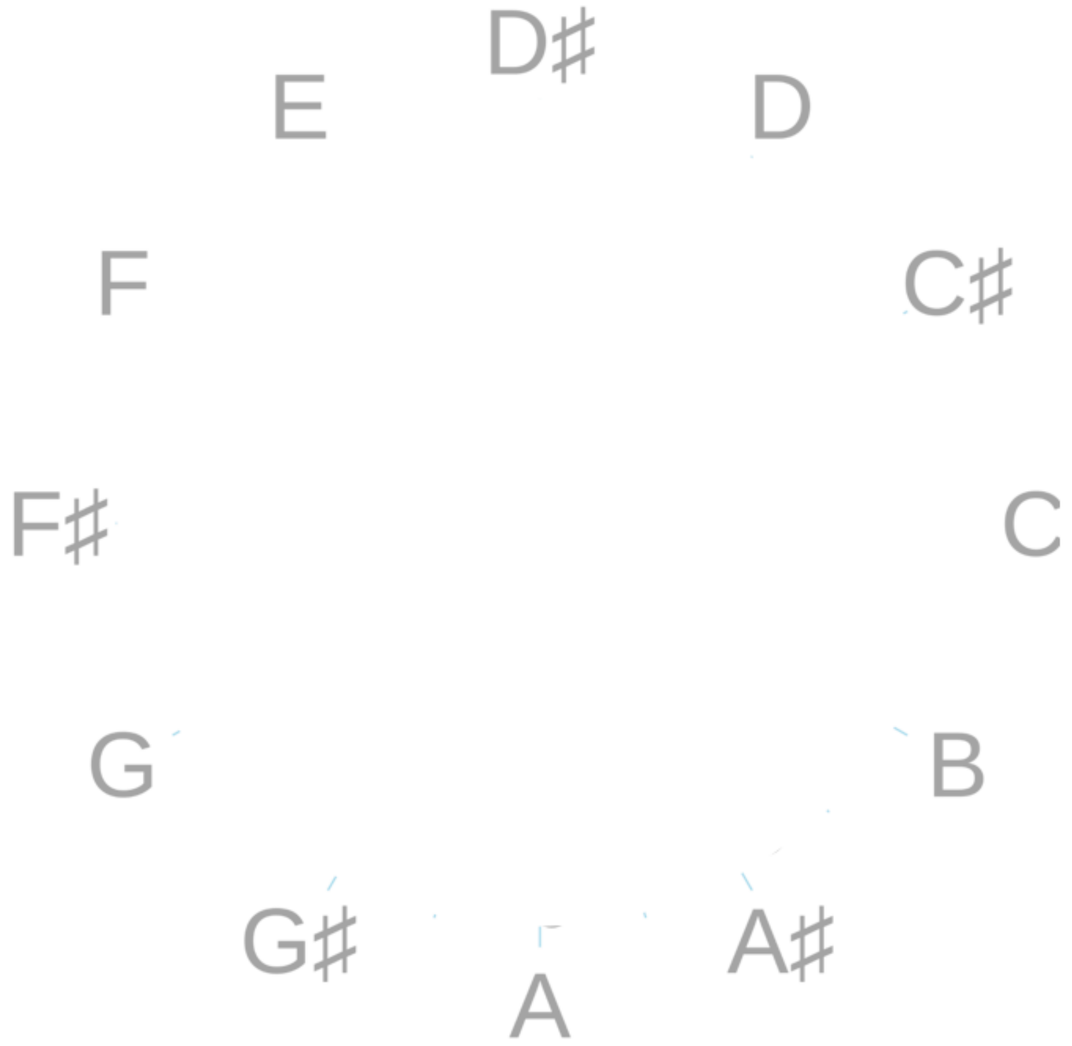
Experiential circle of fifths

- Every BH transition is an implicit V -> V cadenza.
- A experience of BH music can navigate around circles of fifths

