

Introduction to Humdrum

Music 253/CS 275A
Stanford University

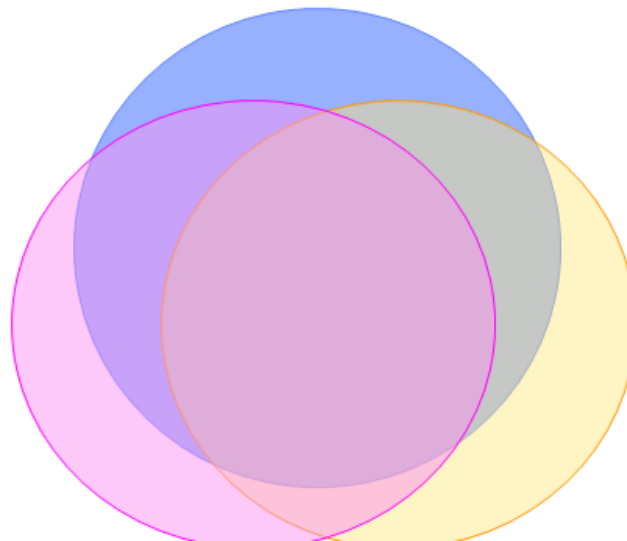
Where we've been

□ Sound apps

- Temporal or
- Sounding pitch

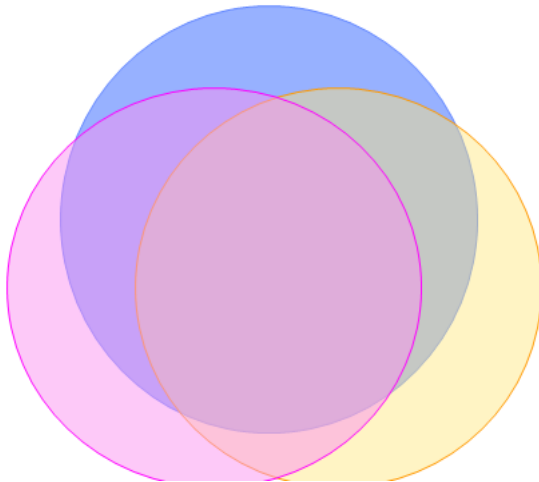
□ Score apps

- 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 repertoires (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
■ ASCII; score-ordered but no spatial information [=MIDI Type 0]; selective attribute encoding permitted |
| □ **kern: Analysis data | □ Event-based → | |

A Humdrum ****kern** file

!!!OTL: Frere Jacques

!!!YEC: ESF 1999

****kern**

*M4/4

*k[]

!soprano

!!First phrase

=1

4c

4d

4e

4c

=2

4c

4d

4e

4c

****text**

!lyrics

=1

Fre-

re

Jac-

ques,

=2

Fre-

re

Jac-

ques,

Spines

!!Fourth phrase

=7

4c

4G

2c

=8

4c

4G

2c

=9

*_

=7

Din,

don,

din.

=8

Din,

don,

din.

