

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: organized strictly time-wise in the data: each succeeding row comes after the preceding (contrasts with all other polyphonic data formats except MIDI Type-0 files).
- Each element on a data line occurs simultaneously in time (a4, b4, c4 occur at the same time).

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

Field Separator/Null Records

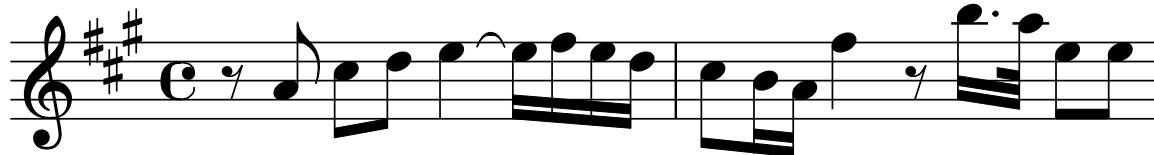
- Each field on a line is separated by exactly *one* **tab character** (may cause vertical alignment aberrations in a text editor if a field is wide).
- If one spine has no event when others do, a **null token** (“.”) is used as a place holder to indicate that the previous item in the spine is still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

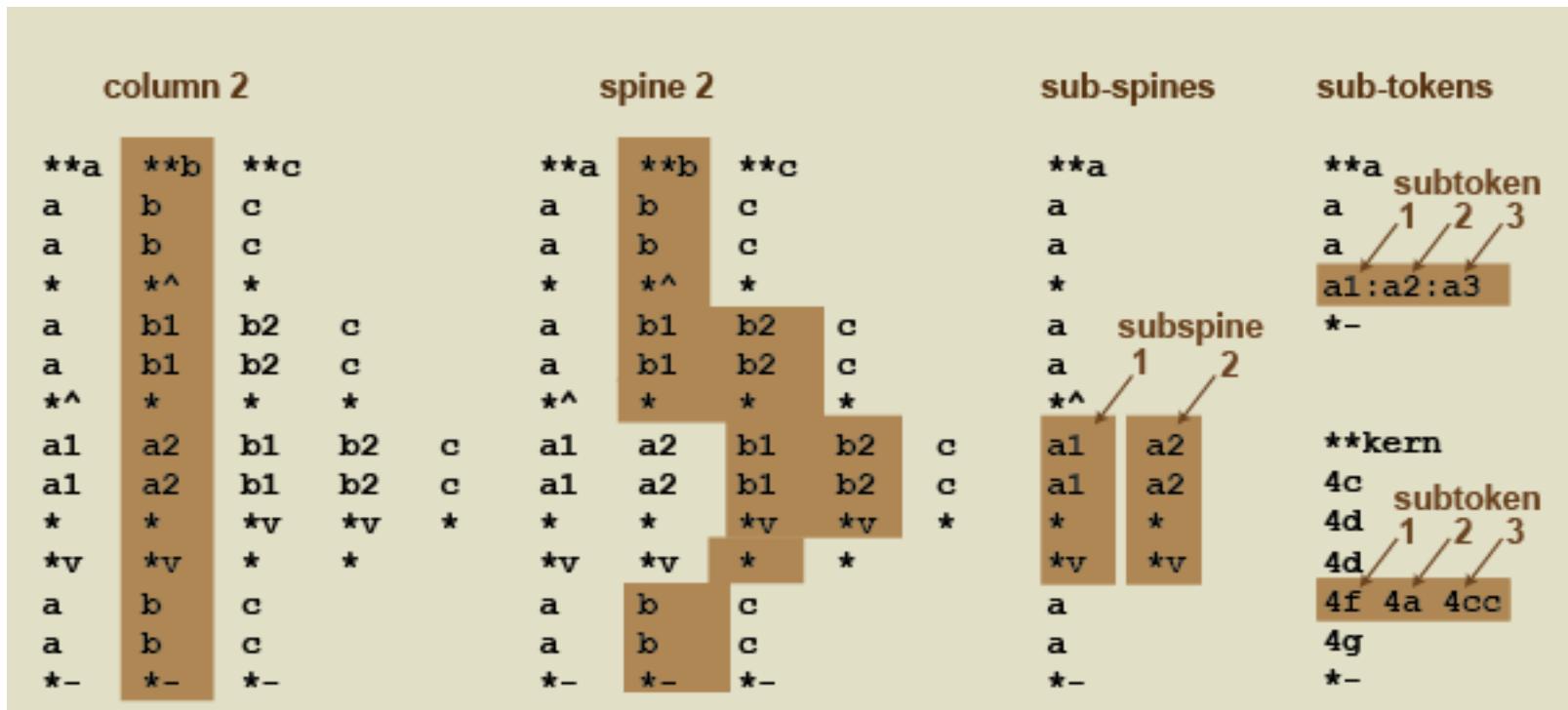
	A	B	C
1	**AAA	**BBB	**CCC
2	a1	b1	c1
3	.	.	c2
4	a2	.	.
5	a3	.	c3
6	a4	b2	c4
7	*-	*-	*-

