Cross-Platform Analysis:
Combining Analysis Programs

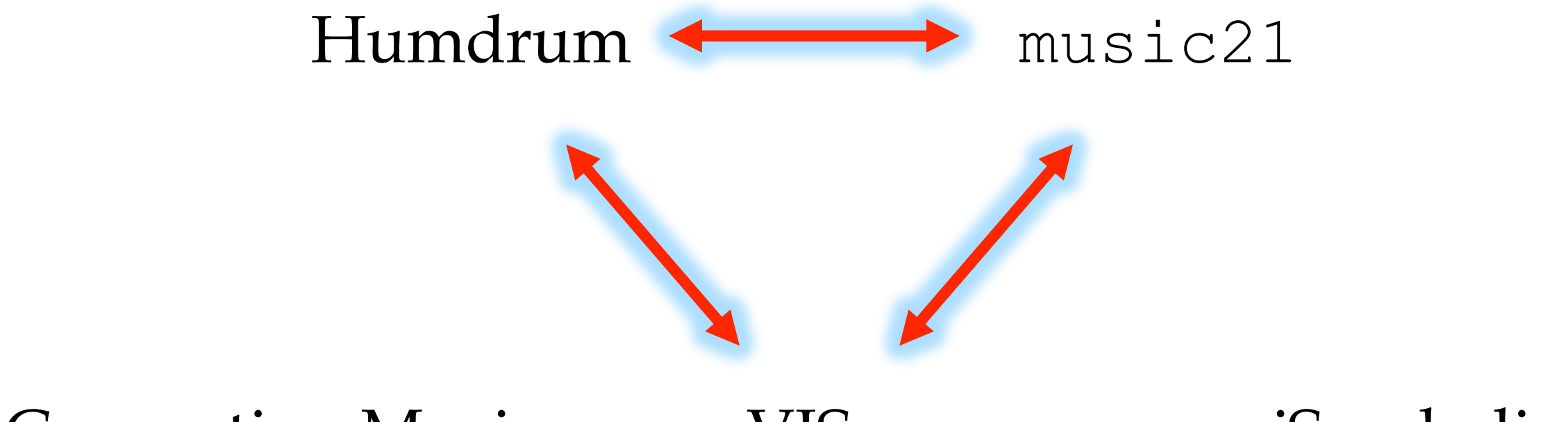
SIMSSA Workshop XII
August 7, 2017

Alexander Morgan
Prix Banneux Post-doctoral Fellow
L'université libre de Bruxelles

Overview

1. Current status of communication between analysis programs
2. Important characteristics of analysis programs
3. Concrete ways these programs could benefit from one another
4. Renaissance dissonance-analysis tool
5. Imitation-analysis tool

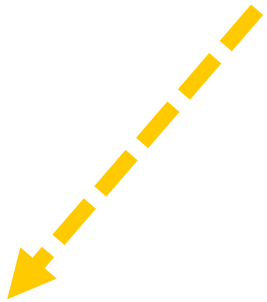
Ideal Scenario



Status Quo

Humdrum

`music21`



VIS

Key Characteristics

`music21`

- Language: Python
- Primary datatype: Stream
- Easy to install
- Broad coding participation
- Reads many file types

```
{0.0} <music21.stream.Measure 1 offset=0.0>
    {0.0} <music21.clef.BassClef>
    {0.0} <music21.meter.TimeSignature 3/4>
    {0.0} <music21.note.Note C>
    {1.0} <music21.note.Note D>
    {2.0} <music21.note.Note E>
{3.0} <music21.stream.Measure 2 offset=3.0>
    {0.0} <music21.meter.TimeSignature 2/4>
    {0.0} <music21.note.Note F>
    {1.0} <music21.note.Note G>
{5.0} <music21.stream.Measure 3 offset=5.0>
    {0.0} <music21.note.Note A>
    {1.0} <music21.note.Note B>
{7.0} <music21.stream.Measure 4 offset=7.0>
    {0.0} <music21.meter.TimeSignature 1/4>
    {0.0} <music21.note.Note C>
    {1.0} <music21.bar.Barline style=final>
```