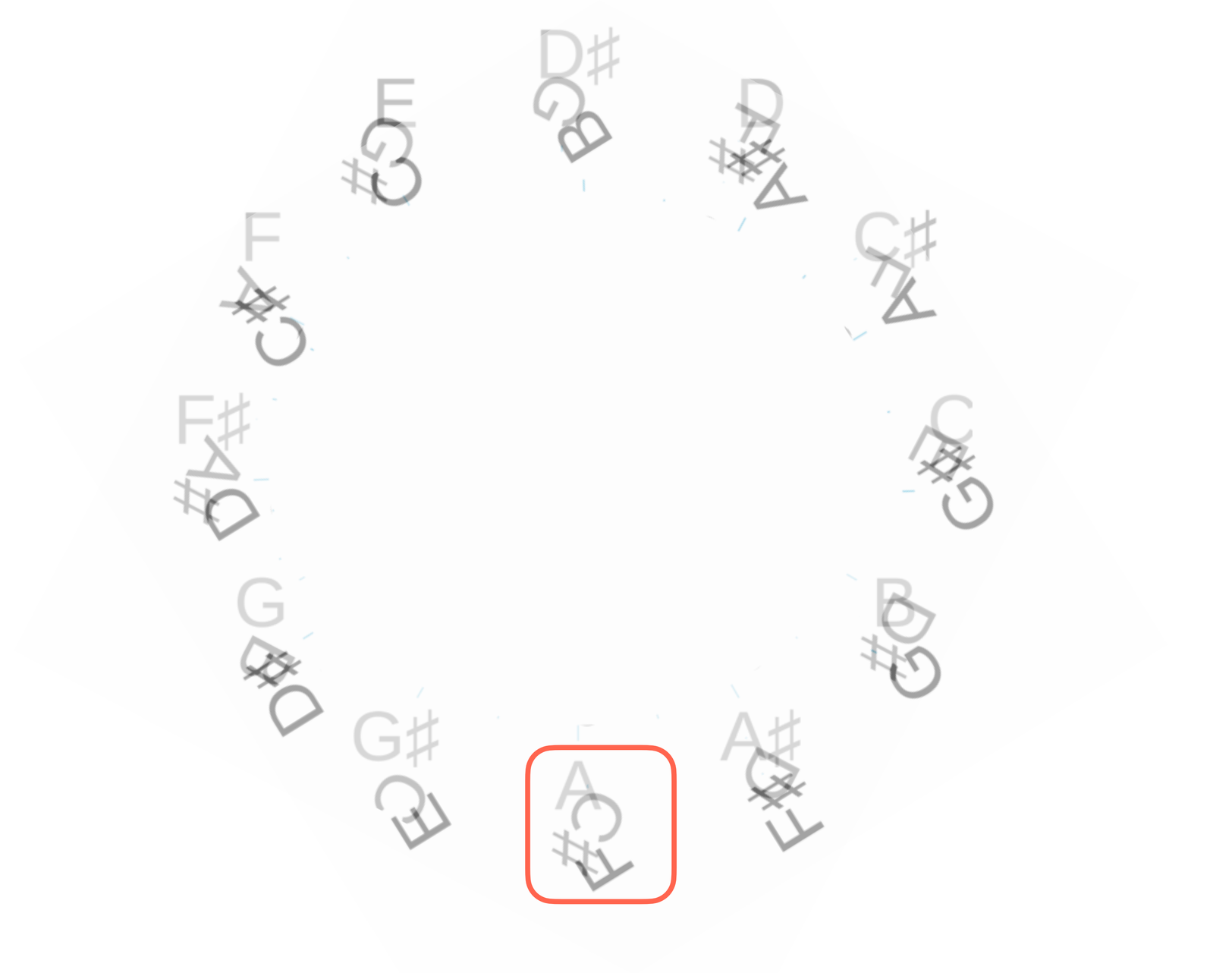
Polycircle of fifths

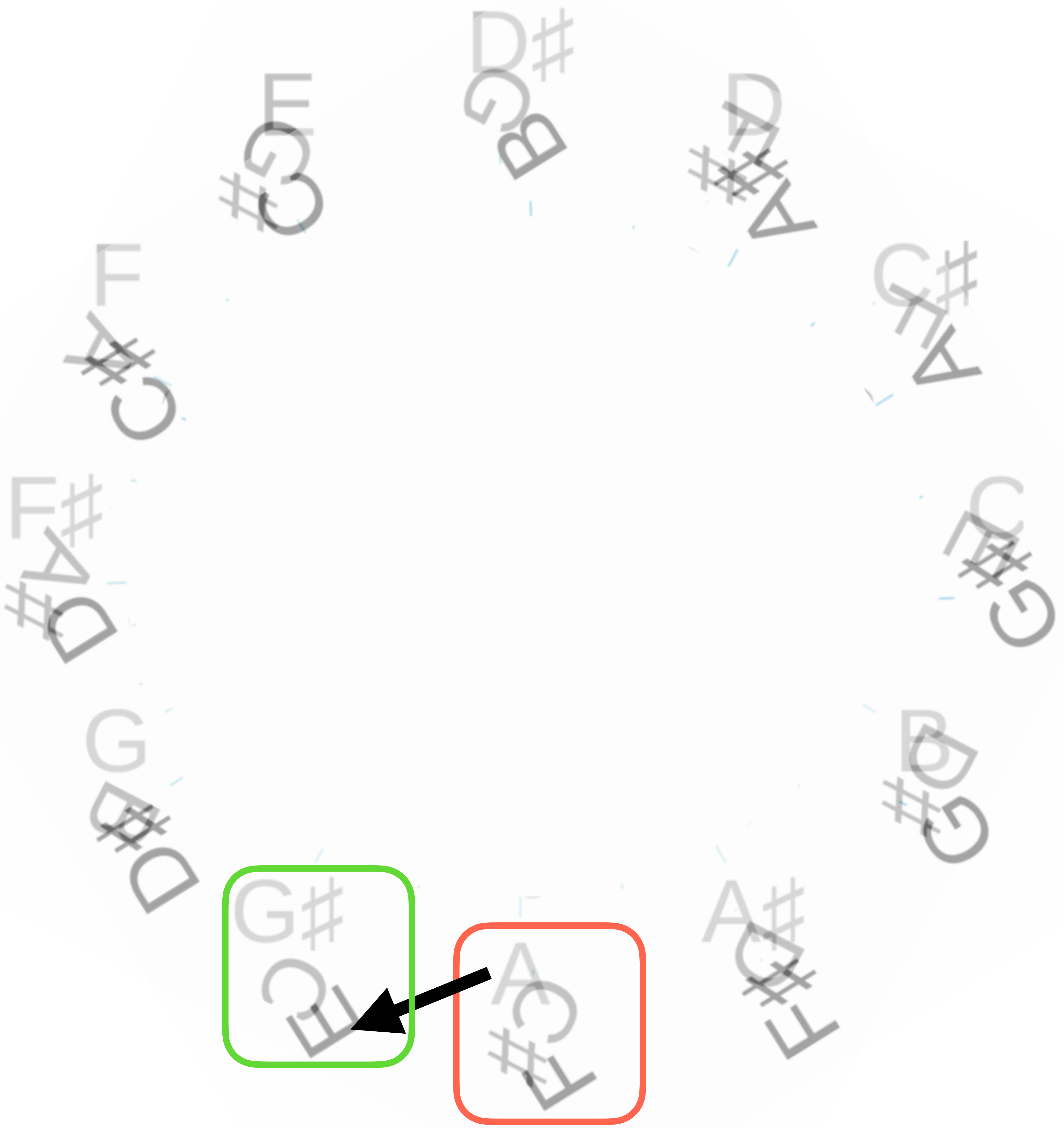
The bi-hexaphonic pitch organisation affords *multiple overlapping circles of fifths*.

Experiential harmonization branches to alternative dominant implications at every cell.

