

Humdrum File Format

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Humdrum File Format

- Humdrum file format is analogous to XML: organizing structure for data without concern for content.
- Each data stream is a column of data (called a *spine*) started by an **exclusive interpretation** which is two stars followed by the data-type name. The end of the data is marked with star-minus (not star-underscore as it may seem in the Courier font).
- Temporal is organized strictly time-wise in the data: each succeeding row comes after the preceding (contrasts to all other polyphonic data formats except MIDI Type-0 files).
- Each line of data occurs simultaneously in time (a4, b4, c4 occur at the same time).

**AAA	**BBB	**CCC	exclusive interpretation (data type)
a1	b1	c1	} data
a2	b2	c2	
a3	b3	c3	
a4	b4	c4	
a5	b5	c5	
* _	* _	* _	spine terminators (data end)

spine

Field Separator/Null Records

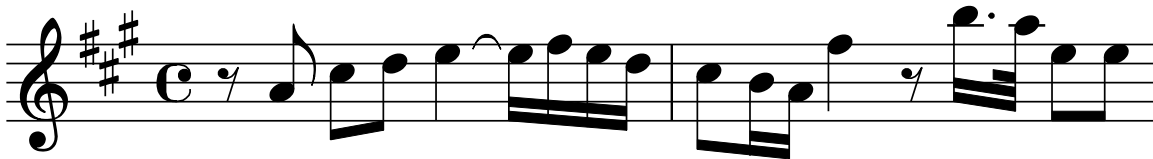
- Each field on a line is separated by exactly *one tab character* (may cause vertical alignment aberrations in a text editor if a field is wide).
- If one spine has no event when others do, a **null token** (".") is used as a place holder to indicate that the previous item in the spine is still in effect.

**AAA	**BBB	**CCC	
a1	b1	c1	← all spines have an event
.	.	c2	← c2 occurs by itself
a2	.	.	← a2 occurs by itself
a3	.	c3	← a3 and c3 occur together
a4	b2	c4	← all spines have an event
*_	*_	*_	