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

**kern
*clefG2
*k[f#c#g#]
*M4/4
*met(c)
=1-
8r
8a
8cc#
8dd
[4ee
16ee]
16ff#
16ee
16dd
=2
*_

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 (place-holder for empty interpretation)

*

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

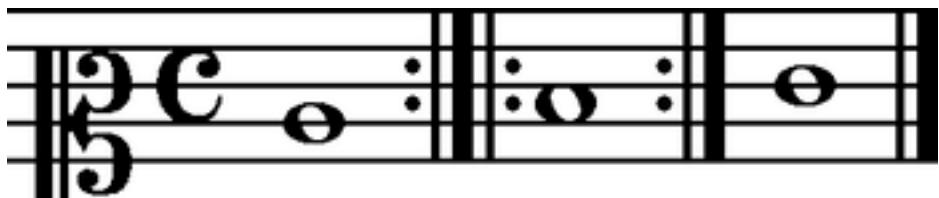
Pitch and Rhythm

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	**kern
='	partial mid barline	*clefC2
=`	partial top barline	*M4/4
		*met(c)
		=--
		1c
		=2: ! :
		1d
		=3: !
		1e
		==
		*_-



Stem directions

**kern

*M3/4

*k[f#]

=-

/ = stem up

4g/

4g\

4g/

=2

4g\

4g/

4g\

=

4g/

4g\

4g/

==

*_-

\ = stem down



Beams and Ties/Slurs

L = start of beam line

**kern

J = end of beam line

*M4/4

LL = start of two beam lines

*k[f#]

JJ = end of two beam lines

=

K = right facing partial beam

{8c/L

k = left-facing partial beam

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#];

==

*_

[= 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



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>

The screenshot shows the homepage of the KernScores website. At the top, the title "Kern Scores" is displayed in a large, stylized red and blue font. Below the title, a subtitle reads: "A library of virtual musical scores in the Humdrum **kern data format. Total holdings: 7,866,496 notes in 108,703 files." A search bar is present with the placeholder "search:" and options for "browse" or "shortcuts". A dropdown menu shows "Text" selected, and there is a checkbox for "anchored". Below the search bar, there are links for "A guided tour of the KernScores website", "Recent additions to the KernScores library", "Data Collection Highlights", "Online Humdrum Editor", "CCARH Humdrum Portal", and "Contribute kern scores". The main content area features two tables: one titled "Composers" and another titled "Genres".

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 output

```
1 **kern
2 *clefc2
3 *M4/4
4 *met(c)
5 --
6 lc
7 =2: || | :
8 ld
9 =3: ||
10 le
11 ==
12 *-
13
14
15
16
17
18
19
20
```

Input URL:

(using one of the actions listed below)

Actions:

Notation
(via [hum2muse](#)) PDF PNG: anti-aliased aliased, 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)
 MIDI bend depth:

Census include **kern information
 Transpose up perfect fifth
 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
*Ipiano *Ipiano
*clefF4 *clefG2
*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#
8F#\ 8d'\ 16ff#\ \
. 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#
8F#\ 8d'\ 16ff#\ \
. 16aa'JJ
8AA'\ 16gg#\LL
. 16ff#\#
8Fn'\ 8d'\J 16gg#\ \
. 16bb'JJ
=5 =5

```

*^	*^		=7	=7	
4e/	8e\	16aa/LL 8r	4E'\ 4B'\ 4g#\`	16ff#\`LL	
.	.	16ccc#/ .	.	16ddd\`	
.	8r	16aa/ 8f#\` 8a`\ 8cc#\`	.	16bb\`	
.	.	16ff#\`JJ .	.	16gg#\`JJ	
4d#/	8d#\`	16cc#\`LL8r	4r	16ff#\`LL	
.	8r	16dd#\`	.	16dd\`	
.	.	16ff#\` 8f#\` 8a`\	.	16b\`	
=6	=6	16aa/JJ .	.	16g#\`JJ	
4c#/	8c#\`	16aa/LL 8r	=8	=8	
.	.	16ccc#/ .	8EEE'/ 8EE'/	16f#\`LL	
.	8r	16aa/ 8d#\` 8f#\` 8a`\	8r	16d/\`	
.	.	16ff#\`JJ .	.	16B/\`	
4B/	8B\`	16cc#\`LL8r	16F#\`LL 4r	16G#\`JJ	
.	8r	16dd#\` .	16D/\`	.	
.	.	16ff#\` 8d#\` 8f#\` 8a`\	16BB/\`	16GG#\`JJ	
*v	*v	16aa/JJ .	=	=	
*	*	*	*	*	
		*			

!!!ENC: Craig Stuart Sapp
!!!END: 2008/07/15/
!!!muse2ps: i0l1c70

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>](#) [A](#) [a](#)

Four-part chorales collected after J.S. Bach's death by his son C.P.E. Bach (and finished by Kirnberger, 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 Birnstiel in 1765 & 1769 which was reprinted in 1795 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 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 button below to download all Humdrum files in a single ZIP file.

All chorales in grand-staff notation (177 pages) [7.8 MB]
 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 sich darcin, 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. Ermuntre 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 Bethlehem, BWV 65/2

KernScores

1. Aus meines Herzens Grunde, BWV 269

Location [top>users>craig>classical>bach>371chorales](#)
Humdrum file [chor001.krn](#) [expanded repeats] **Composer** Bach, Johann Sebastian
Composer's dates 21 Feb 1685 - 28 Jul 1750
Title: orig. lang.: Aus meines Herzens Grunde
German From the Depths of My Heart
Title: English BWV 269
Scholarly cat. num. 1
Publisher's cat. # chorale
Genre designation 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).
Original document B&H, 4th ed, Alfred Dörrfel, c.1875, plate V.A.10
Manuscript source name Craig Stuart Sapp
Electronic Editor 2009/05/22
Electronic edition
version
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.gmd](#) [no repeat] [chor001.gmd](#) [no repeat] **ABC:** [chor001.abc](#) [no repeat] [chor001.abc](#) [no repeat] **MuseData:** [chor001.md2](#) [no repeat] [chor001.md2](#) [no repeat] **SA Sonorities:** [chor001.dat](#) [no repeat] [chor001.dat](#) [no repeat] **MEI:** [chor001.mei](#) [no repeat] [chor001.mei](#) [no repeat]



Josquin Research Project

The Josquin Research Project
Search, browse, and analyze complete scores
of polyphonic music, ca. 1420–ca. 1520

QUICK BROWSE

All Composers
All Genres
Enter Title
Browse

Sample Work: [Josquin, Pensif mari](#) mp3 ►

Pensif mari Josquin des Prez? NJE 27.30

Superius
Tenor
Contra

RECENTLY ADDED

Click the title of any piece for work-specific search and analysis tools.

Composer	Title	Scores	MP3
Martini	O intemerata	►	►
Martini	Quare fremuerunt gentes	►	►
Martini	Qui confidunt	►	►
Martini	Sepe expugnaverunt me	►	►
Martini	Salve regina	►	►
Martini	Sanctorum meritis	►	►
Martini	Vexilla regis	►	►

JRP NEWS
and updates

The JRP database has passed the 1-million-note mark.

JRP editions were used by Cut Circle in a recent performance of Brumel's twelve-voice Earthquake Mass (Musica Sacra festival, Maastricht, the Netherlands)