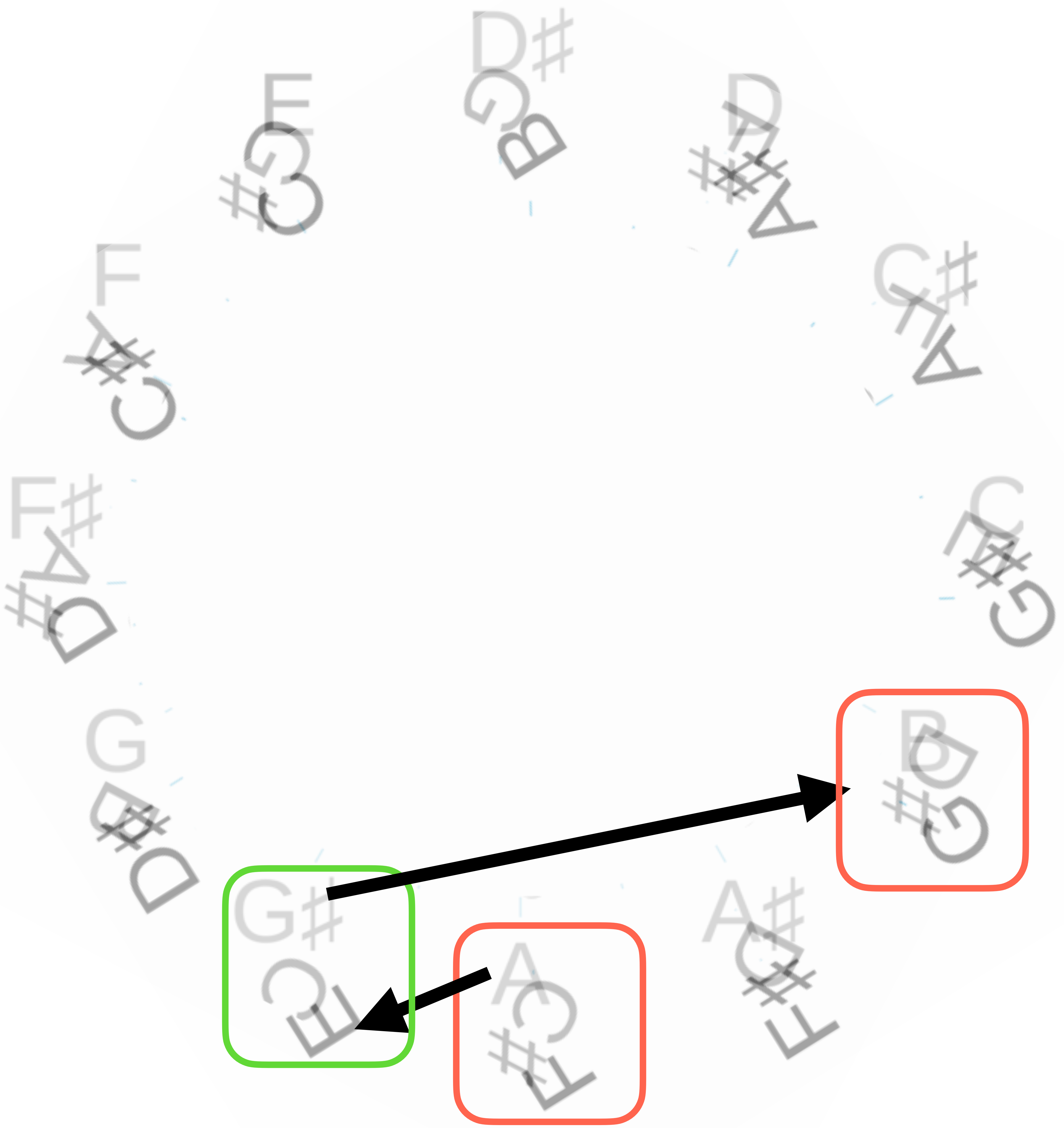

D♯
E
D
F
C♯
F♯
C
G
B
G♯
A♯
A


D♯
D
C♯
C
B
A♯
A
G♯
G
F♯
F
E

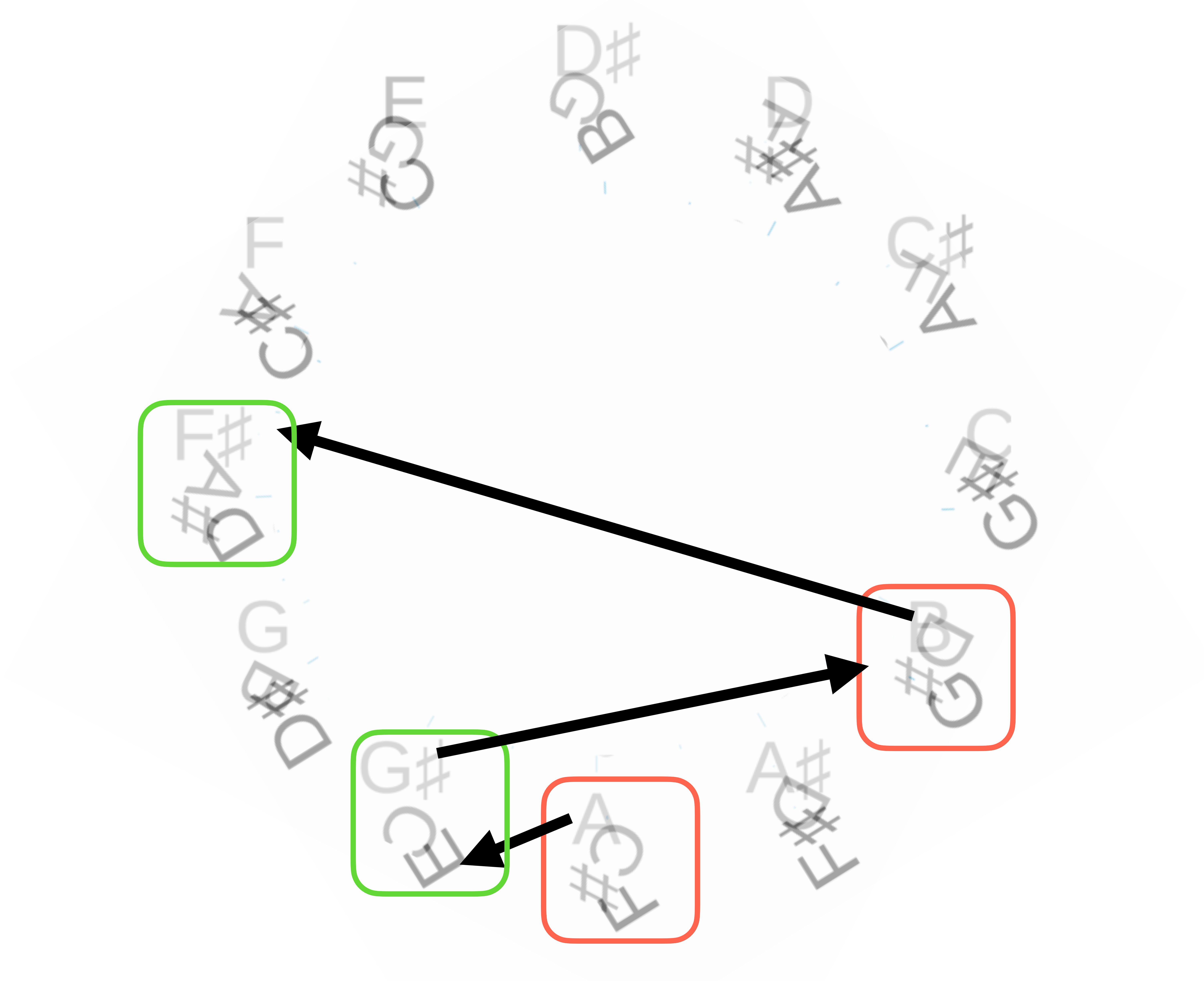

C
G
D
A
E
B
F♯
C♯
G♯
D♯
A♯
F



D#
D
C#
C
B
A#
A
G#
G
F#
F
E



D#
D
C#
C
B
A#
A
G#
G
F#
F
E



D#
D
C#
C
B
A#
A
G#
G
F#
F
E

DEMO of poly-dominancy

