

Automatic Scoring up of Music in Mensural Notation

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Music Encoding Conference
College Park, May 23rd, 2018

Superius

Je chies
Laultre d'antan l'autrier passa
percha. d'un regard forque a melan q' me mist en
larriere l'un tant maluaie brassin me baissa
Kartel sachon me frassa
Cue de ses gaupes me rassa
Mais par dieu elle fist son don
laultre d'antan l'autrier passa.

Tenor

Enor laultre d'antan l'autrier passa
sant me t'percha d'un regard forque a melan.
qui me mist en larriere l'un tant maluaie
brassin laultre d'antan l'autrier passa.

Contratenor

Dnt. laultre d'antan

Beinecke Rare Book & Manuscript Library

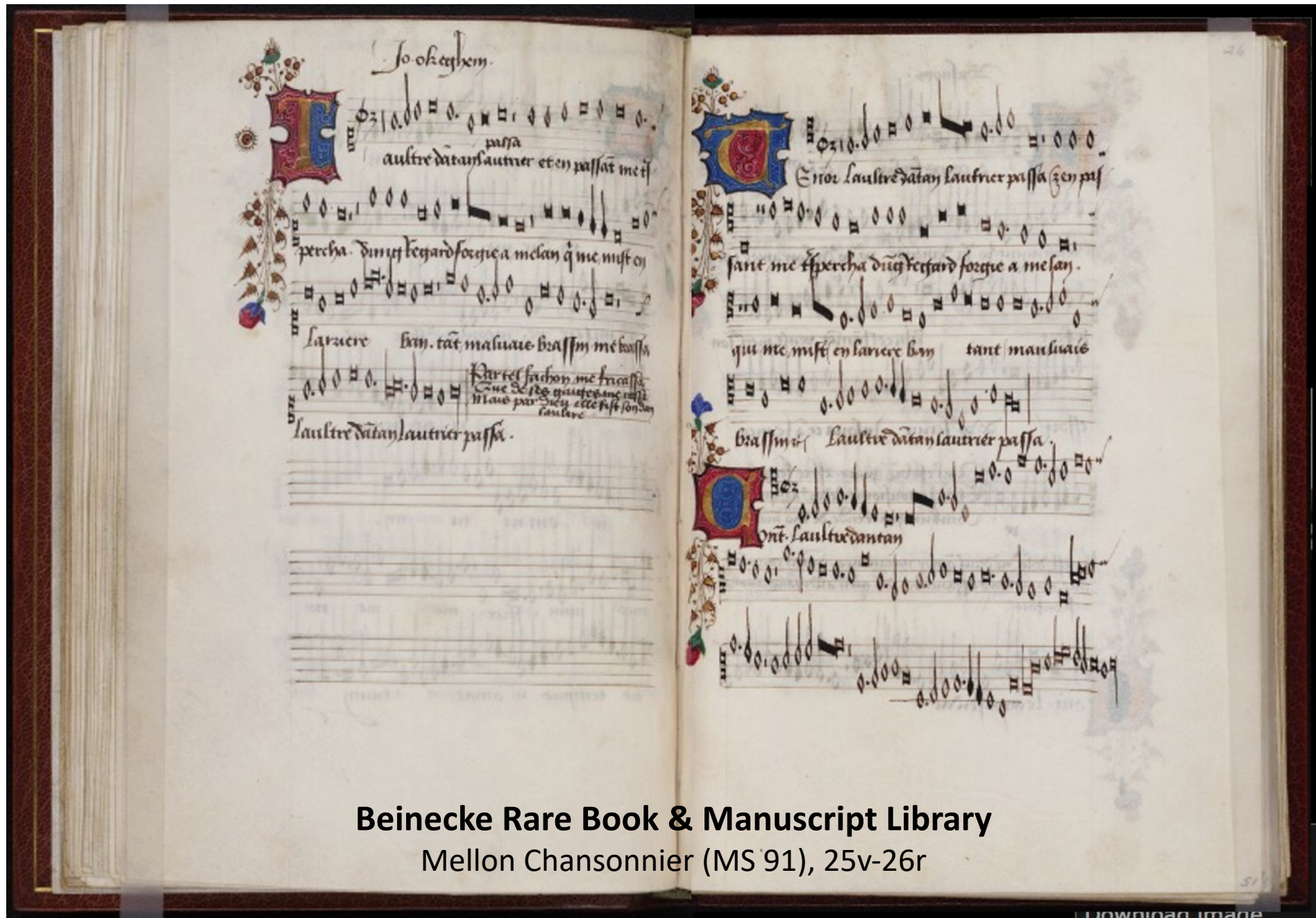
Mellon Chansonnier (MS 91), 25v-26r

Scoring up

The image displays a musical score for three voices: Superius, Tenor, and Contratenor. The score is presented in two systems. The first system shows the beginning of the piece, with the Superius part starting on a high note and the Tenor and Contratenor parts starting on lower notes. The second system shows the continuation of the piece, with the Superius part moving to a lower register and the Tenor and Contratenor parts moving to higher registers. The notes are represented by diamond shapes, and the stems are vertical lines. The background of the score is divided into three horizontal bands: light blue for Superius, light pink for Tenor, and light green for Contratenor.