=9

*_

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

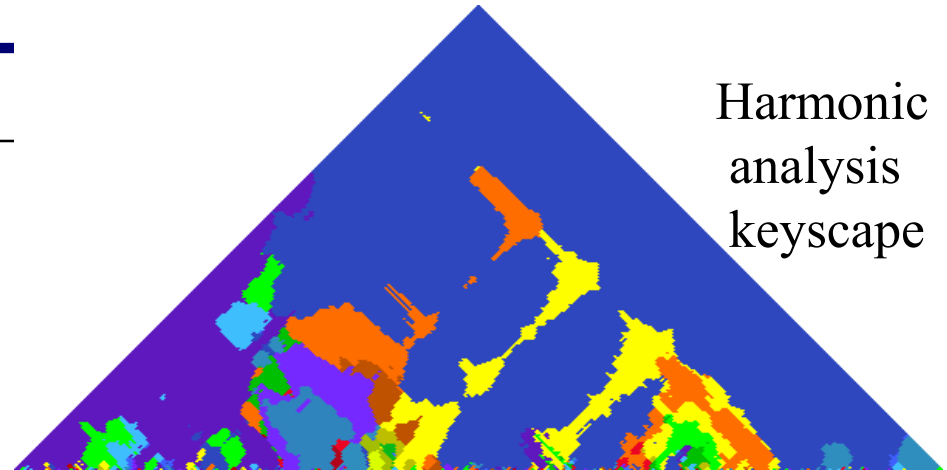
Special qualities of \mathbf{t}

- Very elastic

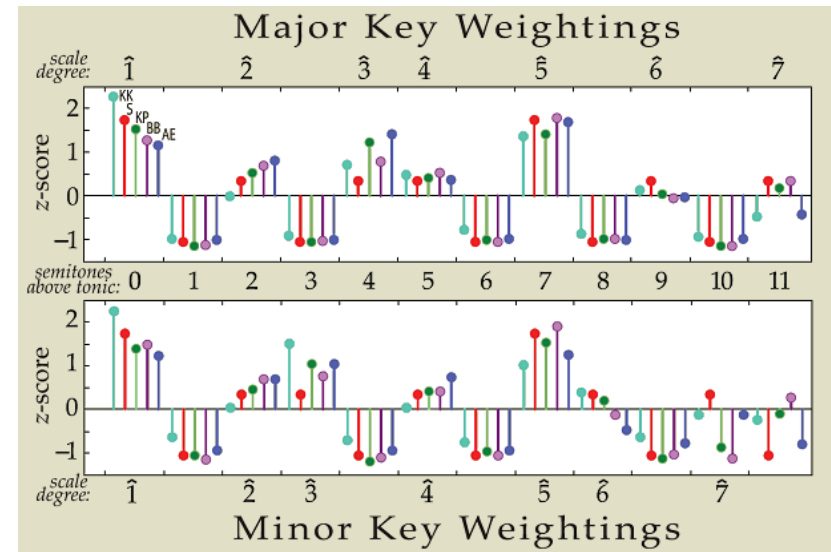
Base-40 pitch numbers



- open, documented
- extensible



Harmonic
analysis
keyscape



What's new in Humdrum?

List view

□ **Verovio:**

verovio.humdrum.org

VerovioHumdrumViewer ?

```
1 |**kern
2 |*M4/4
3 |*clefG2
4 | =1-
5 |(<8f^<L<@
6 |8g'~N
7 |8a^<N
8 |8b~~JZ
9 |2/ee#M<'~;>)
10 |==
11 |*_
12 |!!!RDF**kern: < = below
13 |!!!RDF**kern: > = above
14 |!!!RDF**kern: @ = marked note color="orchid"
15 |!!!RDF**kern: N = marked note color="#8855ff"
16 |!!!RDF**kern: Z = marked note color="yellowgreen"
17 |
```



VerovioHumdrumViewer ?

1. Aus meines Herzens Grunde, BWV 269
2. Ich dank dir, lieber Herre, BWV 347
3. Ach Gott vom Himmel sieh darein, BWV 153/1

ist das Heil uns kommen her, BWV 86/6
Wasserflüssen Babylon, BWV 267
ristus, der ist mein Leben, BWV 281
n lob, mein Seel, den Herren, BWV 17/7
uet euch, ihr Christen alle, BWV 40/8
nuntre dich, mein schwacher Geist, BWV 248/12
s tiefer Not schrei ich zu dir, BWV 38/6 (Phrygian)
u, nun sei gepreiset, BWV 41/6 & 171/6