String Quartet 3

- Andante vivo
- Lento
- **Presto “Perpetuum mobile”, forever looping**

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String Quartet 3

- Andante vivo
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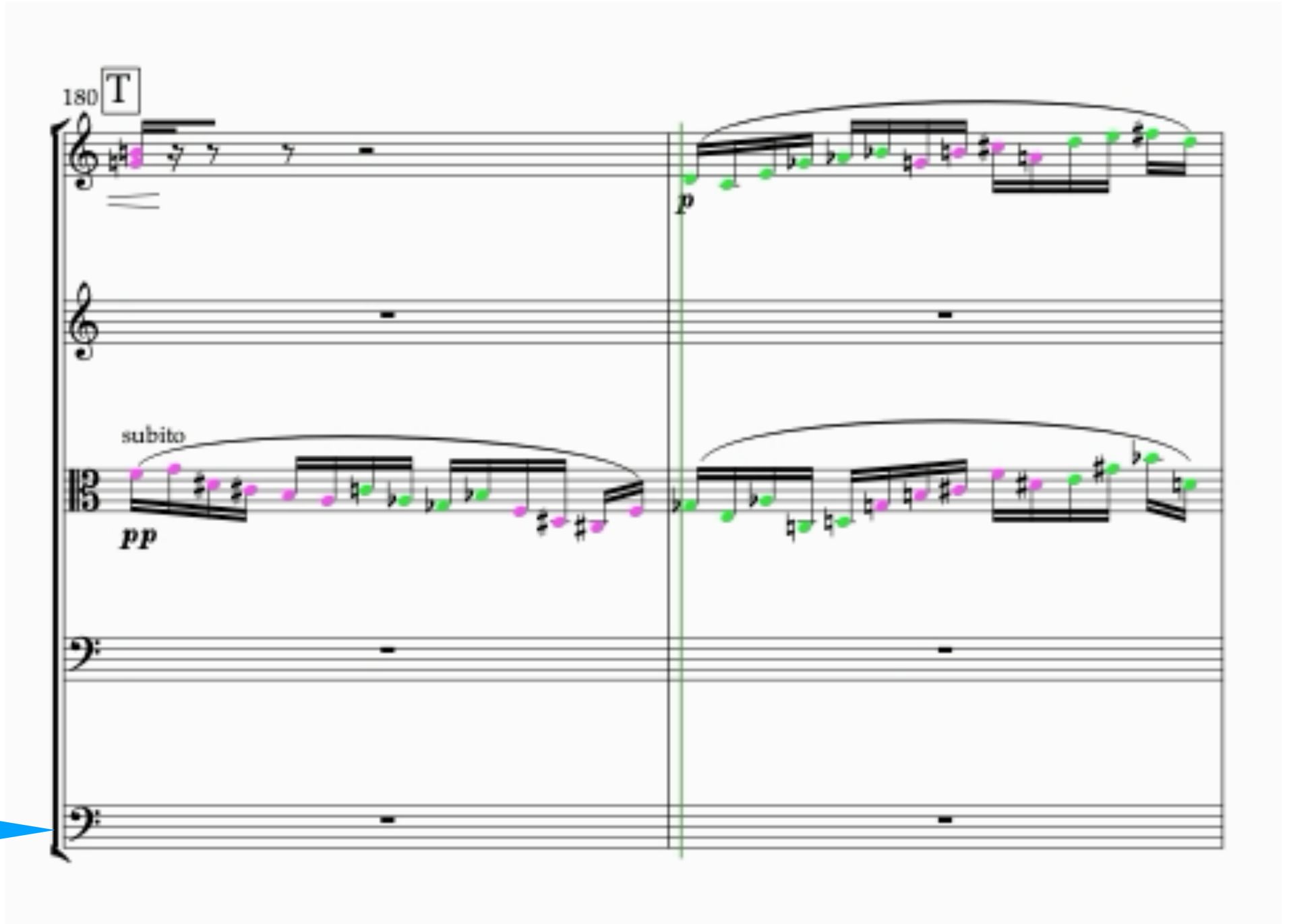


Demo d.b.