Now available with complete text: all four late cyclic masses of Guillaume Du Fay.

[more on Facebook](#)

This repository Search Explore Gist Blog Help craigsapp + ⚙️

[josquin-research-project / jrp-scores](#) Unwatch 2 ★ Unstar 4 Fork 0

Digital scores for all composers in the Josquin Research Project. <http://josquin.stanford.edu>

64 commits 1 branch 0 releases 1 contributor

branch: master | [jrp-scores / +](#)

Added Isaac scores to the database. craigsapp authored 28 days ago latest commit 4ca9b3728a

Author	Commit Message	Date
craigapp	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Ano	Updated for new works.	a year ago
Bru	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Bus	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Com	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Duf	Updated works; added Isaac to composer list.	4 months ago
Gas	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Isa	Added Isaac scores to the database.	28 days ago
Jap	Updated works; added Isaac to composer list.	4 months ago
Jos	Updated works; added Isaac to composer list.	4 months ago
Mar	Updated works; added Isaac to composer list.	4 months ago
Mou	Adding all composers' repositories.	a year ago
Obr	Updated for new works.	a year ago
Ock	Updated works; added Isaac to composer list.	4 months ago
Ort	Updated works; added Isaac to composer list.	4 months ago
Pip	Updated works; added Isaac to composer list.	4 months ago
Reg	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Rue	Updated works; added Isaac to composer list.	4 months ago
Tin	Updated works; added Isaac to composer list.	4 months ago

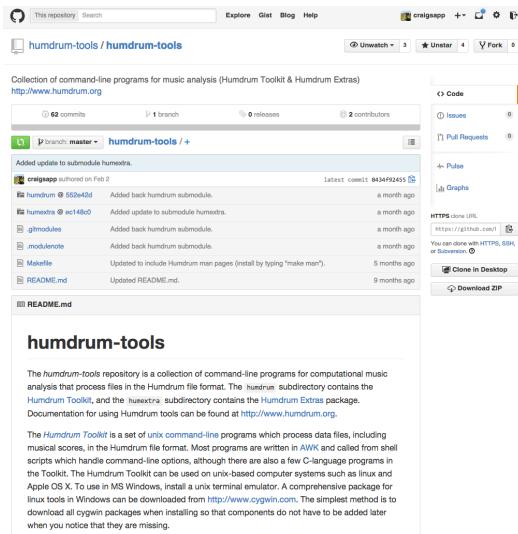
Code Issues Pull Requests Graphs Pulse Clone in Desktop Download ZIP

HTTPS clone URL <https://github.com/josquin-research-project/jrp-scores/>

You can clone with HTTPS, SSH, or Subversion. ↗

<https://github.com/josquin-research-project/jrp-scores>

Github



- Install (unix) command-line utilities for processing Humdrum data from Github

- Github repository for Humdrum tools:

<https://github.com/humdrum-tools/humdrum-tools>

- Github repository for Humdrum data (taken from <http://kern.humdrum.org> website):

<https://github.com/humdrum-tools/humdrum-data>

Virtual Humdrum

- Online bash shell for running Humdrum tool commands.
- Slow, but allows testing against your installation and easier than installing in Windows with cygwin

<http://runnable.com/VD9ZirF3Zp1gkPZM/humdrum-for-shell-and-bash>

The screenshot shows the Runnable web interface. At the top, there's a purple header bar with the Runnable logo and a search bar. Below the header, the title "Humdrum [shell and bash]" is displayed, along with a note that it's a fork from the "Basic Shell Example". It shows statistics: 32 Runs, 86 Views, and 6 Copies. A message indicates it's a virtual installation of the Humdrum tools. The main area has a toolbar with "Run", "Settings", "Like", "Share", and "Save Draft" buttons. Below the toolbar is a file manager showing files "main.sh" and "README.md". The main content area contains a heading "Virtual Humdrum" and instructions to try Humdrum commands. It includes two code snippets: one for Bach's chorale and another for Beethoven's sonata, both using the "humcat" command followed by "| census -k".

The screenshot shows a terminal window titled "Terminal". It displays the output of several Humdrum commands. First, it runs "humcat h://chorales/chor001.krn | census -k", which outputs statistics for the chorale. Then, it lists "KERN DATA" with various musical parameters. Finally, it runs "keycor h://chorales/chor001.krn", which identifies the key as G Major.