Motivation for Humdrum format

- Reaction against the linear parsing needed in DARMS code

8-'A{"CD}4E+{6EFED}/{8C'6BA}"4F8-{6.B3A}{8EE}/



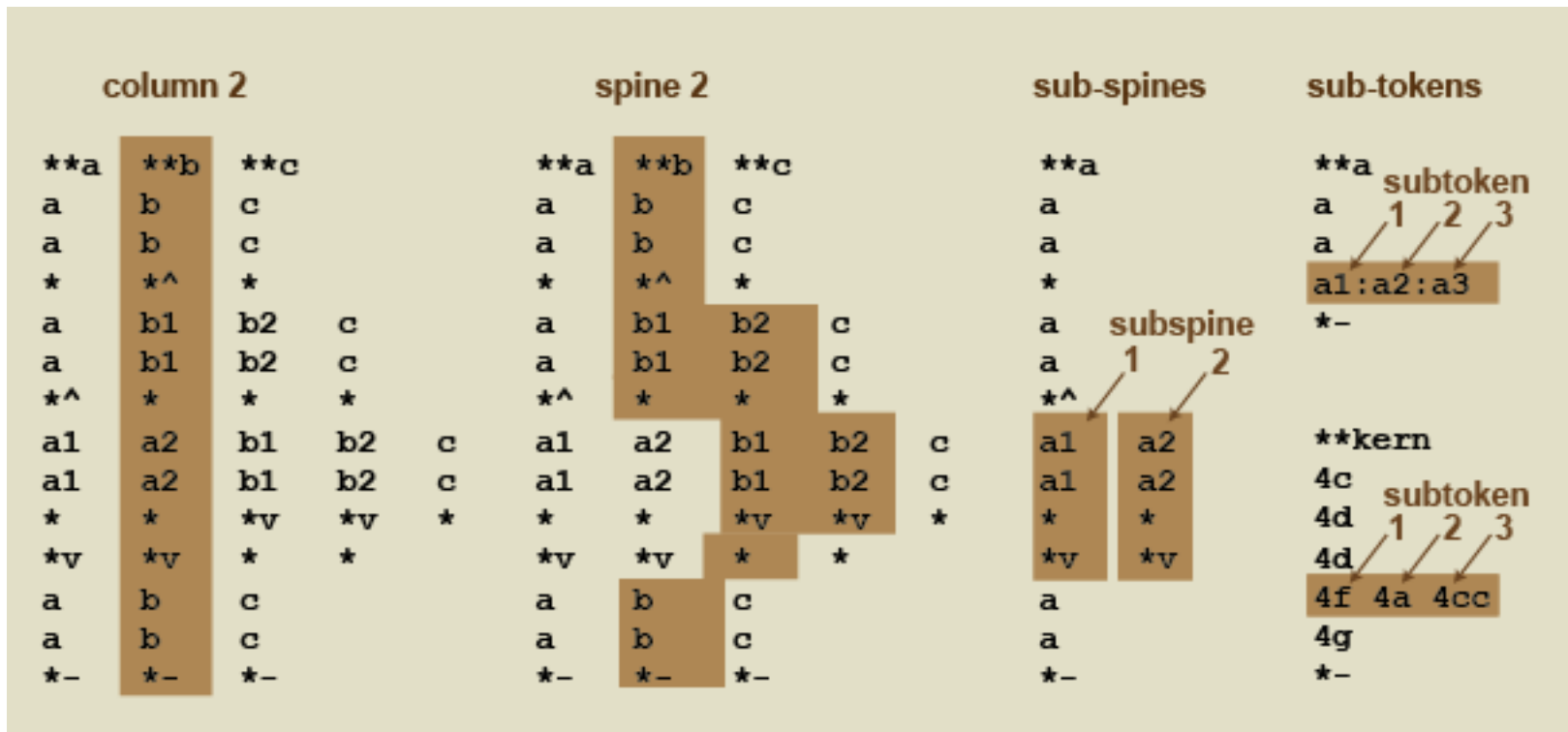
- Spreadsheet model for processing the data.

	A	B	C
1	**AAA	**BBB	**CCC
2	a1	b1	c1
3	.	.	c2
4	a2	.	.
5	a3	.	c3
6	a4	b2	c4
7	*-	*-	*-
8			

- Increased random accesses (e.g., no sticky settings for rhythm/octave like DARMS/Guido/Lilypond/ABC) for better **regular-expressing** parsing.

Spine Manipulators

**datatag	Exclusive interpretation
*^	Spine split (into two sub-spines)
*v	Spine merge (contiguous spines merge)
*x	Spines exchange column positions (rare)
*+	Add new spine
*-	Spine terminator (end of data for spine)
*	Null interpretation (null manipulator)



Record (line) Types

Comments (starting with !)

Reference Record (bibliographic record):

!!!key: value

Global Comment:

!!unstructured text

Local Comment:

!text

Interpretations (starting with *)

Spine Manipulators (fixed set):

**start, *^, *v, *x, *+, *-

Tandem Interpretations (data-type dependent):

*clefG2, *M4/4, *MM=120

Null interpretation (can occur on spine manipulator line or tandem interpretation line)

*

Barline (starting with =)

technically a form of data in Humdrum (should be interpretation)

Data line (starting anything else)

Reference Records

!!!COM: Mozart, Wolfgang Amadeus

!!!CDT: 1756/01/27/-1791/12/05/

!!!CNT: German

!!!OTL: Piano Sonata No. 16 in B-flat major

!!!SCT: K 576

!!!OMV: Mvmt. 2

!!!OMD: Adagio

!!!ODT: 1789///

COM = Composer:	Mozart, Wolfgang Amadeus
CDT = Composer's dates:	27 Jan 1756 - 5 Dec 1791
CNT = Nationality:	German
OTL = Title:	Piano Sonata No. 16 in B-flat major
SCT = Scholarly cat. num.:	K 576
OMV = Movement number:	Mvmt. 2
OMD = Movement designation:	Adagio
ODT = Date of composition:	1789

