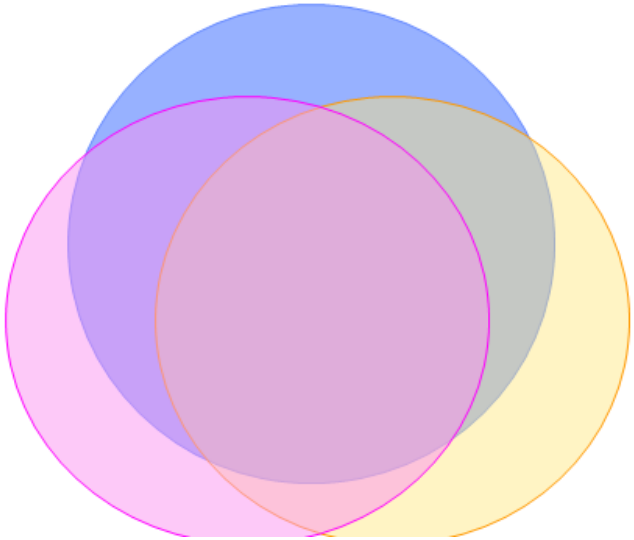
Introduction to Humdrum

Music 253/CS 275A

Stanford University

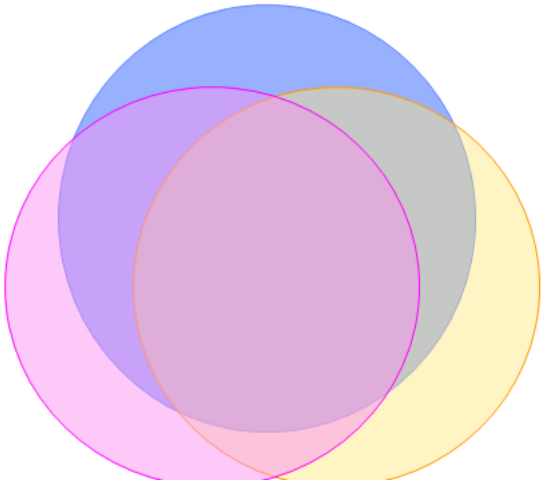
Where we've been

- Sound apps
  - Temporal or
  - Sounding pitch
- Score apps
  - Spatial org
  - Written pitch



“Logical” information (for analysis)

- No necessary requirements for
  - **Sound** description
  - **Page** description



- Possible requirements
  - **Gestural** information
  - Selective details of notation or sound
  - **Cues** to formal structure
  - **Accentual info**

Humdrum Toolkit (1985—)

- *Goal*: encoding for analysis
- *Inventor*: David Huron
- *Orientation*: Context-free grammar
  - Adaptable to many repertories (incl. non-Western)
  - *Not directly printable* [based on Unix]
  - Offers a wide range of representations
  - Features and representations can be extended
  - Features can be minimized or excluded
- *Availability*:
  - Extensive documentation online
  - Tool set (official version) downloadable

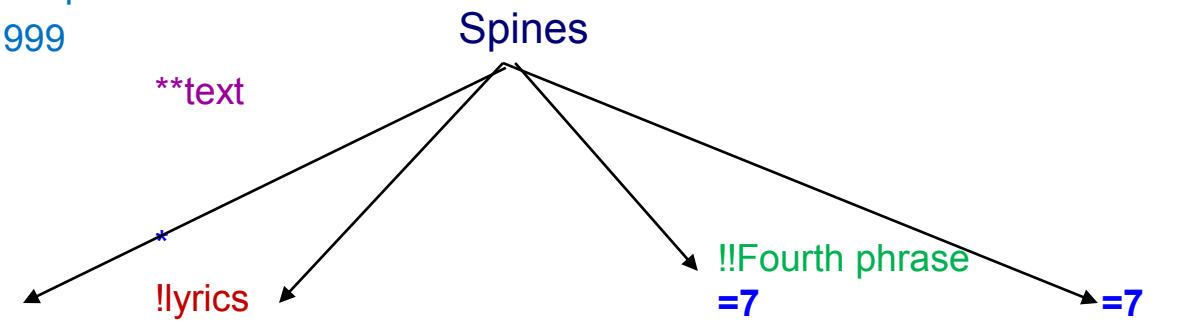
Local resources for Humdrum

- CCARH Humdrum Portal: http://humdrum.ccarh.org/
- Downloads of the Toolkit: http://extras.humdrum.org/download/
- Sapp extras: http://extras.humdrum.org/
- Data in the **kern form (CMN format for Humdrum TK): http://kern.ccarh.org/
- Humdrum users group: **hug
- **Verovio** Humdrum Viewer (VHV): **http://verovio.humdrum.org**