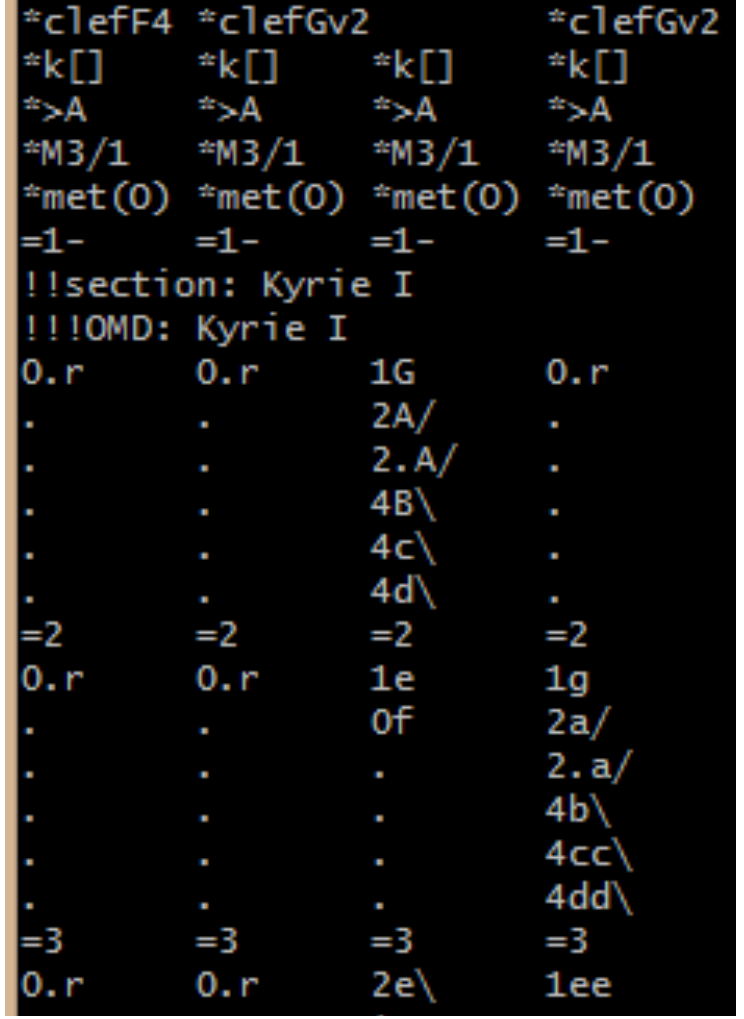
Key Characteristics

VIS

- Language: Python
- Primary datatype: DataFrame
- Built on Pandas
- Connected to `music21`

Indexer		noterest.NoteRestIndexer	
Parts		Cantus	Tenor
Measure	Offset		
1	0.0	G4	Rest
	2.0	B-4	G4
	3.5	C5	NaN
2	4.0	D5	B-4
	5.5	NaN	C5
	6.0	Rest	D5
	7.0	G4	NaN
3	8.0	F4	Rest
	9.0	E4	G5
	10.0	D4	NaN
	11.0	D5	F5
4	12.0	NaN	E5
	13.0	C#5	NaN
	14.0	D5	D5
	15.0	D5	NaN