Mensural Notation

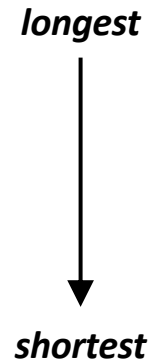
(An Introduction)



Beinecke Rare Book & Manuscript Library
Mellon Chansonnier (MS 91), 25v-26r

Mensural Notation

- There is a clear hierarchy in the note duration



Notes		Values				
Name	Shape	Perfect			Imperfect	
Maxima	☐	☐	☐	☐	☐	☐
Long	☐	◊	◊	◊	◊	◊
Breve	◊	⋮	⋮	⋮	⋮	⋮
Semibreve	◊	⋮	⋮	⋮	⋮	⋮



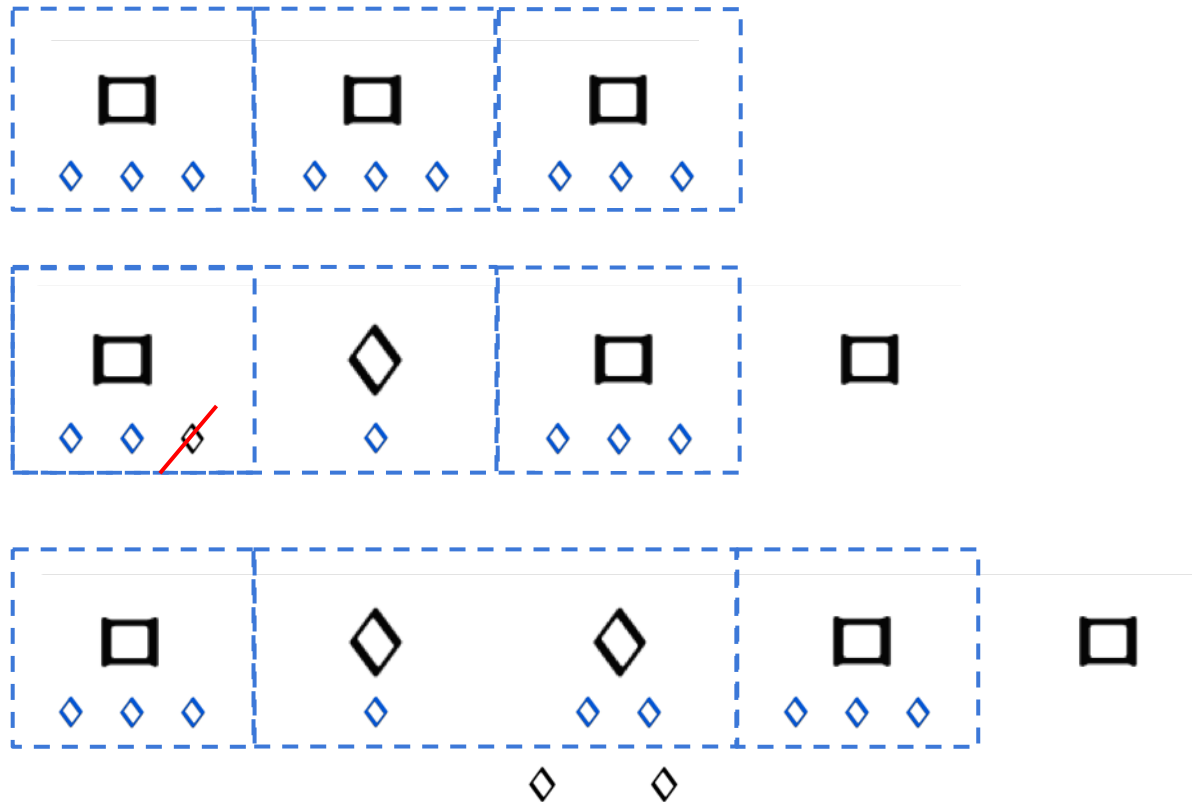
Mensuration

Establishes the relation between the note values (“perfect” or “imperfect”)

In perfect mensurations, the duration of the individual note symbols is not absolute, but rather **depends on context**

Examples of Context Changing the Note's Duration

Mensuration: Breve = 3 → Breves are perfect by default



*Principles of
Imperfection
and Alteration*

Imperfection
Perfect → Imperfect

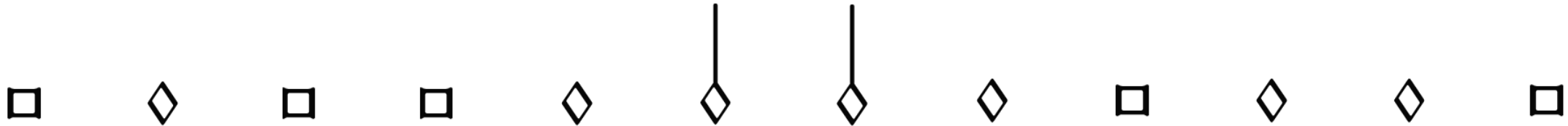
Alteration

Franco of Cologne
Ars Cantus Mensurabilis (ca. 1280)