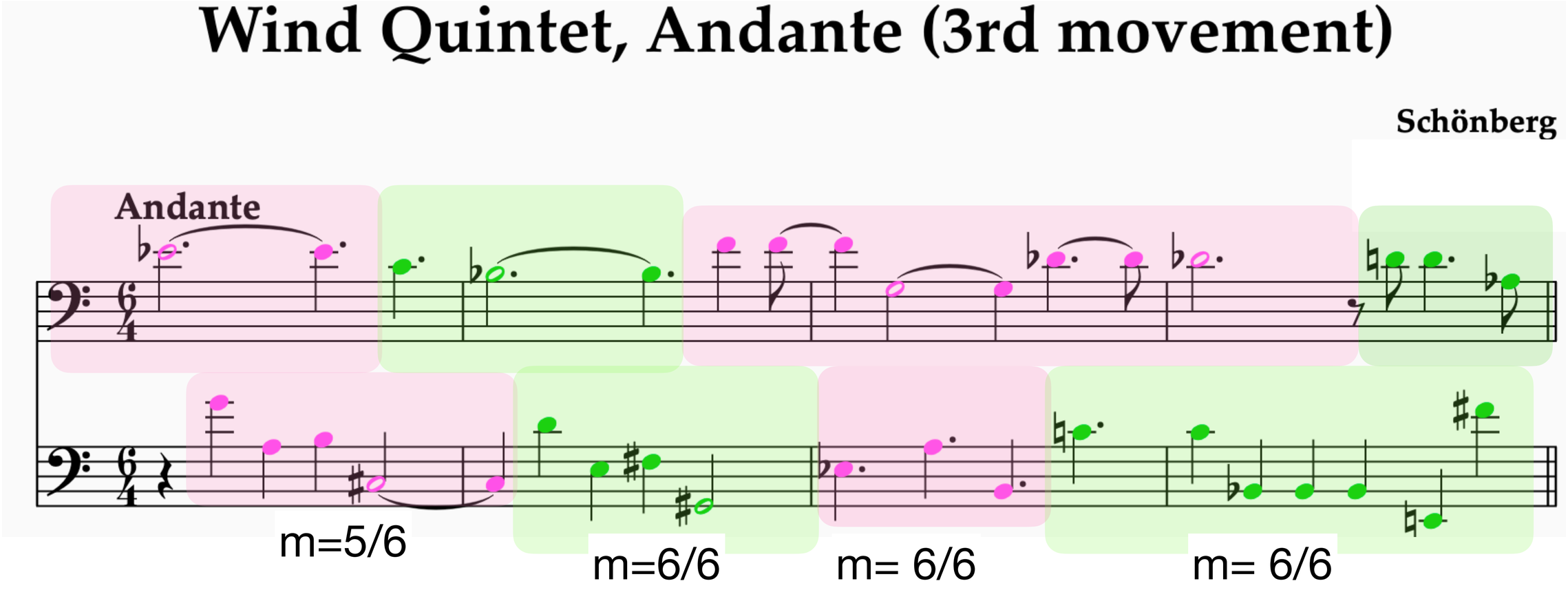
Schönberg revisited

Why can one sometimes experiential dominant functions in Schönberg?

Why sometimes not?

Schönberg 1951, 124

Schönberg revisited



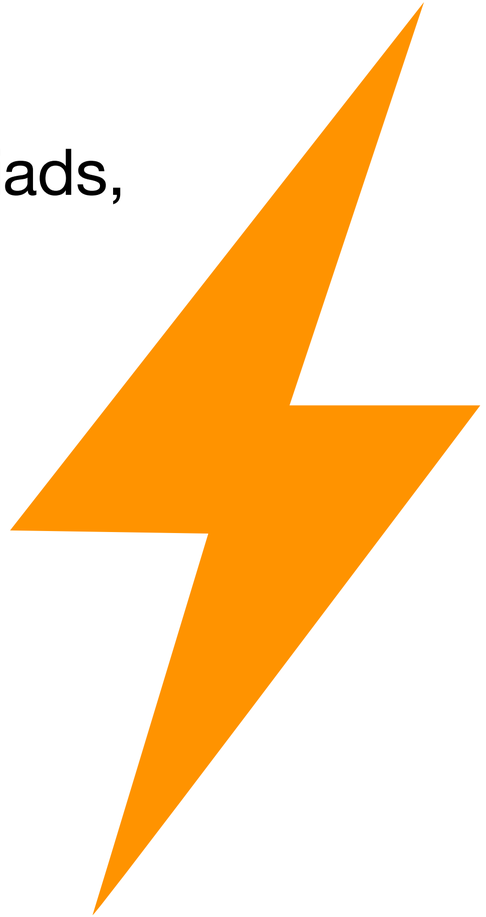
<= Mature hexaphonic cells!

<= BH-dissonance, appogiature/suspensione

Kaipainen revisited

Why do you experience Kaipainen's music diatonic (do you?), even if there are no:

- major or minor triads,
- no keys
- no tonic centres



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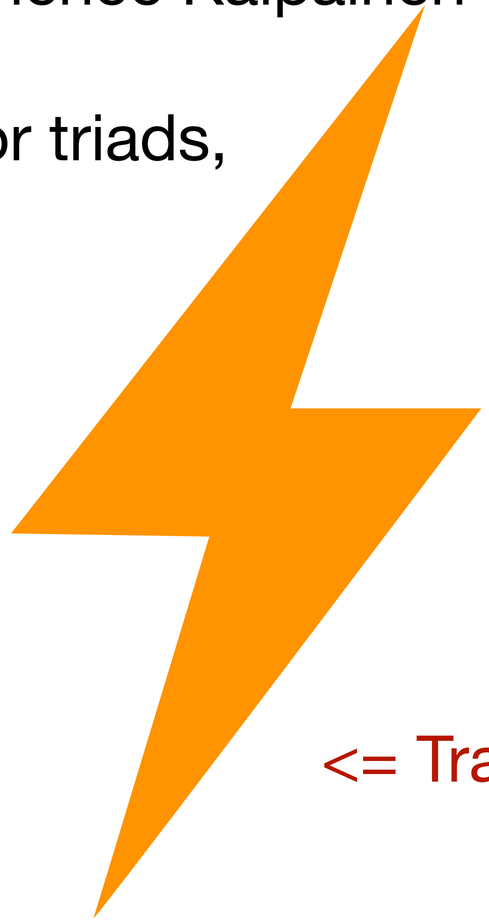
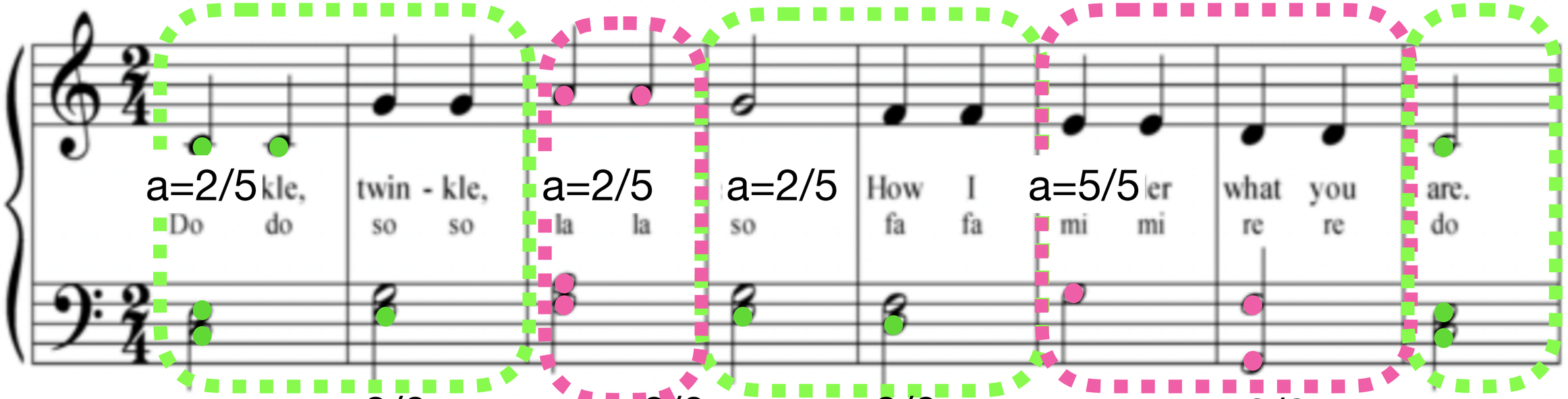


Maybe because of:

<= The vertical (harmonic) rule?

<= Traditional voice-leading & counterpoint?

Diatonics revisited



m=2/6 t=0.13

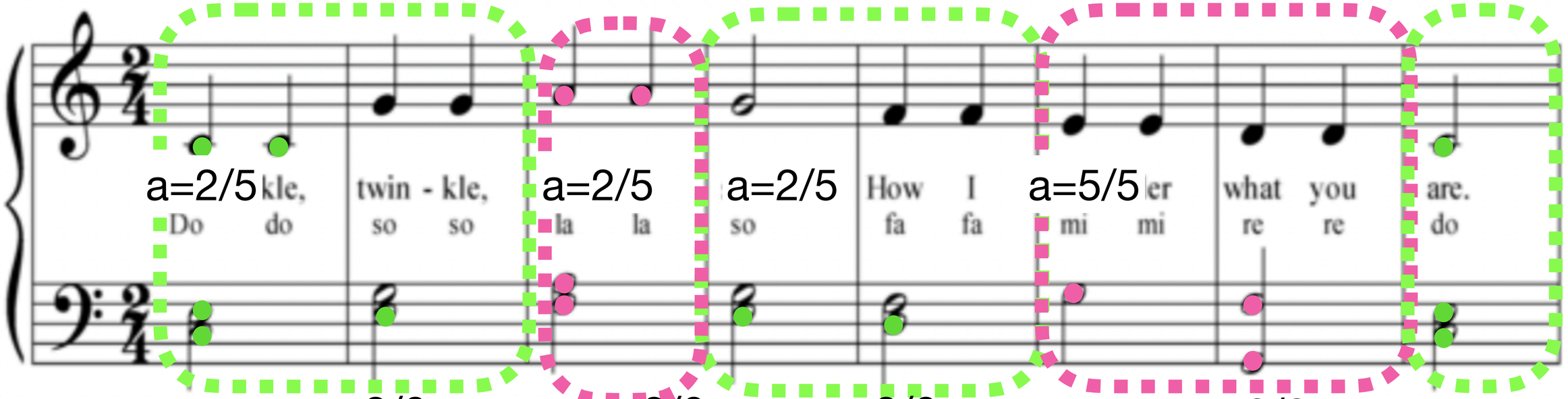
m=2/6 t=0.13

m=2/6 t=0.13

m=2/6 t=0.33

- Cells with low BH tension (low ambitus, low maturity)
- II & III, IV & V regarded as one cell (one generalised function?)

Diatonics revisited



m=2/6
t=0.13

m=2/6
t=0.13

m=2/6
t=0.13

m=2/6
t=0.33

- Cells with low BH tension
- II & III, IV & V regarded as one cell

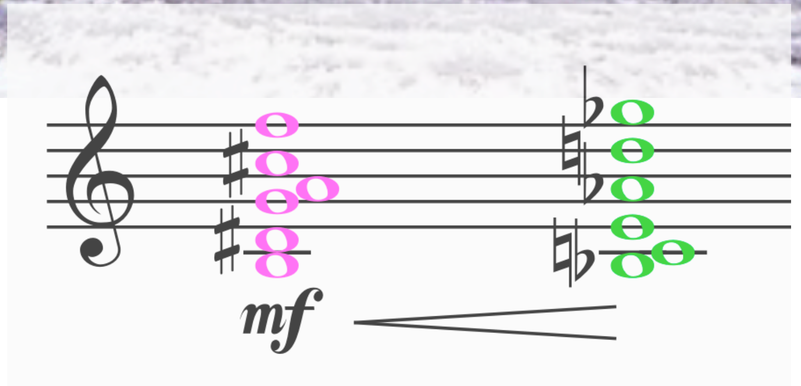
CONCLUSIONS

Conclusions: Bi-hexaphony

- Analysed implications and characteristics of bi-hexaphony
- Claimed omnipresence of BH across septatonic scales, and recognised the challenge of BH analysis and history of BH