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

File with code and notation

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

1	!!!COM:	Bach, Johann Sebastian		
2	!!!CDT:	1685/02/21/-1750/07/28/		
3	!!!OTL@DE:	An Wasserflüssen Babylon		
4	!!!SCT:	BWV 267		
5	!!!PC#:	5		
6	!!!AGN:	chorale		
7	**kern	**kern	**kern	**kern
8	*ICvox	*ICvox	*ICvox	*ICvox
9	*Ibass	*Itenor	*Ialto	*Isopr
10	*I"Bass	*I"Tenor	*I"Alto	*I"Soprano
11	*>[A,A,B]	*>[A,A,B]	*>[A,A,B]	*>[A,A,B]
12	*>norep[A,B]	*>norep[A,B]	*>norep[A,B]	*>norep[A,B]
13	*>A	*>A	*>A	*>A
14	*	*oclefC4	*oclefC3	*oclefC1
15	*clefF4	*clefGv2	*clefG2	*clefG2
16	*k[f#]	*k[f#]	*k[f#]	*k[f#]
17	*G:	*G:	*G:	*G:
18	*M4/4	*M4/4	*M4/4	*M4/4
19	*met(c)	*met(c)	*met(c)	*met(c)
20	*MM100	*MM100	*MM100	*MM100
21	4G	4B	4g	4dd
22	=1	=1	=1	=1
23	4C	8cL	4g	4ee
24	.	8Bj	.	.
25	4D	4A	4f#	8ddL
26	.	.	.	8ccJ
27	4E	4e	4g	8bL
28	.	.	.	8ccJ
29	8F#L	8AL	4f#	4dd
30	8Gj	8Bj	.	.
31	=2	=2	=2	=2
32	4A	8cL	8eL	8ccL
33	.	8eJ	8gJ	8bJ
34	4D	4d	8gL	4cc
35	.	.	8f#J	.
36	4G;	4d;	4g;	4b;
37	4F#	4d	4a	4a

https://www.wsi.com



The musical notation displays four staves: Soprano, Alto, Tenor, and Bass. The key signature is one sharp (F#), indicating G major. The time signature is common time (C). The melody is a chorale tune, with the Soprano part starting on G4 and the Bass part starting on G2. The notation includes various musical symbols such as clefs, key signatures, time signatures, and note values.

The other end of Verovio development

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



Home

How it works

Tutorial

MEI Viewer

Other formats

A music notation engraving library

Designed for the Music Encoding Initiative - Fast - Light - Flexible - No dependencies

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.



SMuFL

Standard Music Font Layout

Mässig.

Singstimme

Pianoforte

p

Am Brun-nen vor dem Tho-re, da
Ich musst' auch heu-te wan-tern vor
Die kal-ten Win-de blie-sen mir

A musical score for a song. The top staff is for the Singstimme (voice) in 3/4 time, marked "Mässig." (moderate). The bottom staff is for the Pianoforte (piano) in 3/4 time, marked "p" (piano). The lyrics are in German: "Am Brun-nen vor dem Tho-re, da Ich musst' auch heu-te wan-tern vor Die kal-ten Win-de blie-sen mir". The piano accompaniment consists of chords and moving lines in both hands.

Verovio for Humdrum viewing

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

The screenshot shows the Verovio website. At the top, there is a navigation bar with links: Home, How it works, Tutorial, MEI Viewer, Other formats (highlighted in red), and Download. Below this is a dark banner with the text "A music notation engraving library" and "Designed for the Music Encoding Initiative - Fast - Light - Flexible - No dependencies". On the left, a sidebar menu lists: MusicXML Converter, MIDI Output, Plain & Easy Input, Plain & Easy Editor, and Humdrum Input (highlighted in red). The main content area is titled "Humdrum Input" and contains a paragraph explaining that Humdrum data is an analytic music code for transcribing fully polyphonic textures. Below this, a section titled "Sample data and Verovio rendering" shows a musical score for "Allegro assai" in 3/4 time, featuring a piano sonata excerpt. The score is rendered in a standard musical notation style. At the bottom of the score, it says "Notation generated with Verovio version 0.9.13-687a7bc-dirty".

Verovio

Home How it works Tutorial MEI Viewer **Other formats** Download

A music notation engraving library
Designed for the Music Encoding Initiative - Fast - Light - Flexible - No dependencies

MusicXML Converter
MIDI Output
Plain & Easy Input
Plain & Easy Editor
Humdrum Input

Humdrum Input

Humdrum data is an analytic music code for transcribing fully polyphonic textures. Humdrum syntax presents notes of the score in strict time sequence. Each data row represents all notes sounding or events occurring at the same time, and each column traces the melodic line of the individual parts. More information about the syntax is available on the [Humdrum](#) website.

Sample data and Verovio rendering

The following example from Mozart's piano sonata in F major, K¹ 280 (K⁶ 189e), mvmt. 1, is generated dynamically within this page using the JavaScript form of Verovio, inputting the Humdrum data that follows.

Allegro assai

Notation generated with Verovio version [0.9.13-687a7bc-dirty](#)