The Scoring-up Tool

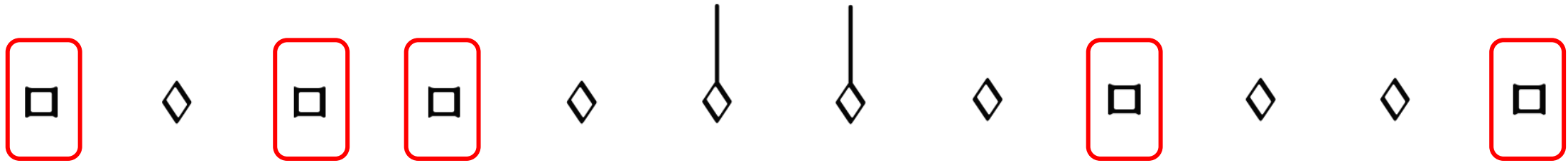
Algorithm

Mensuration: Breve = 3 → Breves are perfect by default



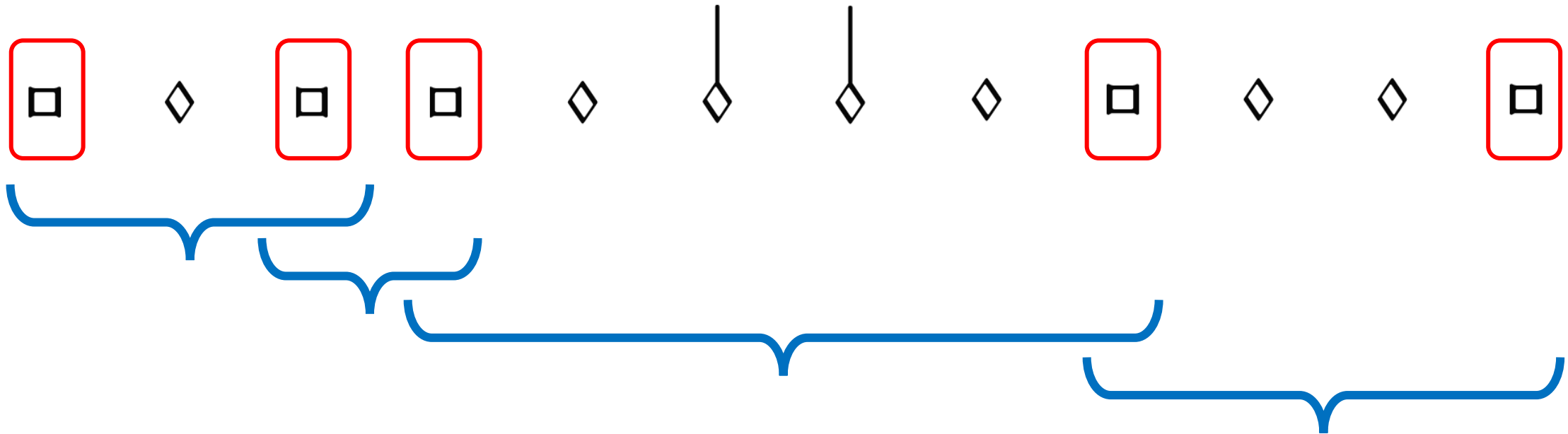
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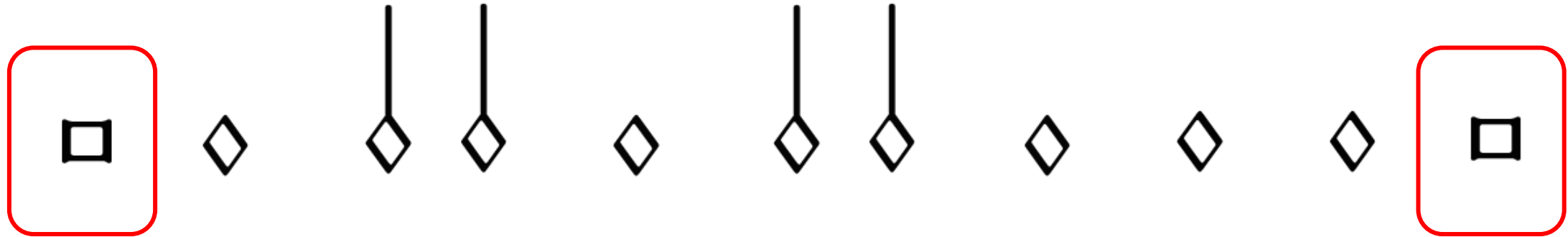


Algorithm

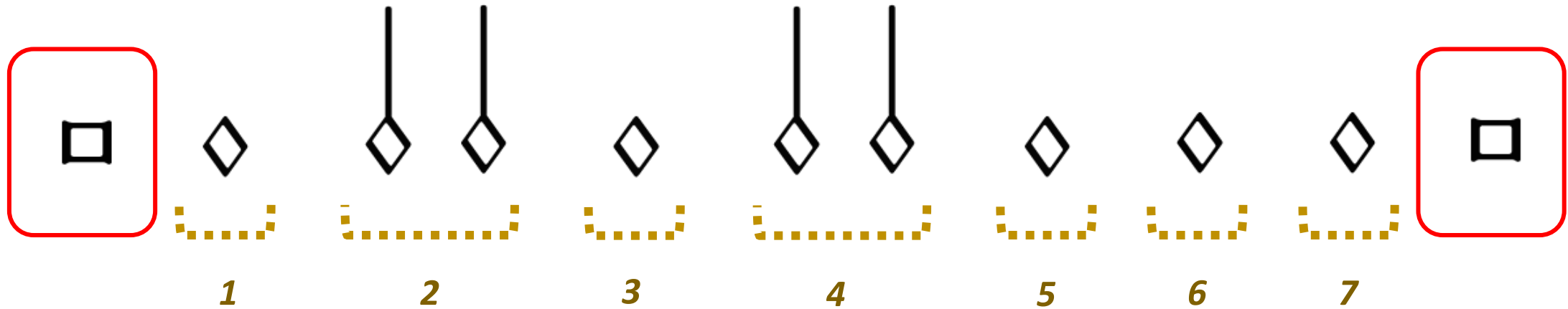
Mensuration: Breve = 3 → Breves are perfect by default