**kern

- **kern = exclusive interpretation (data type) which represents the “core” (in German) of musical data.
- Primary data format for storing music in Humdrum files.

```
**kern      **text
*M4/4      *
=-         =-
1c         Hello world!
==         ==
*_         *_
```



Tandem interpretations for **kern

- *clefG2 = treble clef (G clef on second line from bottom of staff)
- *clefGv2 = vocal tenor clef (G clef on second line, notes transposed down an octave)
- *clefF4 = bass clef (F clef on fourth line from bottom of staff)
- *clefC3 = alto clef
- *MM120 = tempo marking (120 beats per *quarter* note)
- *k[f#c#g#] = key signature of A major/F# minor
- *A: = music is in A major
- *f#: = music is in F# minor
- *k[b-e-a-d-g-c-f-] = key signature for C-flat major
- *C-: = music is in C-flat major
- *M3/4 = $\frac{3}{4}$ meter
- *met(c) = common time
- *met(c|) = cut time
- *met(O) = circle mensuration

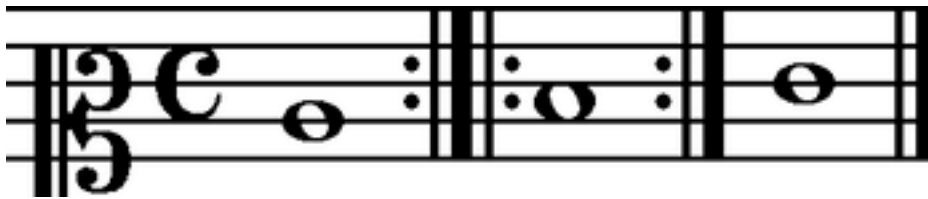
Pitch and Rhythm

c = middle c (C4)
cc = octave higher (C5)
ccc = two octaves higher (C6)
C = octave lower (C3)
CC = two octaves lower (C2)
B = minor second below c
b = major seventh above c
c# = c-sharp
c- = c-flat
c## = c-double sharp
c-- = c-double flat
r = rest

4 = quarter note
8 = eighth note
16 = 16th note
32 = 32nd note
64 = 64th note
2 = half note
1 = whole note
2. = dotted half note
4.. = double dotted quarter note
12 = triplet eighth note
20 = quintuplet sixteenth note
3%2 = triplet whole note (extension)

Barlines

=	plain barline
=23	barline #23
=23;	barline #23 with a fermata over it
=-	invisible barline
=: !	left-pointing repeat barline (= light line, !=heavy line).
=: ! :	left-right repeat barline
==	double (final) barline
='	partial mid barline
=`	partial top barline



```
**kern
*clefC2
*M4/4
*met(c)
=-
1c
=2:|!|:
1d
=3:|!
1e
==
*_
```

Stem directions

**kern

*M3/4

*k[f#]

=-

4g/

4g\

4g/

=2

4g\

4g/

4g\

=

4g/

4g\

4g/

==

*_

/ = stem up

\ = stem down



Beams and Ties/Slurs

L = start of beam line

J = end of beam line

LL = start of two beam lines

JJ = end of two beam lines

K = right facing partial beam

k = left-facing partial beam

[= start of tie

_ = middle note in tie (continues in both directions from printed note.

] = end of tie

(= beginning of slur

) = end of slur

{ = beginning of phrase

} = end of phrase

**kern

*M4/4

*k[f#]

=-

{8c/L

8d/J

8.e/L

16f#/Jk

16g/LK

8.a/J

16g/LL

16f#/_

16e/_

16d/JJ}

=

(8c/L

16d/L

16e/JJ)

[4f#

4f#_

4f#];

==

*_



Multiple parts

!!!COM: Landini, Francesco

!!!OTL: Excerpt from Non avrà ma' pietà

**kern **kern **kern

*clefF4 *clefG2 *clefG2

*M3/4 *M3/4 *M3/4

= = =

4A 4e 8eL

. . 8fJ

4B- 4d 8g

. . 4f#

4A 4c# .