Conclusion: Bi-hexaphonic transition as affordance for experiential tension-resolution

Alpha



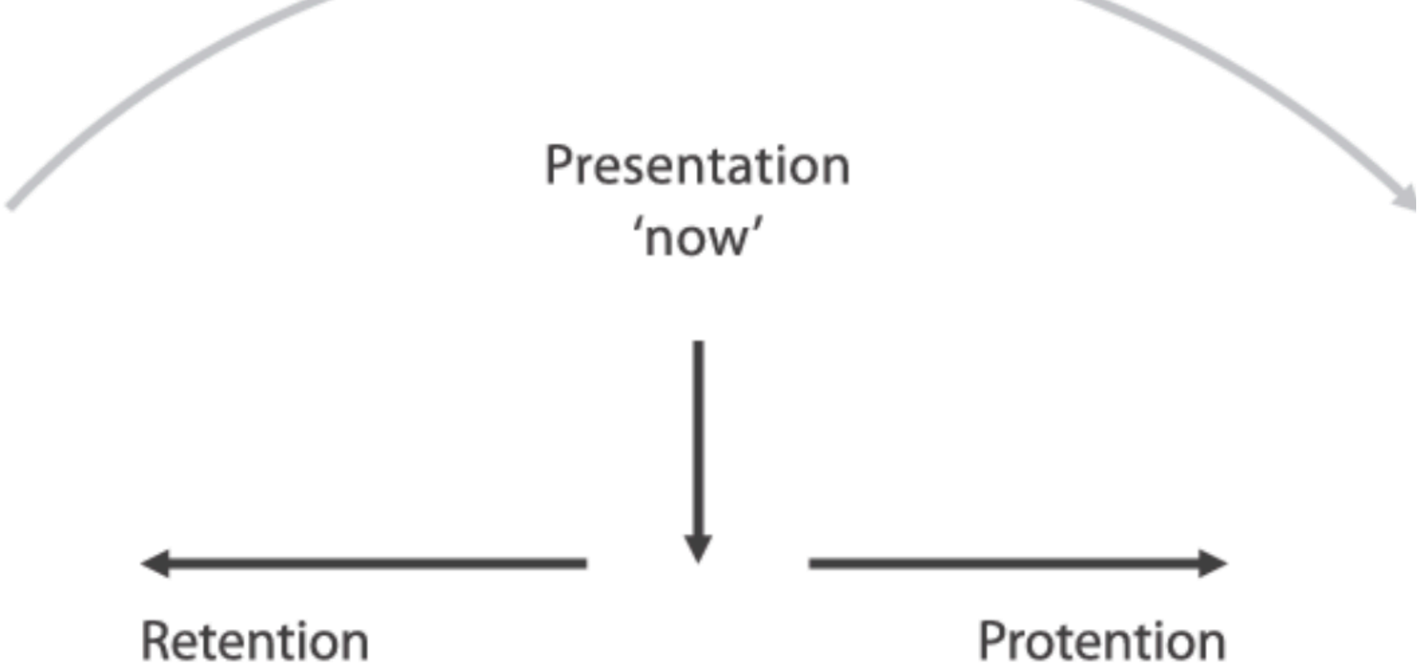
Beta

Conclusion: Experience

I have applied BH bipolarity to conceptually superimpose:

- Experiential protention-retention structure

- Bi-hexaphonic tension-release



Conclusion: Experience & BH tension-release

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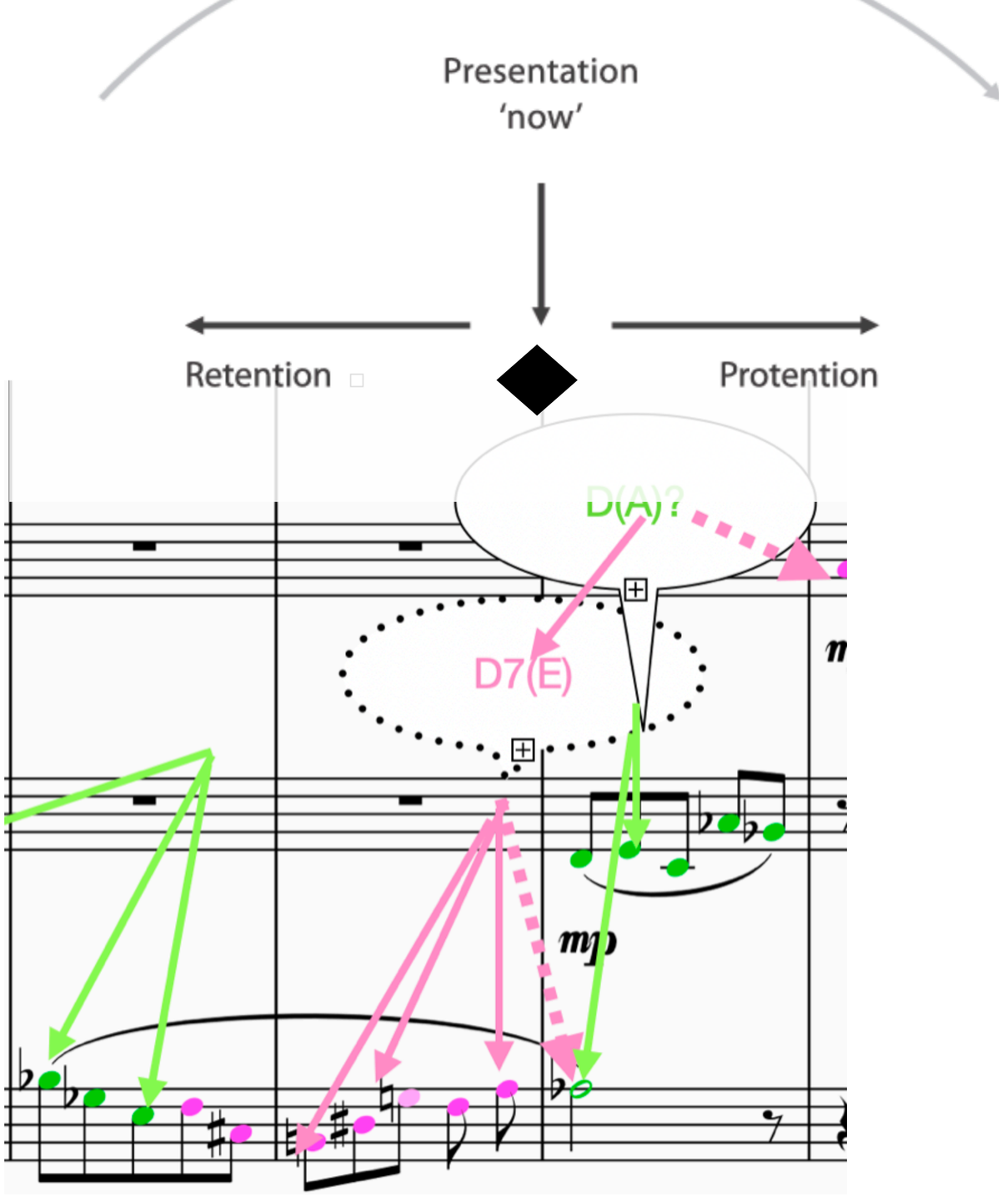