```
root@runnable:~# humcat h://chorales/chor001.krn | census -k
HUMDRUM DATA

Number of data tokens: 412
Number of null tokens: 91
Number of multiple-stops: 0
Number of data records: 103
Number of comments: 17
Number of interpretations: 14
Number of records: 134

KERN DATA

Number of note-heads: 229
Number of notes: 223
Longest note: 2.
Shortest note: 8
Highest note: dd
Lowest note: FF#
Number of rests: 0
Maximum number of voices: 4
root@runnable:~# keycor h://chorales/chor001.krn
The best key is: G Major
root@runnable:~#
```

Example problem

- Examine the trend in duple v. triple meters (mensurations) in early renaissance music

<http://josquin.stanford.edu/analysis/rhythm>

Rhythmic Patterns in Works of Josquin des Prez

This page lists every rhythmic pattern that starts at the beginning of a perfection and lasts exactly one breve (or, under some mensuration signs, one long), along with information about the frequency of each pattern. Click on any pattern for a list of voices/measures in which it appears.

Cut-C	Circle	3, Cut-C3, 3/2, Circle/3	Cut-Circle
32823	2815	1361 (18.9%)	150
21082 (16.1%)	1080 (7.8%)	1213 (16.8%)	143 (9.6%)
20432 (15.6%)	884 (6.4%)	1056	79 (5.3%)
7084 (5.4%)	460 (3.3%)	765 (10.6%)	56 (3.8%)
5392 (4.1%)	396 (2.8%)	503 (7%)	48 (3.2%)
5293 (4%)	290 (2.1%)	466 (6.5%)	37 (2.5%)
4758 (3.6%)	287 (2.1%)	410 (5.7%)	37 (2.5%)

<http://museinfo.sapp.org/examples/humdrum/menpat.cpp>

Metric rhythm patterns

Missa De beata virgine

2. Gloria

Josquin/La Rue?
NJE 3.3

v01 menCutC :: w_w
v01 menCutC :: md_q_w
v01 menCutC :: w_w
v01 menCutC :: wr_w
v01 menCutC :: md_q_m_m
v01 menCutC :: tq_q_q_q_w

v03 menCutC :: br
v03 menCutC :: br
v03 menCutC :: w_w
v03 menCutC :: md_q_w
v03 menCutC :: w_w
v03 menCutC :: wr_w

v02 menCutC :: wd_m
v02 menCutC :: w_w
v02 menCutC :: wd_m
v02 menCutC :: m_m_m_m
v02 menCutC :: tm_md_q_q_q
v02 menCutC :: b

v04 menCutC :: br
v04 menCutC :: br
v04 menCutC :: wd_m
v04 menCutC :: w_w
v04 menCutC :: w_w
v04 menCutC :: w_w

Metric rhythm patterns (3)

```
menpat * | sed 's/:.*//' | sort | uniq -c | sort -nr
```

186206 menCutC
17806 menCircle
4868 men3
3608 menC
2241 menC2
1878 menCircle2
1866 menCutC3
1688 menCutCircle
1486 menCircleOver3
336 menCircleDot
320 menC3
302 men3Over2
274 menCutC2
162 m(C|/3)
140 m(C|/2)
125 menCDot
114 men2
100 m(O|3)
80 menCutCircle3Over2
70 menReverseC
60 m(O3)

menpat * → extract mensural patterns
sed 's/:.*//' → remove from ":" to end of line
sort → sort lines alphabetically
uniq -c → remove duplicates lines, counting number of duplicates
sort -nr → sort lines in reverse numeric order0

Metric rhythm patterns (4)