Example: (sequence bounded by breves)

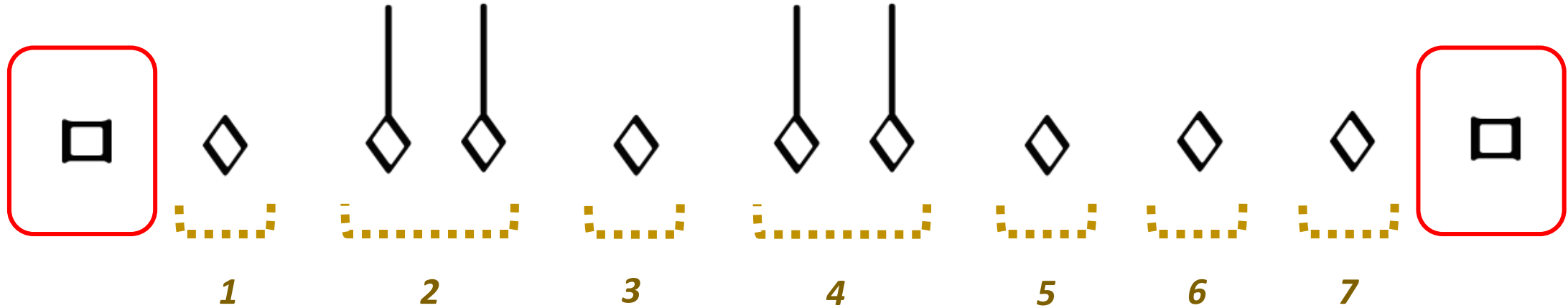


Example: (sequence bounded by breves)



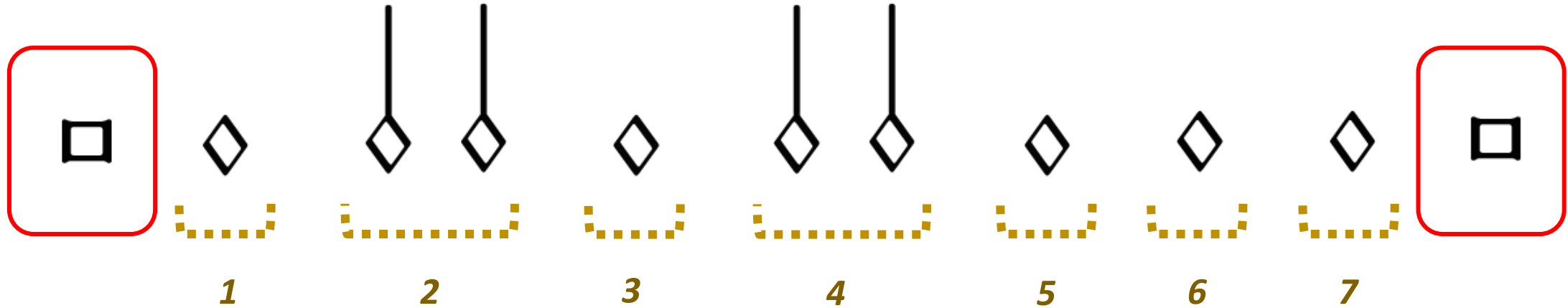
7 semibreves

Example: (sequence bounded by breves)



7 semibreves = Two groups of 3 semibreves + 1

Example: (sequence bounded by breves)



7 semibreves

=

Two groups of 3 semibreves

+

1

Number N of semibreves between the boundaries	Number P of perfect groups of semibreves	General Interpretation	Alternative Interpretation
$N = 3P + 1$	$P \geq 0$	Imperfection (by following)	Imperfection (by preceding)
$N = 3P + 2$	$P = 0$	Alteration	Imperfection (by following) & Imperfection (by preceding)
	$P > 0$	Imperfection (by following) & Imperfection (by preceding)	Alteration
$N = 3P$	$P = 0$	-	-
	$P = 1$		Imperfection (by following) & Alteration
	$P > 1$	Imperfection (by following) & Alteration	-

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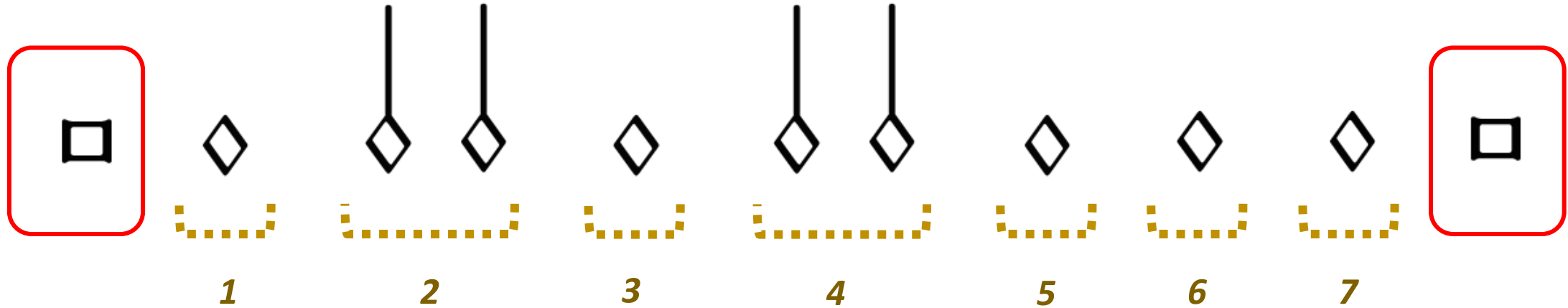
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Example: (sequence bounded by breves)