. . 8e

= = =

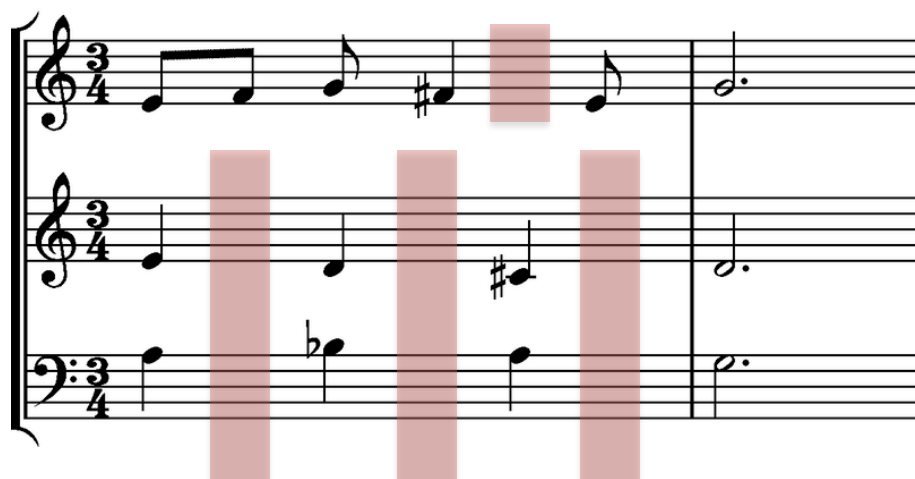
2.G 2.d 2.g

= = =

*_ *_ *_

!!muse2ps: z21jw1500

Excerpt from Non avrà ma' pietà
Francesco Landini



Null tokens

KernScores

<http://kern.ccarh.org>

Kern Scores

A library of virtual musical scores in the Humdrum ****kern** data format.
Total holdings: 7,866,496 notes in 108,703 files.

search:
[browse](#) | [shortcuts](#) anchored

[A guided tour of the KernScores website](#)
[Recent additions to the KernScores library](#)
[Data Collection Highlights](#)

[Online Humdrum Editor](#)
[CCARH Humdrum Portal](#)
[Contribute kern scores](#)

Composers

Adam	Chopin	Giovannelli	Lassus	Schubert
Alkan	Clementi	Grieg	Liszt	Schumann
J.S. Bach	Corelli	Haydn	MacDowell	Scriabin
Banchieri	Dufay	Himmel	Mendelssohn	Sinding
Beethoven	Dunstable	Hummel	Monteverdi	Sousa
Billings	Field	Isaac	Mozart	Turpin
Bossi	Flecha	Ives	Pachelbel	Scarlatti
Brahms	Foster	Joplin	Prokofiev	Vecchi
Buxtehude	Frescobaldi	Josquin	Ravel	Victoria
Byrd	Gershwin	Landini	Scarlatti	Vivaldi
				Weber

Genres

Ballate	Etudes	Motets	Scherzos	Symphonies
Ballads	Fugues	Preludes	Sonatas	Virelais
Chorales	Madrigals	Ragtime	Sonatina	Waltzes
Contrafacta	Mazurkas	Quartets		

Database of Humdrum files containing
****kern** data.

- <http://kern.humdrum.org/help/tour>
- <http://kern.humdrum.org/cgi-bin/kseditor>

Online Humdrum Editor

<http://kern.humdrum.org/cgi-bin/kseditor>

Very simple interface to some of the Humdrum tools

KernScores Online Humdrum Editor

Note: only works with Firefox web browser

input

```
**kern
*clefC2
*M4/4
*met(c)
1c
2: | | :
1d
3: |
1e
;
```

output

Input URL: (using one of the actions listed below)

Actions:

- Notation** (via *hum2muse*)
 - PDF, PNG: anti-aliased aliased, MuseData
 - transparent background: zoom factor for PNG: (use 3.0 for print publications)
 - music compression factor: (larger value for more space, smaller value for denser music)
 - For images used in print, set zoom factor to 3, and uncheck transparent background option.
- Notation** (via *hum2abc*)
 - PDF PNG GIF (not anti-aliased) zoom factor for PNG & GIF:
- MIDI**
 - bend depth:
- Census**
 - include **kern information
- Transpose**
 -
- MEI**
- Extract**
 - remove spine number
- Freeform**
 -
 -

E button on KernScores

```

!!!COM: MacDowell, Edward
!!!CDT: 1860/12/18/-1908/01/23/
!!!OPR: Second Modern Suite, Op. 14
!!!ODT: 1882///
!!!OTL: Dance of Fantasy
!!!OPS: Op. 14
!!!ONM: No. 5
**kern **kern
*staff2 *staff1
*piano *piano
*clefF4 *clefG2
*k[f#c#g#] *k[f#c#g#]
*A: *A:
*M2/4 *M2/4
*MM152 *MM152
=1- =1-
8AA'\L 8r
8E'\ 8c#\ 4ee^\ 4eee^\
8AA'\
8E'\ 8c#\J 8e'/ 8ee'/
=2 =2
8AA'\L 16ff#\LL
. 16ee#\
8Fn'\ 8d'\ 16ff#\
8AA'\ 16aa'\JJ
8AA'\ 16gg#\LL
. 16ff#\
8Fn'\ 8d'\J 16gg#\
. 16bb'\JJ
=3 =3
8AA'\L 8r
8E'\ 8c#\ 4ee^\ 4eee^\
8AA'\
8E'\ 8c#\J 8e'/ 8ee'/
=4 =4
8AA'\L 16ff#\LL
. 16ee#\
8Fn'\ 8d'\ 16ff#\
. 16aa'\JJ
8AA'\ 16gg#\LL
. 16ff#\
8Fn'\ 8d'\J 16gg#\
. 16bb'\JJ
=5 =5

```

```

*^ *^
4e/ 8e\ 16aa/LL 8r
. . 16ccc#\
. 8r 16aa/ 8f#\ 8a'\ 8cc#\
. 16ff#/JJ
4d#/ 8d#\ 16cc#/LL8r
. 16dd#\
. 8r 16ff#/ 8f#\ 8a'\
. 16aa/JJ
=6 =6 =6 =6
4c#/ 8c#\ 16aa/LL 8r
. 16ccc#\
. 8r 16aa/ 8d#\ 8f#\ 8a'\
. 16ff#/JJ
4B/ 8B\ 16cc#/LL8r
. 16dd#\
. 8r 16ff#/ 8d#\ 8f#\ 8a'\
. 16aa/JJ
*v *v *
*v *v *v

```

```

=7 =7
4E'\ 4B'\ 4g#\ 16ff#\LL
. 16ddd\
. 16bb\JJ
4r 16ff#\LL
. 16dd\
. 16b\
. 16g#\JJ
=8 =8
8EEE'/ 8EE'/ 16f#\LL
. 16d/
8r 16B/
. 16G#\JJ
16F#\LL 4r
16D/
16BB/
16GG#\JJ
=
*_
!!!ENC: Craig Stuart Sapp
!!!END: 2008/07/15/
!!muse2ps: i011c70

```

Dance of Fantasy Edward MacDowell

KernScore Browse

<http://kern.ccarh.org/browse?l=371chorales>

KernScores

Local Search: Pitch anchored

[top>users>craig>classical>bach>371chorales](#)

Four-part chorales collected after J.S. Bach's death by his son C.P.E. Bach (and finished by Kimberger, J.S. Bach student, after C.P.E. Bach's death). Ordered by Breitkopf & Härtel numbers, and includes all chorales except #150 which is not 4-part. First complete edition by Breitkopf & Härtel from 1784-1787 in four volumes. [First incomplete edition consisting of 200 chorales in two volumes by Friedrich Wilhelm Bimstiel in 1765 & 1769 which was reprinted in 1975 by Georg Olms]. This digital edition is referenced against the fourth edition of the chorales by Breitkopf & Härtel, c. 1875:

371 vierstimmige Choralgesänge von Johann Sebastian Bach. 4th ed. by Alfred Dörrfel. Breitkopf & Härtel, Leipzig [c. 1875]. 178 pp. Plate Number: v. a. 10. Retypeset c. 1915 as Edition Breitkopf 10. Reprinted by Associated Music Publishers, Inc., New York [c. 1940].