Overview (comparative)

MIDI: Sound	**Event-based**	Binary; time-ordered; var-length; score Types 0, 1]
SCORE: Graphics	Object-based	ASCII; score/spatially- ordered; var. no fields
MuseData: Core rep.	**Event-based**	ASCII; fixed/expandable; part-ordered [=MIDI Type 1]
MusicXML: interchange	Attribute/element-based	ASCII; fixed/expandable; time- or score-ordered
****kern: Analysis data**	**Event-based**	ASCII; score-ordered but no spatial information [=MIDI Type 0]; selective attribute encoding permitted

A Humdrum **kern file



!!!OTL: Frere Jacques			
!!!YEC: ESF 1999			
**kern	**text		
*M4/4			
*k[ ]	*		
!soprano	!lyrics	!!Fourth phrase	
!!First phrase		=7	=7
=1	=1	4c	Din,
4c	Fre-	4G	don,
4d	re	2c	din.
4e	Jac-	=8	=8
4c	ques,	4c	Din,
=2	=2	4G	don,
4c	Fre-	2c	din.
4d	re	=9	=9
4e	Jac-	*-	*-
4c	ques,		

Decoding a Humdrum file

Comment records:

!!! **Reference** records

!! **Global** comments

! **Local** comments

Interpretation records:

** **Exclusive** interpretation

* **Tandem** interpretation

*>*x* Form marker

*- **End-of-spine** marker

Measure markers:

= Single bar-line

== Double bar-line

Tandem interpretations:

*staff<*1*>	staff no.
**clef*<*G2*>	clef name
*<*G:*>	key name
*k[f#c#]	key signature
*M<2/4>	meter signature

Semiotic aspects of Humdrum

- **Multiple understandings** of individual terms
- A sample problem of **nomenclature**: pitch
- Humdrum's answers (e.g.)
  - Notated pitch
  - Concert pitch
  - Relative pitch
  - Fundamental frequency
  - Cents
  - Interval
  - Scale degree
  - MIDI note number
  - Visual appearance……

Humdrum in relation to music

Relies heavily on **Unix commands** and syntax

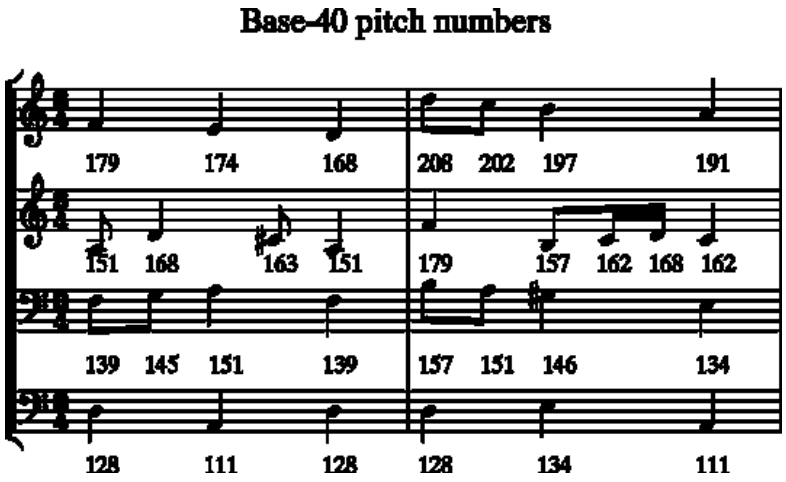
- Unix regular expressions (`grep`)
- File-manipulation commands (`assemble, yank`)
- Sound-management tools (`record, perform`)
- Pitch translation tools (`frequency, cents`)
- Duration and accent tools (`beat, accent pos.`)
- Melody tools (e.g. `melodic intervals`)
- Harmony tools (e.g. `harmonic intervals`)
- Other music-theory tools (e.g. `tone-row, pitch-class sets`)