7 semibreves

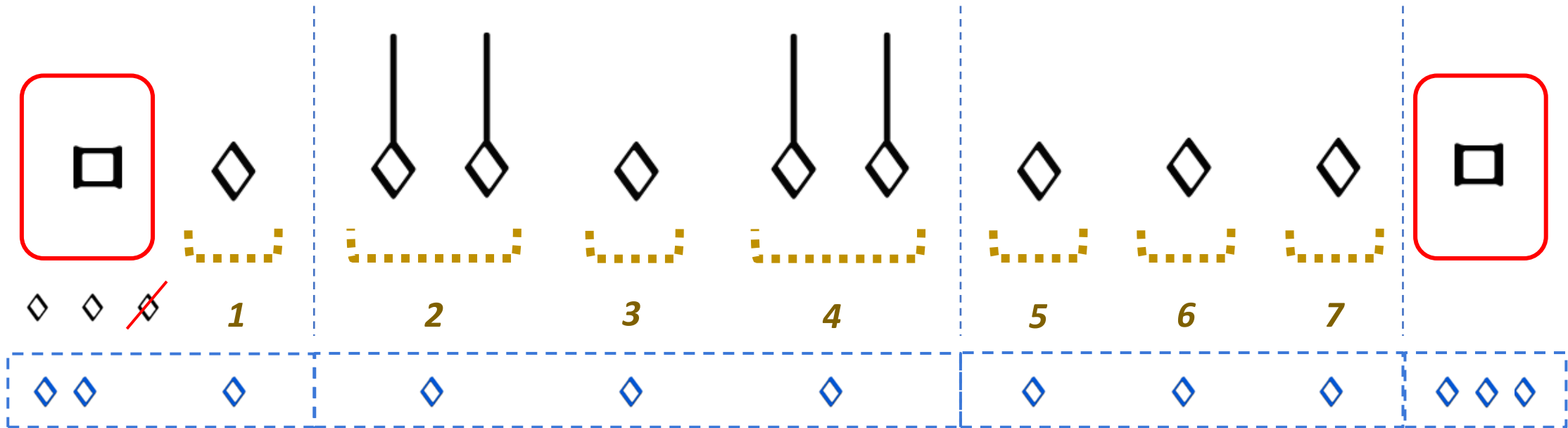
=

Two groups of 3 semibreves

+

1

Example: (sequence bounded by breves)



7 semibreves

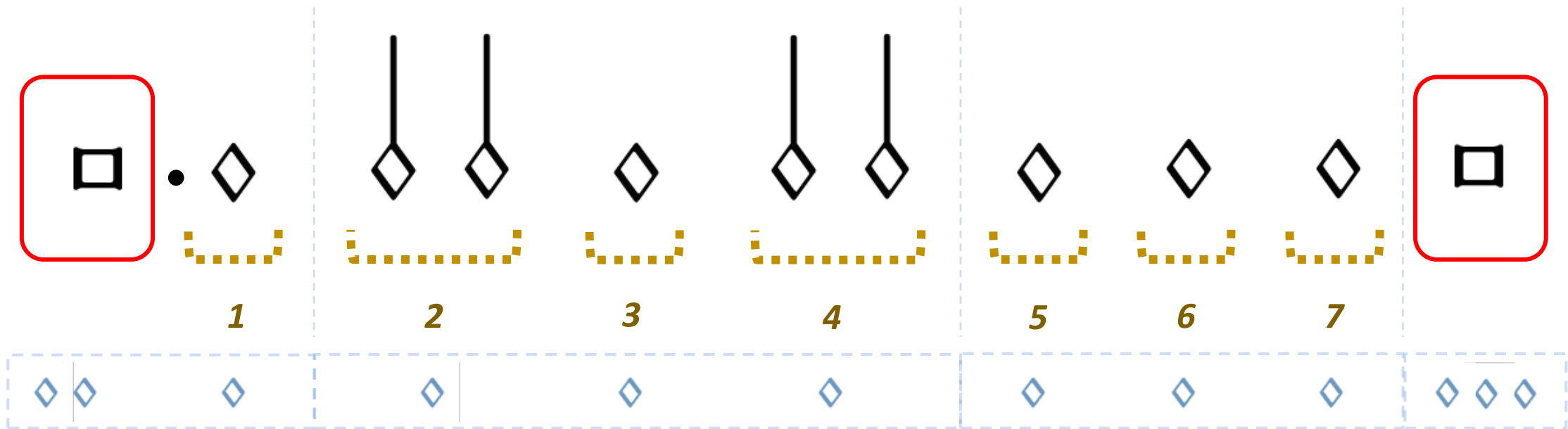
=

Two groups of 3 semibreves

+

1

Example: (sequence bounded by breves)