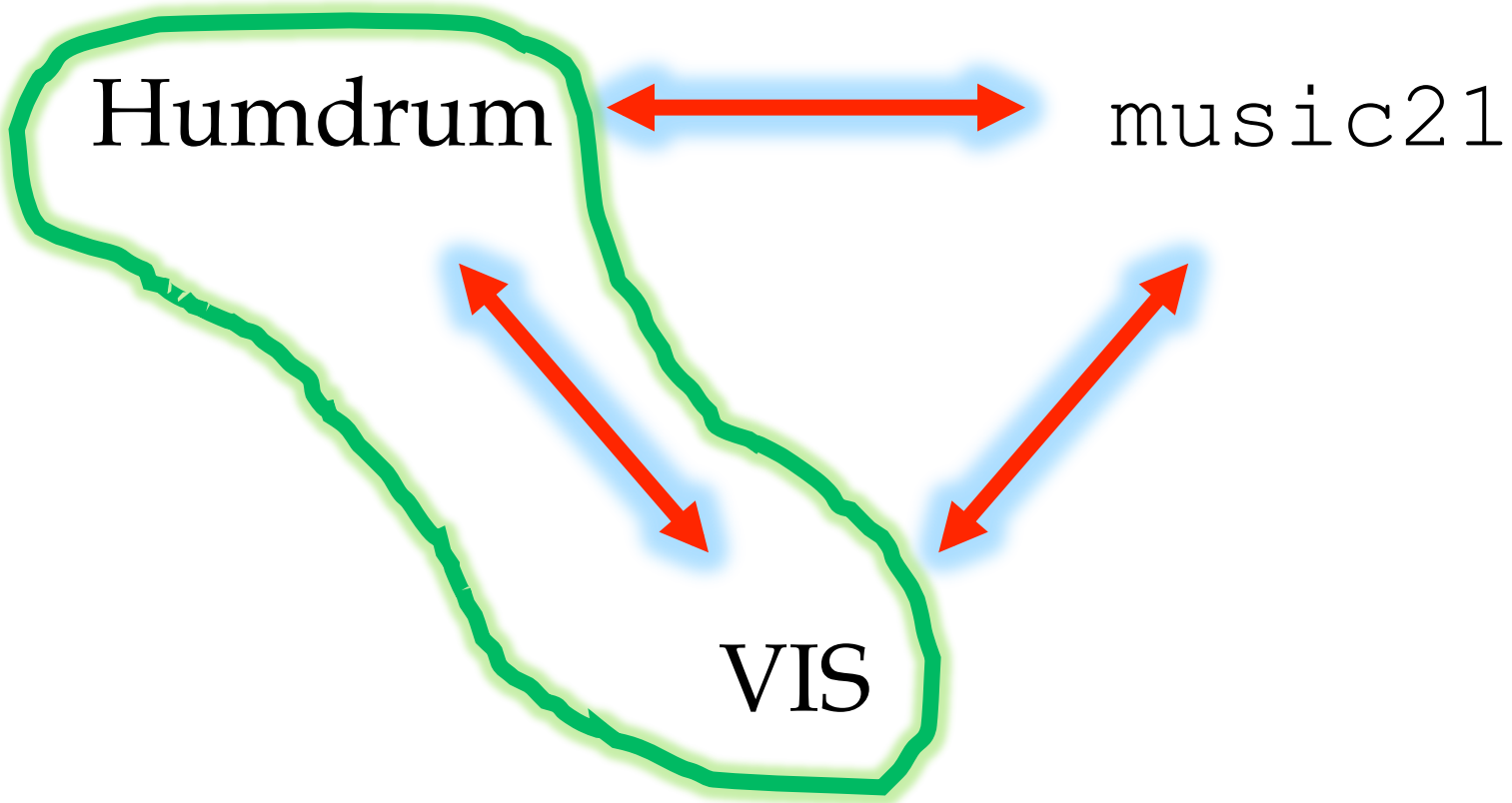
Key Characteristics



Humdrum

- Language: C++
- Primary datatype: Kern
- Fast processing
- Widely used in publications
- Available from terminal and online
- Seamlessly connected with JRP website and repertoire
- Score visualization, annotation, and playback readily available via VHV online

Ideal Scenario



What VIS Can Gain from Humdrum

Humdrum -> VIS

- VIS gains access to all Humdrum indexers
- Quick and relatively easy fix to:
  - VIS issues #258, #370, #383, #401, #406, #425, #446
  - music21 issue #192

VIS Issue #425:
"Rewrite the dissonance indexer"

Two solutions:

1. Hire a specialist of Renaissance dissonance treatment, Renaissance theory treatises, who is fluent with Python and Pandas, and ask him/her to devote several months to dissonance classification
2. Hire a computer programmer for a week or two to write a Humdrum-to-VIS converter

What Humdrum Can Gain from VIS

VIS -> Humdrum

- Humdrum gains access to all VIS indexers
- Humdrum gains access to most music21 functionality
- VIS gets score output capability
- Identify shortcomings in VIS

Renaissance Dissonance Analysis in Humdrum

Guiding Principles

- Stick with pairwise analysis as much as possible
  - ~~match~~ ~~catch~~
- Dissonance types acknowledged by period authors are taken as a point of departure
  - Search for things you don't necessarily expect to find
  - When making new types, create definitions that are as precise as existing dissonance types