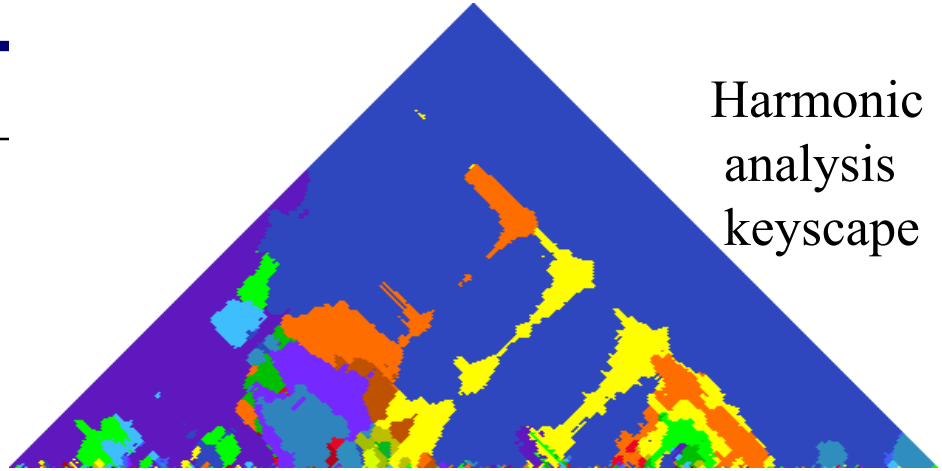
Pre-defined representations (49)

- pitch-class
- semitones, cents, MIDI, critical bands, cochlear coordinates
- melodic interval, harmonic interval
- absolute time, relative time, duration, epoch, date
- tablatures: guitar, lute, banjo, sitar ...
- harmony, embellishments