7 semibreves

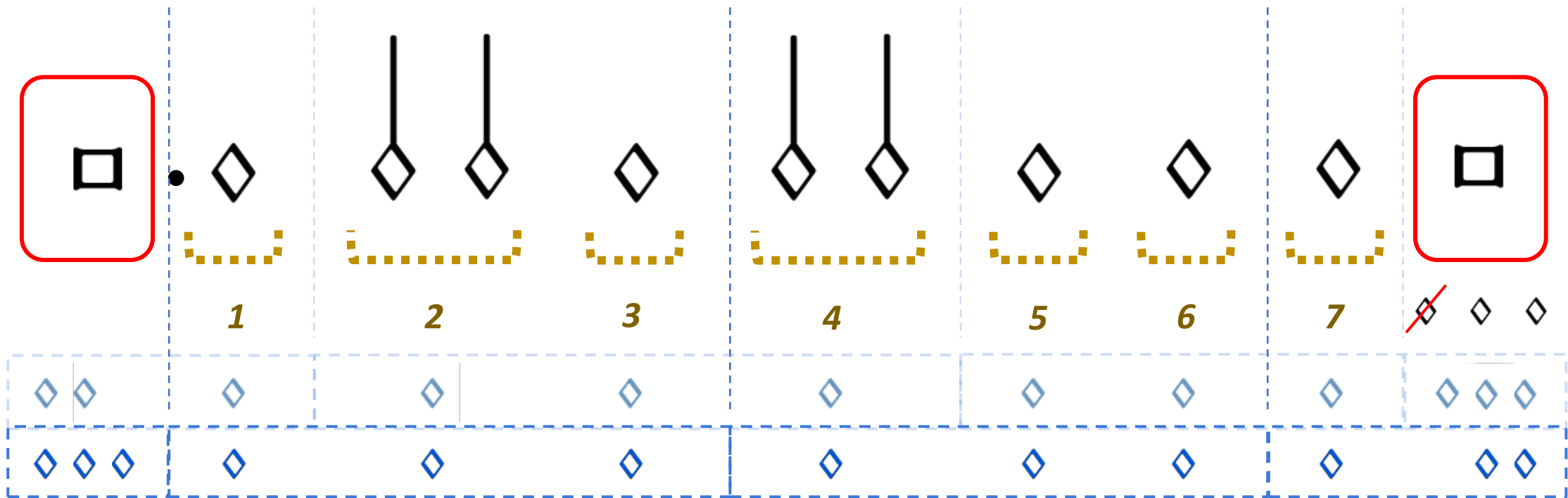
=

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1

Example: (sequence bounded by breves)



7 semibreves

=

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1

Scoring-up Tool

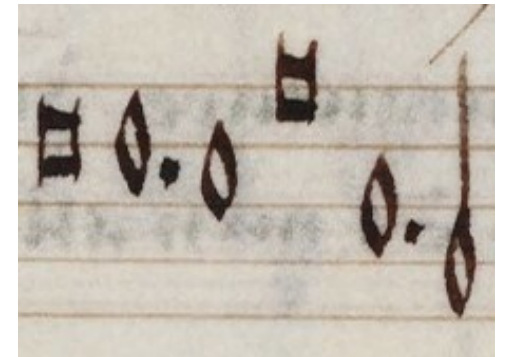
- Deals with the context-dependent nature of mensural notation
 - By implementing the “principles of imperfection and alteration”

- Deals with other non-context-related features:

- Dots of augmentation



When?
Distinguish between “dots of division”
and “dots of augmentation”

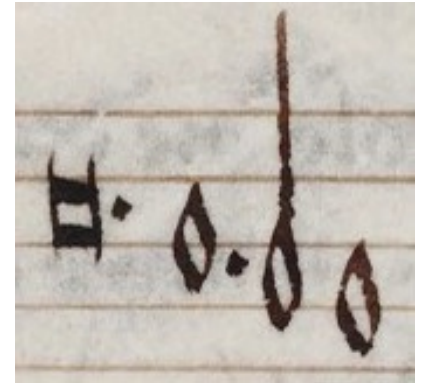


- Coloration

Scoring-up Tool

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 - By implementing the “principles of imperfection and alteration”
- Deals with other non-context-related features:
 - Dots of augmentation →

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Distinguish between “dots of division”
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Scoring-up Tool

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 - By implementing the “principles of imperfection and alteration”
- Deals with other non-context-related features:

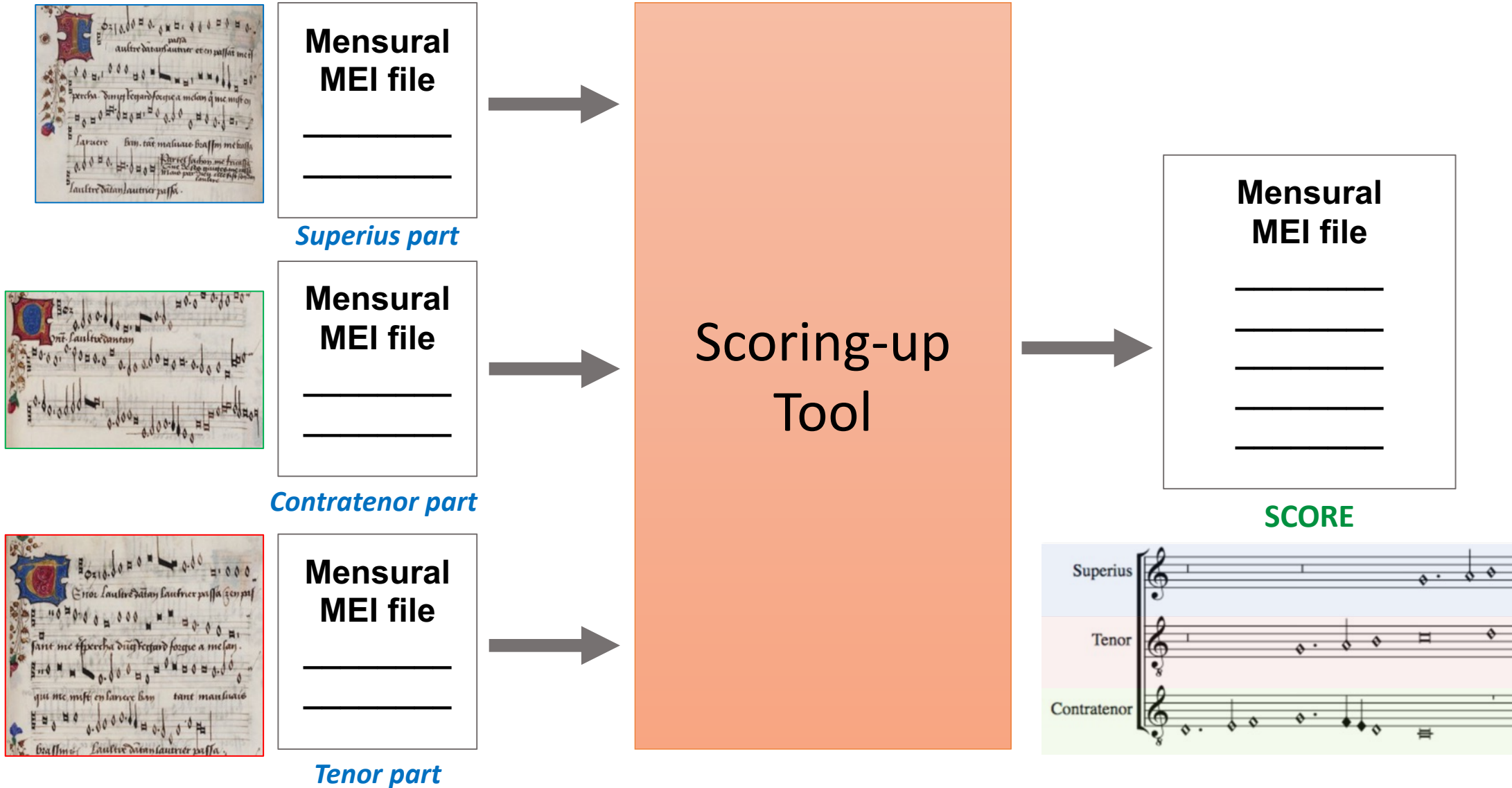
- Dots of augmentation →

When?
Distinguish between “dots of division”
and “dots of augmentation”

- Coloration →

When does coloration affect the note value?

Scoring-up Tool



Scoring-up Tool

Modification	@num	@numbase
Imperfection	3	2
Alteration	1	2
Augmentation	2	3

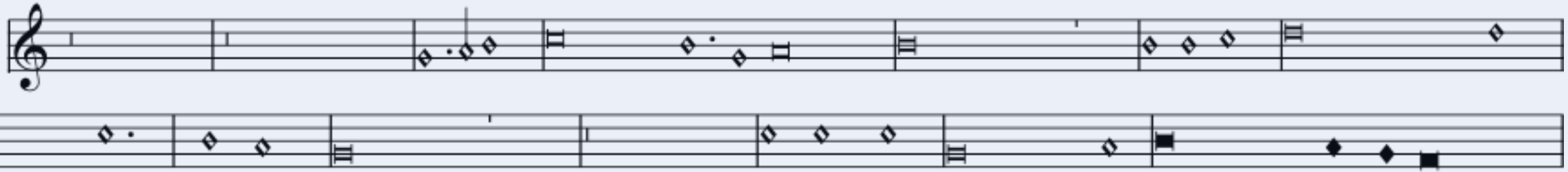
Data used for the Experiment

Pieces from the XIV and XV Centuries

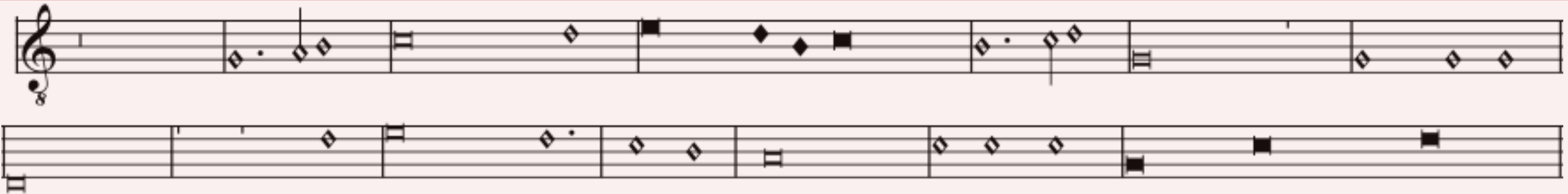
Century	Project	Format	Composers and Sources	Number of Pieces
XIV	Measuring Polyphony Project (Karen Desmond)	Mensural MEI	Vitry, Machaut, Anonymous (Ivrea Codex)	8
XV	Josquin Research Project (Jesse Rodin, Craig Sapp, Clare Bokulich)	Modern transcriptions converted into Mensural MEI using: <i>SibMEI + Mensural MEI Translator</i>	Du Fay and Ockeghem (GB-Ob, Dijon, Mellon, Laborde, Wolfenbüttel)	Du Fay: 5 Ockeghem: 5

Example: Three Separate Parts

Superius



Tenor



Contratenor



In Quasi-Score Format – Without Scoring-up Tool (notes are not aligned)

The image displays a musical score in Quasi-Score Format, consisting of two systems of three staves each. The top system is labeled 'Superius', 'Tenor', and 'Contratenor' on the left. Each staff begins with a treble clef and a common time signature. The notes are represented by diamond-shaped symbols, and the stems are vertical lines. The notes are not aligned across the staves, indicating that the parts are not synchronized. The bottom system continues the same three-part structure. The notation is minimalist, focusing on the pitch and rhythm of the notes without traditional musical notation like beams or rests.