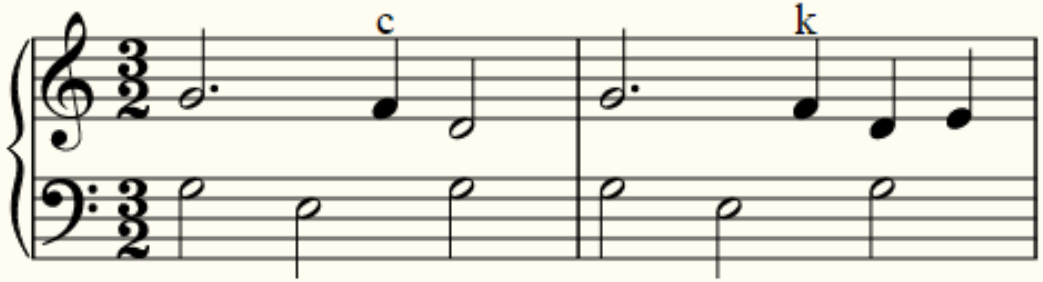
Renaissance Dissonance Analysis in Humdrum

“New” Dissonance Types

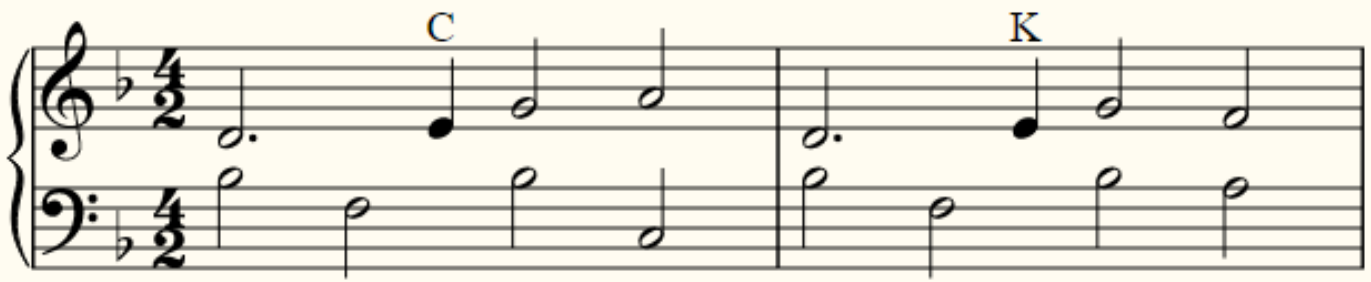
- Rising D3Qs and also upper and lower dissonant third quarter neighbor tones
- Accented passing and neighbor tones
- Double neighbors
- Distinguish between short- and long-form nota cambiatas

Cambiatas notes (C, c, K, k)

A *nota cambiata* is approaced by step and left by a leap of a third in the same direction. It must be metrically weaker than the note that preceded it. If after leaping a third, the melody moves a step in the opposite direction (thus filling in the note that was skipped over) the dissonance gets a `K` or `k` label for the long-form cambiata. If this change of direction does not occur then a `C` or `c` label is used.



As with most other dissonance labels (with the exception of suspension and agent labels), a lowercase letter means it was approached by step down, as in the example above, and an uppercase letter means the dissonance was approached by step up, as in the example below.