Special qualities of H

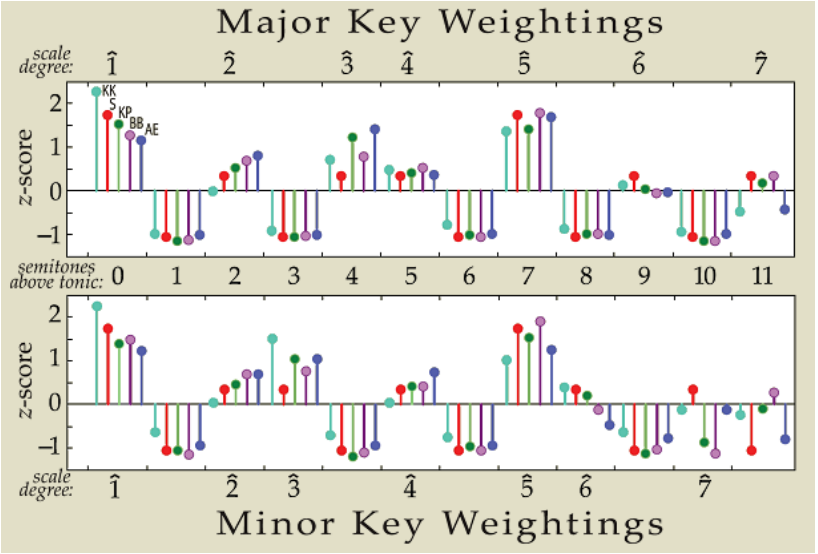
- Very elastic





Harmonic analysis keyscape

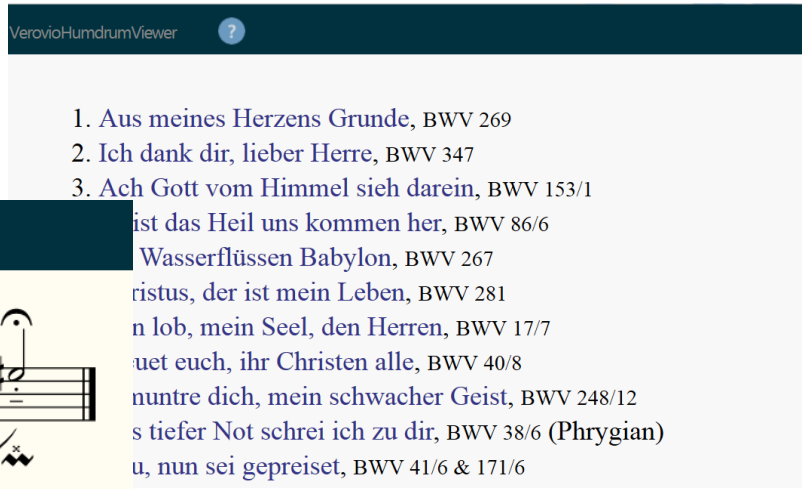
- **open, documented**
- **extensible**

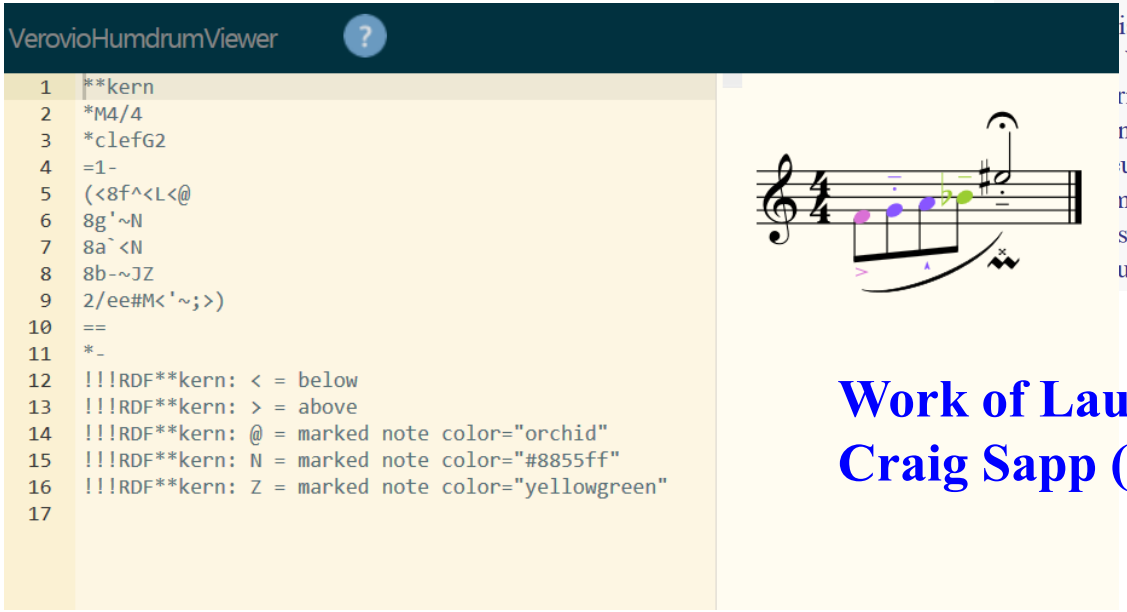


What's new in Humdrum?

List view

- **Verovio: verovio.humdrum. org**





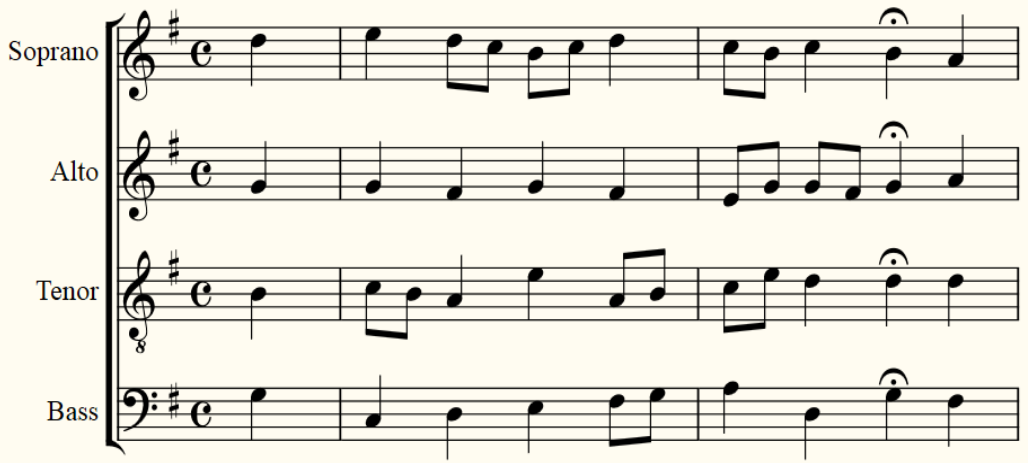
Work of Laurent Pugin (notation)
Craig Sapp (Humdrum implementation)

File with code and notation

VerovioHumdrumViewer ◀ ▲ ▶ Bach, Chorale 5. *An Wasserflüssen Babylon*, BWV 267 ? Play