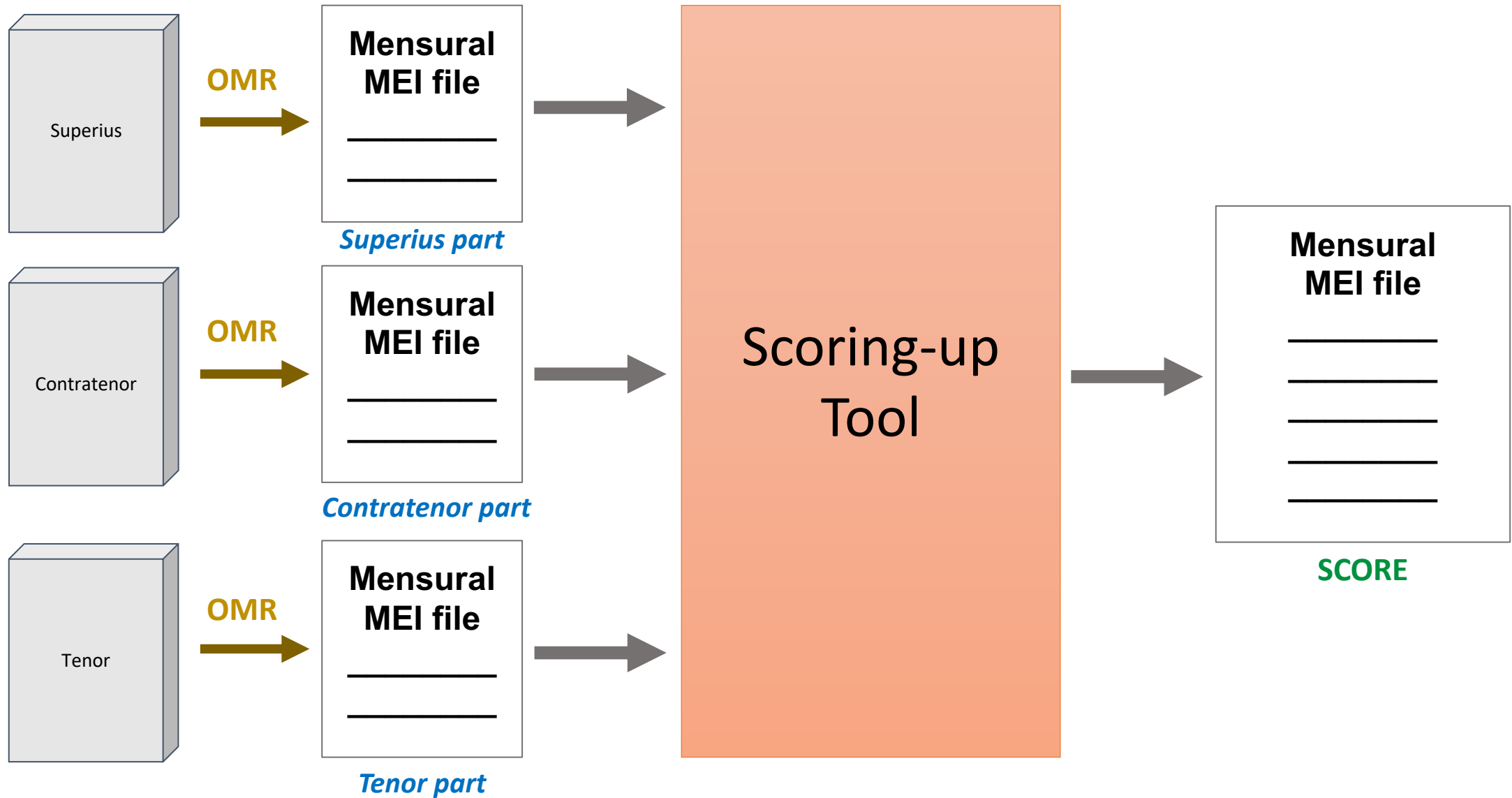
In Score Format – With Scoring-up Tool (modification values encoded)

The image displays a musical score for three vocal parts: Superius, Tenor, and Contratenor. The score is presented in a system of seven staves. The first three staves are labeled 'Superius', 'Tenor', and 'Contratenor' respectively. Each staff contains musical notation with various notes, rests, and modification values (II, III) encoded throughout. The notation includes diamond-shaped notes, some with stems, and vertical red lines indicating measure boundaries. The modification values are represented by Roman numerals II and III, which are placed above or below the notes to indicate specific adjustments. The score is organized into measures by vertical red lines, and the overall layout is clean and professional.

Conclusions

- Preserves the original note values
- The scoring-up tool presents the piece in score format
- Facilitates visualizing the vertical sonorities and studying the relation between the voices of a piece

- Future work...



Thank you!

<https://github.com/elvis-project/scoring-up>

SIMSSA | Single Interface for Music
Score Searching and Analysis

Verovio

MUSIC ENCODING
MEI
INITIATIVE



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