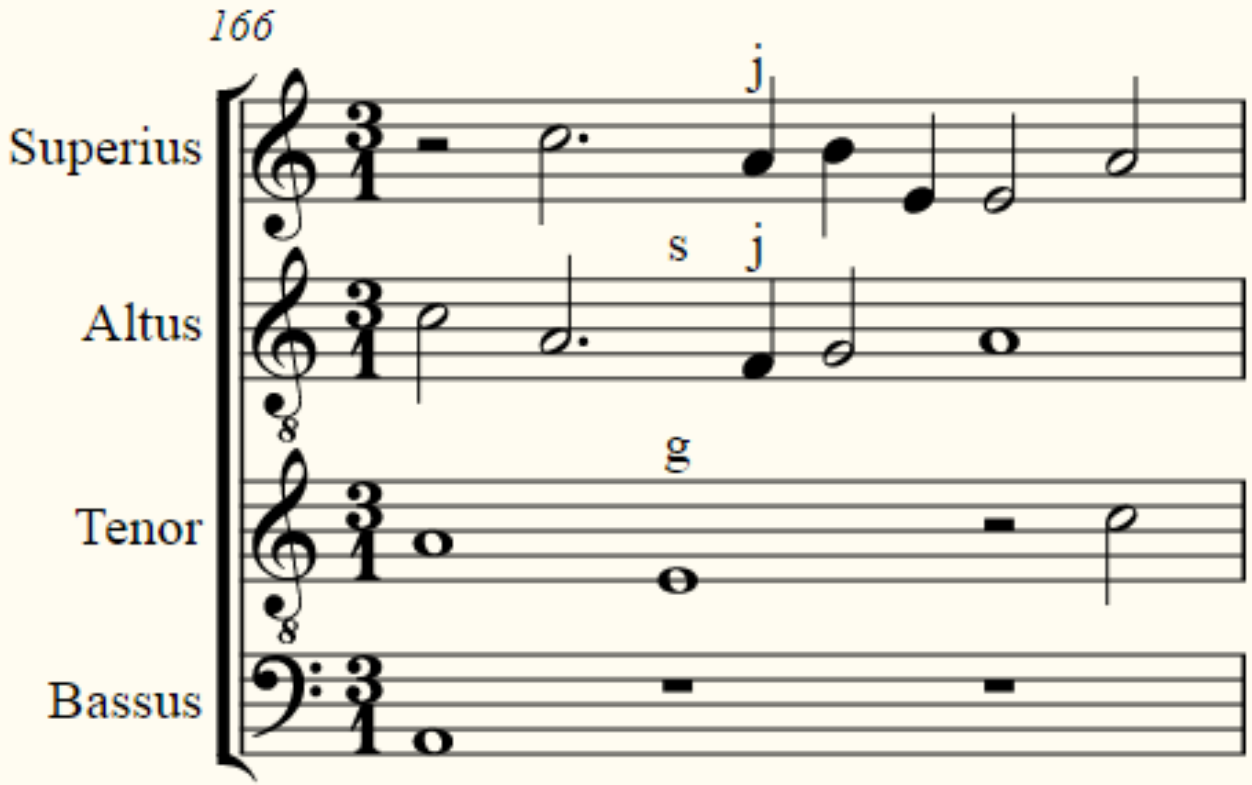
Renaissance Dissonance Analysis in Humdrum

“New” Dissonance Types

- Rising D3Qs and also upper and lower dissonant third quarter neighbor tones
- Accented passing and neighbor tones
- Double neighbors
- Distinguish between short- and long-form nota cambiatas
- “Reverse” short-form cambiatas and échappées

Reverse échappées (J, j)