```
menpat Jos/* | grep -Pv "\s[^_]*r\s*\$" | sed 's/:.*//' | sortcount -ph
```

```
**pcent **data
82.33 menCutC
8.05 menCircle
2.34 men3
1.56 menC
1.15 menC2
0.99 menCircle2
0.88 menCutC3
0.83 menCutCircle
0.7 menCircleOver3
0.18 menCircleDot
0.16
0.14 menCutC2
0.14 menC3
0.12 men3Over2
0.07 m(C|/2)
0.07 m(C|/3)
0.06 menCDot
0.05 men2
0.05 m(O|3)
0.04 menCutCircle3Over2
0.04 menReverseC
0.03 m(O3)
0
*- *-
```

`grep -Pv "\s[^_]*r\s*\$"` → remove measures with full-measure rest.

`sortcount -ph` → similar to `sort | uniq -c | sort -nr`
`-p` = show counts as percentages
`-h` = format data in Humdrum syntax

Metric rhythm patterns (5)

```
menpat Ock/* | grep -Pv "\s[^_]*r\s*\$" | sed 's/::*/ /' | sortcount -ph
```

Ockeghem:

**pcent	**data
50.98	menCutC
32.3	menCircle
13.47	menC
1.06	menCDot
1.02	menCutCircle
0.5	men3
0.31	m(O3)
0.15	men2
0.07	m(C .)
0.06	m(C.)
0.06	menCircle2
0.02	menReverseC
0.01	menCircleDot
*	*

Josquin:

**pcent	**data
82.33	menCutC
8.05	menCircle
2.34	men3
1.56	menC
1.15	menC2
0.99	menCircle2
0.88	menCutC3
0.83	menCutCircle
0.7	menCircleOver3
0.18	menCircleDot
0.16	
0.14	menCutC2
0.14	menC3
0.12	men3Over2
0.07	m(C /2)
0.07	m(C /3)
0.06	menCDot
0.05	men2
0.05	m(O 3)
0.04	menCutCircle3Over2
0.04	menReverseC
0.03	m(O3)
0	

Metric rhythm patterns (6)

- Separate JRP data files by genre:

(mkdir songs; cd songs; humsplit h://jrp/Zso)

(mkdir songs; cd motets; humsplit h://jrp/Zmo)

(mkdir songs; cd masses; humsplit h://jrp/Zma)

Masses:

```
menpat motets/*.krn | grep -Pv "\s[^_]*r\s*\$" | sed  
's/:.*//' | sortcount -ph
```

**pcent	**data
86.73	menCutC
4.87	menCircle
2.55	men3
2.43	menC2
0.97	menCircleOver3
0.85	menC
0.4	menCircle2
0.26	menCutC3
0.16	menCutC2
0.15	menCircleDot
0.14	men3Over2
0.14	menCutCircle
0.07	menC3
0.01	menCDot
*	*

Motets:

**pcent	**data
86.73	menCutC
4.87	menCircle
2.55	men3
2.43	menC2
0.97	menCircleOver3
0.85	menC
0.4	menCircle2
0.26	menCutC3
0.16	menCutC2
0.15	menCircleDot
0.14	men3Over2
0.14	menCutCircle
0.07	menC3
0.01	menCDot
*	*

**pcent	**data
52.87	menCutC
18.92	menCircle
9.23	menC
8.7	menC2
3.66	men3
2.2	menCutCircle
1.31	menCutC3
1.01	menCircle2
0.5	menC3
0.45	menCircleOver3
0.31	menCircleDot
0.29	menCDot
0.08	men2
0.08	m(C /2)
0.08	m(C /3)
0.07	menReverseC
0.06	m(O 3)
0.05	menCutC2
0.03	men3Over2
0.02	menCutCircle3Over2
0.01	m(C .)
0.01	m(C.)
*	*

Metric rhythm patterns (7)

```
menpat songs/Ock*.krn | grep -Pv "\s[^_]*r\s*\$" | sed 's/::*//' | sortcount -ph
```

**pcent	**data
63.93	menCutC
19.02	menCircle
14.24	menC
2.81	m(O3)
*_-	*_-

**pcent	**data
93.84	menCutC
2.17	menC2
1.29	menCircle
1.25	menC
1.18	menCutC3
0.22	menCutC2
0.04	men3
*_-	*_-

```
menpat songs/Jos*.krn | grep -Pv "\s[^_]*r\s*\$" | sed 's/::*//' | sortcount -ph
```