Conclusions: Bi-hexaphonic pitch organisation

- Introspection: BH allows me an expressive musical syntax for my obsessive composition.
- Allows a introspection laboratory of temporal experience
- Allows a music theoretical laboratory with *polydominance* as one of the core issues.

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Conclusion: Diatonics

- Bi-hexaphony is omnipresent and is as old as septatonic scales (since Antiquity?).
- => History of BH tension: A red thread through music history
- => Explanatory value of BH with respect equally to diatonic and post-diatonic music
- => Potential contributions to **experiential music theory,** independent of the diatonic canon.

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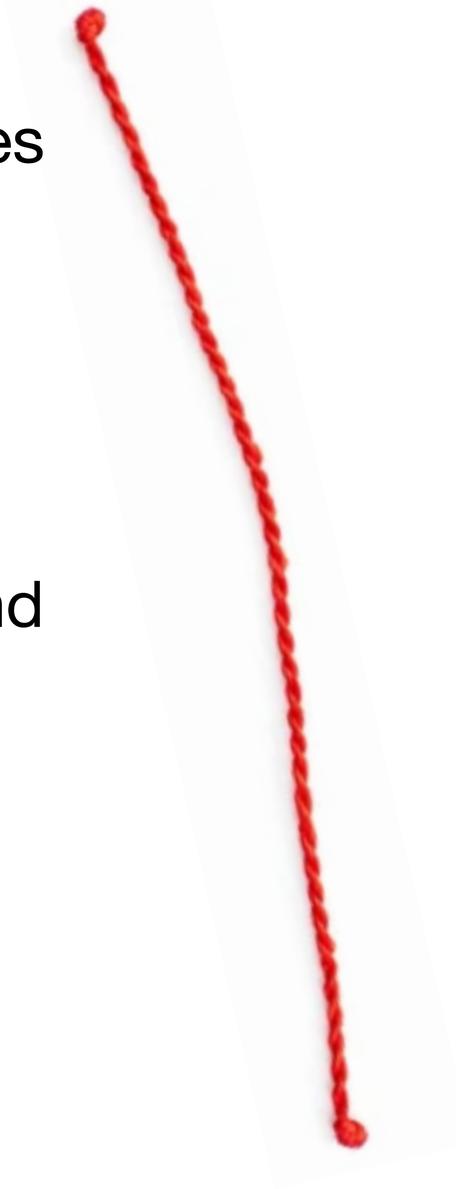
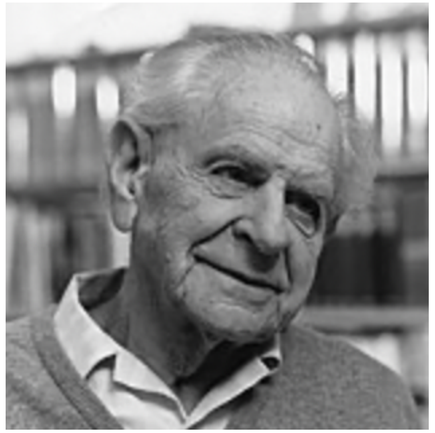


Conclusions: Epistemology

- Is the hypothesis of bi-hexaphonic tension confirmable/ falsifiable?
- Individual experience can not be proven, but the shared embodied structure of experience can.
- Psychophysiogical experiments may or may not be able to show the accumulation of tension, e.g. based on the paradigm of mismatch negativity (Tervaniemi 2021).

Conclusions: Epistemology

- Popper: For any hypothesis to have credence, it *must be inherently disprovable* before it can become accepted as a scientific hypothesis or theory.
- Is the hypothesis of bi-hexaphonic tension disprovable?
- Individual experience can not be proven, but the shared embodied structure of experience can.
- Psychophysiogical experiments may or may not be able to show the accumulation of tension, e.g. based on the paradigm of mismatch negativity (Tervaniemi 2021).
- Humanistic approval: Historical consistency



Popper, Karl [1959]. *The Logic of Scientific Discovery*.

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Musical examples

- Mauri Kaipainen: *Piano concerto* https://www.dropbox.com/scl/fi/n69q3o3ns96bb5iexkdi8/Piano-Concerto.mp3?rlkey=6y8pef1qg402jjj5id2vbc54o&dl=0

- Mauri Kaipainen: *Urban prelude and fugue* for saxophone quartet https://www.dropbox.com/scl/fi/yqmrtlvnbtuu2a11ur5t5/Urban-prelude-and-fugue.mov?rlkey=1hjz25nh8df7cl6win1wxhn5w&dl=0

- Mauri Kaipainen: String quartet 3: https://www.dropbox.com/scl/fi/pc28ami2luzp4v2xgtz59/SQ3.mov?rlkey=2h4965smoekav7l9d4f1ohr4f&dl=0

- Arnold Schönberg: Wind quintet Op. 26 https://youtu.be/VUEj5q43nec?si=v4tXe_yaCG1TnS18