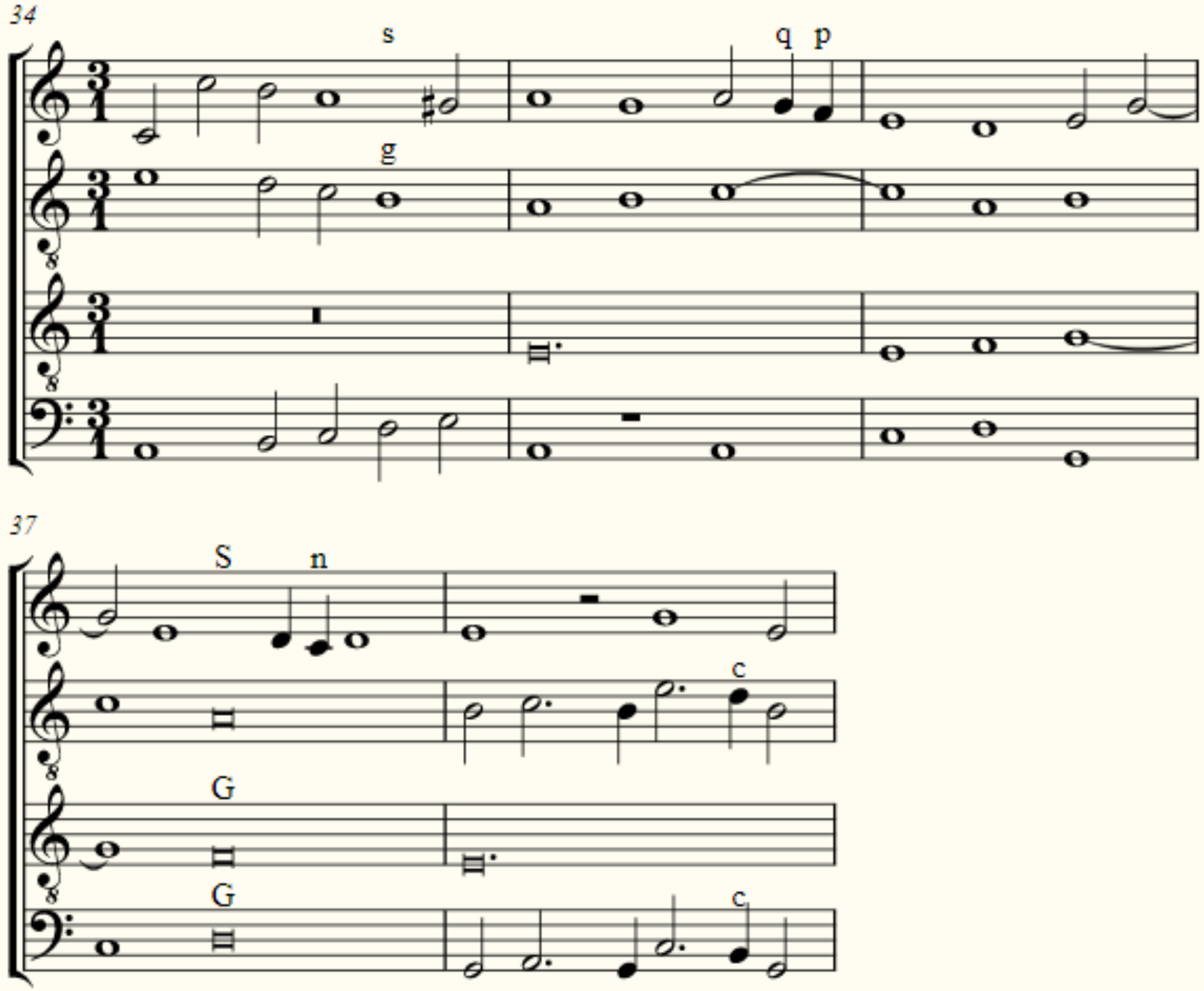
The "reverse" échappée is a weak dissonance that is approached by leap and then resolved by step in the opposite direction. It is labeled `J` when that initial leap is up, and `j` when it is down, similar to neighbor tones. This often occurs as an ornament of a suspension. While only dissonant suspensions are labeled, consonant suspensions also receive this same type of ornamentation. The example below taken from the Sanctus of the Missa Sub tuum presidium contains two parallel reverse échappées, one decorating a consonant suspension in the Altus, and the other ornamenting a consonant suspension (unlabeled) in the Superius.



Renaissance Dissonance Analysis in Humdrum

“New” Dissonance Types

- Rising D3Qs and also upper and lower dissonant third quarter neighbor tones
- Accented passing and neighbor tones
- Double neighbors
- Distinguish between short- and long-form nota cambiatas
- “Reverse” short-form cambiatas and échappées
- Distinguish between binary and ternary suspensions (for patients and agents)