Scans of the source edition can be viewed by clicking on the **S** button to the left of each chorale title. See [this chorale bibliography](#) at the Riemenschneider Bach Institute at Baldwin Wallace College for a good publication history of the Bach chorales. See also this article: [The History of the Breitkopf Collection of J.S. Bach's Four-Part Chorales](#) by Thomas Braatz. Click on the **Z** button below to download all Humdrum files in a single ZIP file.

- Z** **S** All chorales in grand-staff notation (177 pages) [7.8 MB]
- S** All chorales in vocal-score notation (254 pages) [8.8 MB]
- S** **H** **M** **K** 1. **Aus meines Herzens Grunde**, BWV 269
- S** **H** **M** **K** 2. **Ich dank dir, lieber Herre**, BWV 347
- S** **H** **M** **K** 3. **Ach Gott vom Himmel sieh darein**, BWV 153/1
- S** **H** **M** **K** 4. **Es ist das Heil uns kommen her**, BWV 86/6
- S** **H** **M** **K** 5. **An Wasserflüssen Babylon**, BWV 267
- S** **H** **M** **K** 6. **Christus, der ist mein Leben**, BWV 281
- S** **H** **M** **K** 7. **Nun lob, mein Seel, den Herren**, BWV 17/7
- S** **H** **M** **K** 8. **Freuet euch, ihr Christen alle**, BWV 40/8
- S** **H** **M** **K** 9. **Ermunte dich, mein schwacher Geist**, BWV 248/12
- S** **H** **M** **K** 10. **Aus tiefer Not schrei ich zu dir**, BWV 38/6 (Phrygian)
- S** **H** **M** **K** 11. **Jesu, nun sei gepreiset**, BWV 41/6 & 171/6
- S** **H** **M** **K** 12. **Puer natus in Bethlehém**, BWV 62/2

KernScores

1. Aus meines Herzens Grunde, BWV 269

Location	top>users>craig>classical>bach>371chorales
Humdrum file	chor001_krn [expanded repeats] [no repeats]
Composer	Bach, Johann Sebastian
Composer's dates	21 Feb 1685 - 28 Jul 1750
Title: orig. lang.:	Aus meines Herzens Grunde
German	
Title: English	From the Depths of My Heart
Scholarly cat. num.	BWV 269
Publisher's cat. #	1
Genre designation	chorale
Original document	371 vierstimmige Choralgesänge von Johann Sebastian Bach, 4th ed. by Alfred Dörrfel (Leipzig: Breitkopf und Härtel, c.1875). 178 pp. Plate "V.A.10". reprint: J.S. Bach, 371 Four-Part Chorales (New York: Associated Music Publishers, Inc., c.1940).
Manuscript source name	B&H, 4th ed, Alfred Dörrfel, c.1875, plate V.A.10
Electronic Editor	Craig Stuart Sapp
Electronic edition version	2009/05/22
Current Checksum	909510096

Data Format	PDF Score	chor001.pdf
Translations	Standard MIDI File	chor001.mid [with repeats]
	Director Musices:	chor001.mus
	Melisma Format:	chor001.notes
	MusicXML:	chor001.xml
	STK/SKIN!:	chor001.ski
	Guido:	chor001.gmn [not on via noteserver.org]
	ABC+:	chor001.abc [not on via abc2ps] [number every bar]
	MuseData:	chor001.md2 [not on via muse2ps]
	SA Sonorities:	chor001.dat
	MEI:	chor001.mei

Aus meines Herzens Grunde.