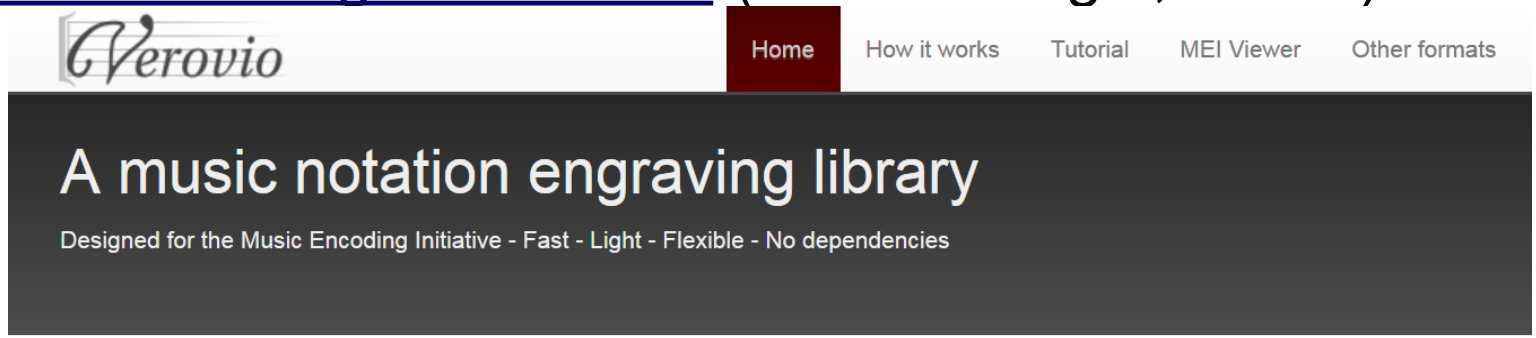
```
!!!COM:     Bach, Johann Sebastian
!!!CDT:     1685/02/21/-1750/07/28/
!!!OTL@@DE: An Wasserfl&uuml;ssen Babylon
!!!SCT:     BWV 267
!!!PC#:     5
!!!AGN:     chorale
**kern      **kern      **kern      **kern
*ICvox      *ICvox      *ICvox      *ICvox
*Ibass      *Itenor     *Ialto      *Isoprn
*I"Bass     *I"Tenor    *I"Alto     *I"Soprano
*>[A,A,B]   *>[A,A,B]   *>[A,A,B]   *>[A,A,B]
*>norep[A,B]            *>norep[A,B]            *>
*>A         *>A         *>A         *>A
*           *oclefC4    *oclefC3    *oclefC1
*clefF4     *clefGv2    *clefG2     *clefG2
*k[f#]      *k[f#]      *k[f#]      *k[f#]
*G:         *G:         *G:         *G:
*M4/4       *M4/4       *M4/4       *M4/4
*met(c)     *met(c)     *met(c)     *met(c)
*MM100      *MM100      *MM100      *MM100
4G          4B          4g          4dd
=1          =1          =1          =1
4C          8cL         4g          4ee
.           8BJ         .           .
4D          4A          4f#         8ddL
.           .           .           8ccJ
4E          4e          4g          8bL
.           .           .           8ccJ
8F#L        8AL         4f#         4dd
8GJ         8BJ         .           .
=2          =2          =2          =2
4A          8cL         8eL         8ccL
.           8eJ         8gJ         8bJ
4D          4d          8gL         4cc
.           .           8f#J        .
4G;         4d;         4g;         4b;
4F#         4d          4a          4a
```

https://www.wsj.com



The other end of Verovio development

http://www.verovio.org/index.xhtml (Laurent Pugin, Berne)

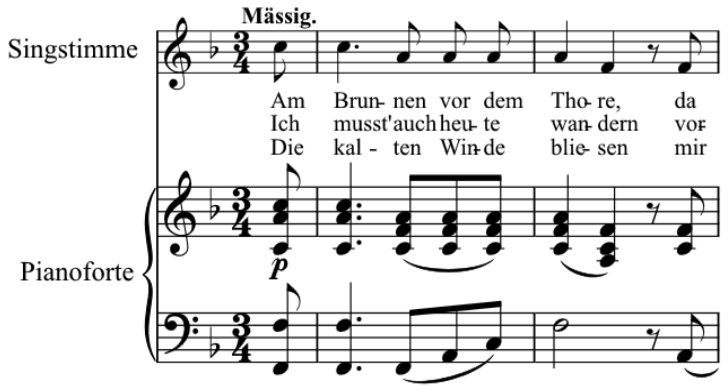


Verovio is a fast, portable and lightweight **open-source** library for engraving **Music Encoding Initiative** (MEI) music scores into SVG.

Verovio follows the **Standard Music Font Layout** specification, which makes it easy to change the music font for personalizing the appearance.

MUSIC ENCODING MEI INITIATIVE

SMuFL
Standard Music Font Layout



Verovio for Humdrum viewing

- http://www.verovio.org/humdrum.xhtml