34
s
q
p
g
37
S
n
c
G
G
c

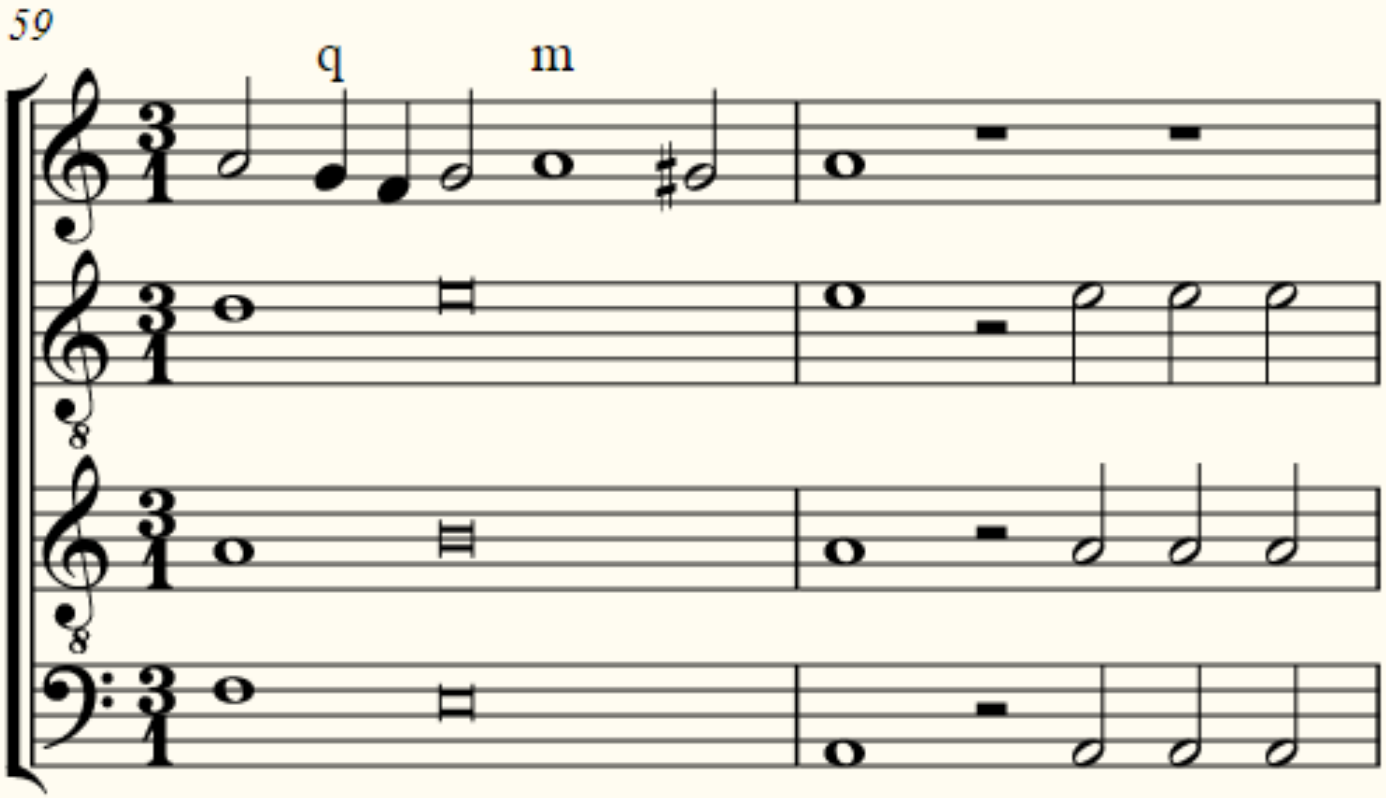
Renaissance Dissonance Analysis in Humdrum

“New” Dissonance Types

- Rising D3Qs and also upper and lower dissonant third quarter neighbor tones
- Accented passing and neighbor tones
- Double neighbors
- Distinguish between short- and long-form nota cambiatas
- “Reverse” short-form cambiatas and échappées
- Distinguish between binary and ternary suspensions (for patients and agents)
- Identify “suspensions” missing struck agents

Suspensions with missing agents (M, m)

In some cases a suspension seems to be missing an attacked agent. This figure consists of a voice moving up or down by step, then sustaining over the following beat, and then resolving down by step all over a pedal tone. This dissonance is labeled `M` or `m` based on whether the dissonant note is approached by leap or by step respectively. The example below is taken from Obrecht's motet Factor Orbis.



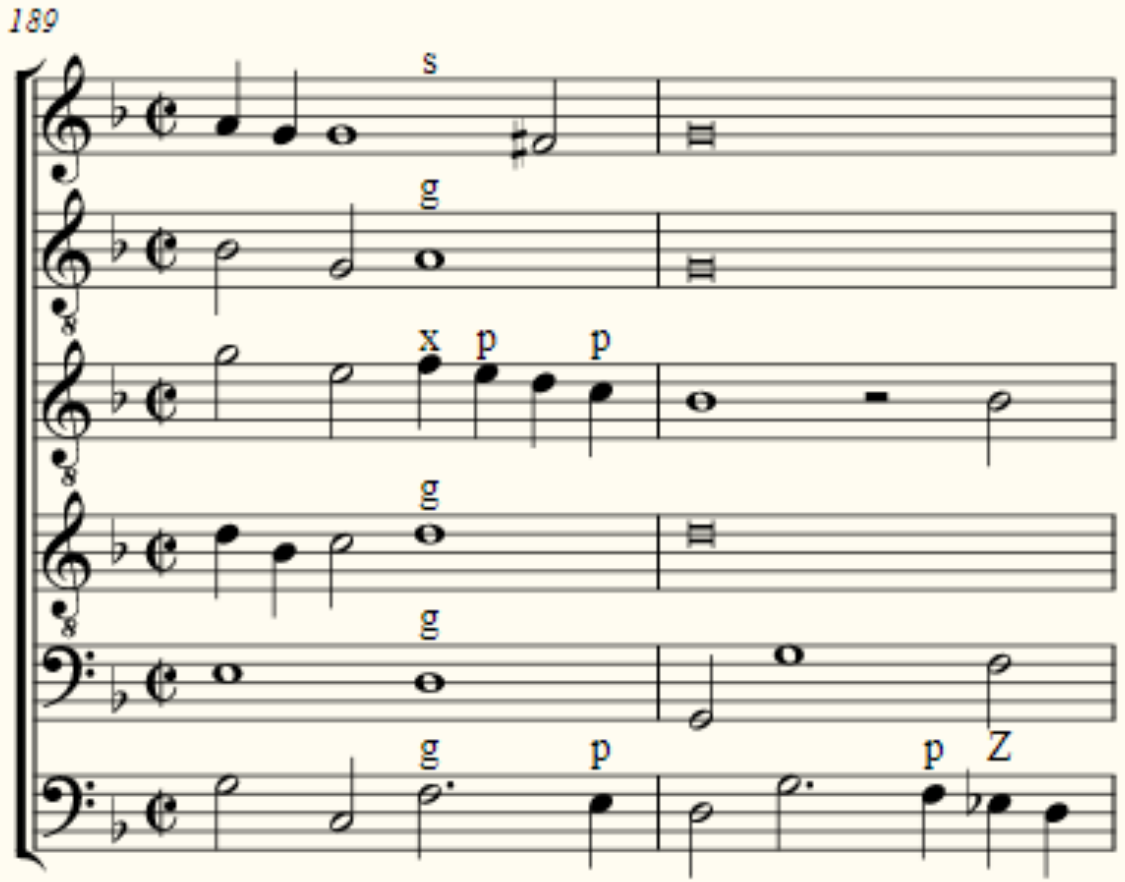
Renaissance Dissonance Analysis in Humdrum

"New" Dissonance Types

- Rising D3Qs and also upper and lower dissonant third quarter neighbor tones
- Accented passing and neighbor tones
- Double neighbors
- Distinguish between short- and long-form nota cambiatas
- "Reverse" short-form cambiatas and échappées
- Distinguish between binary and ternary suspensions (for patients and agents)
- Identify "suspensions" missing struck agents
- Fake suspensions approached by leap and/or by anticipation
- Resolution against suspension dissonance

Resolution against suspension dissonance (X, x)

When a voice sounds the note of resolution of a suspension in a descending line against the dissonant portion of the suspension in another voice, it is labeled with an `x`. There is no ascending form of this dissonance so an uppercase `X` is only used if the -u setting is invoked. This dissonance necessarily only occurs when three or more voices are present, because in addition to the dissonance itself, two other voices must form a suspension. It often occurs in even thicker textures though, such the excerpt below taken from the motet Victime paschali laudes by Brunet.



Renaissance Dissonance Analysis in Humdrum

"New" Dissonance Types

- Rising D3Qs and also upper and lower dissonant third quarter neighbor tones
- Accented passing and neighbor tones
- Double neighbors
- Distinguish between short- and long-form nota cambiatas
- "Reverse" short-form cambiatas and échappées
- Distinguish between binary and ternary suspensions (for patients and agents)
- Identify "suspensions" missing struck agents
- Fake suspensions approached by leap and/or by anticipation
- Resolution against suspension dissonance
- Two primary ways of ornamenting suspensions
- Parallel accompaniment to identifiable dissonance
- Only dissonant against known dissonances

Imitation Analysis in Humdrum

- Catherine Motuz's "canon finder" looked at the melodic motion of one voice in order to extrapolate what ensuing harmonic interval would constitute imitation at a given pitch interval
- Humdrum looks at the harmonic intervals of *staggered* elements in two voices, and if they remain the same, there is imitation at the time and pitch intervals that separate those staggered notes
- Imitation at any pitch interval and at any time interval is found
- *Finding* instances of imitation is now a solved problem
- The remaining questions are musicological:
  - How many notes are required for a point of imitation to "count"?
  - How exact does imitation have to be?
  - Does "simultaneous imitation" count?
  - What role does metric position play in the use of imitation?

Thank you!

Alexander Morgan
Prix Banneux Post-doctoral Fellow
Université libre de Bruxelles
alexanderpmorgan@gmail.com