Humdrum Tools II

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Melodic Searching

tindex – themax – theloc

Download data files for J.S. Bach chorales:

humsplit h://371chorales

Create *thema* search index:

tindex *.krn > index.dat

Search for the pitch sequence “c d e f g a b”:

themax –p “c d e f g a b” index.dat --loc

chor190.krn::1 48-54 58-64
chor325.krn::1 17-23

Convert matched note numbers into measure/beat locations:

themax –p “c d e f g a b” index.dat --loc | **theloc**

chor190.krn::1 48=9B1-54=9B4 58=10B2-64=11B2.5
chor325.krn::1 17=5B1-23=6B3

http://extras.humdrum.org/man/tindex (themax, theloc)

Marking search in data

chor190.krn::1
48=9B1-54=9B4

58=10B2-64=11B2.5

Chorale 190, first **kern spine (bass part)
First match on notes 48-54 which is in measure 9 starting on beat one and ending at beat 4.
Second match on notes 58-64 starting at m10 beat 2 and ending at m11 beat 2.5

Marking match in original data:

themax –p “c d e f g a b” index.dat --loc | theloc –m

(only first entry in themax results will be processed)

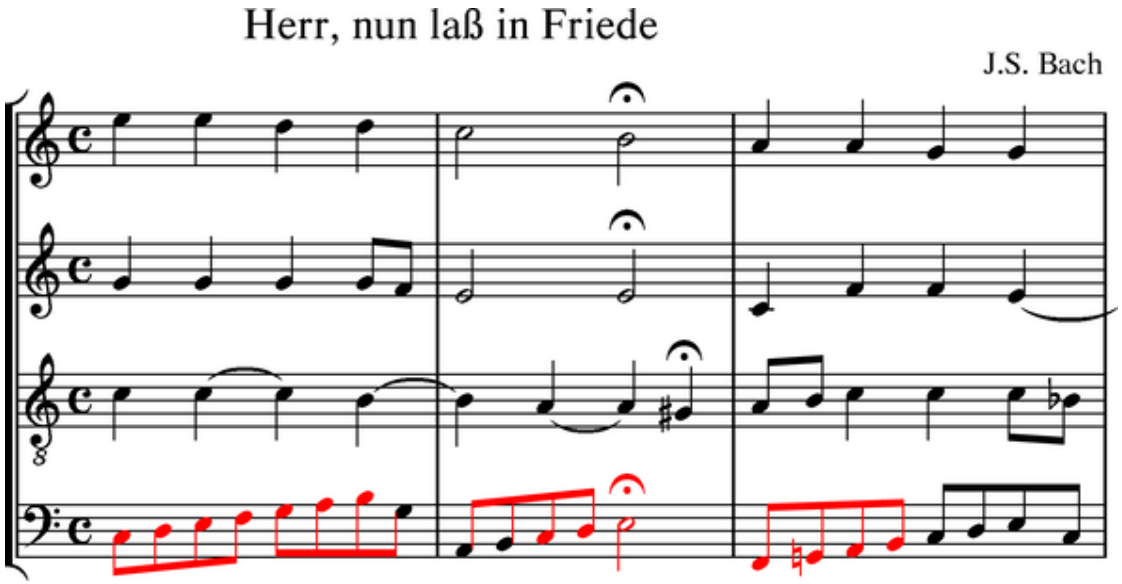
@ sign is a “user-definable signifier”
!!!RDF**kern: @= matched note

=9	=9	=9	=9
8CL@	4c	4g	4ee
8D@	.	.	.
8E@	[4c	4g	4ee
8FJ@	.	.	.
8GL@	4c]	4g	4dd
8A@	.	.	.
8B@	[4B	8gL	4dd
8GJ	.	8fJ	.
=10	=10	=10	=10
8AAL	4B]	2e	2cc
8BB	.	.	.
8C@	[4A	.	.
8DJ@	.	.	.
2E;@	4A]	2e;	2b;
.	4G#;	.	.
=11	=11	=11	=11
8FFL@	8AL	4c	4a
8GGn@	8BJ	.	.
8AA@	4c	4f	4a
8BBJ@	.	.	.
8CL	4c	4f	4g
8D	.	.	.
8E	8cL	[4e	4g
8CJ	8B-J	.	.
=12	=12	=12	=12

Displaying matches in graphical notation

themax –p “c d e f g a b” index.dat --loc | head –n1 | theloc –m | **myank** –m 9-11 > match.krn

cat match.krn| autostem | hum2muse | muse2ps =z21j | pstopnm -dpi=300 \
| convert - -trim -resize '33%’ match.png



themax –p “c d e f g a b” index.dat --loc | head -n1 | theloc -m | myank **--marks** > match.krn

Parallel feature searching

Search for the pitch sequence “cdefgab” only going upwards:

```
themax -p "cdefgab" -C "uuuuuu" index.dat --loc
    chor190.krn::1   48-54
    chor325.krn::1   17-23
```

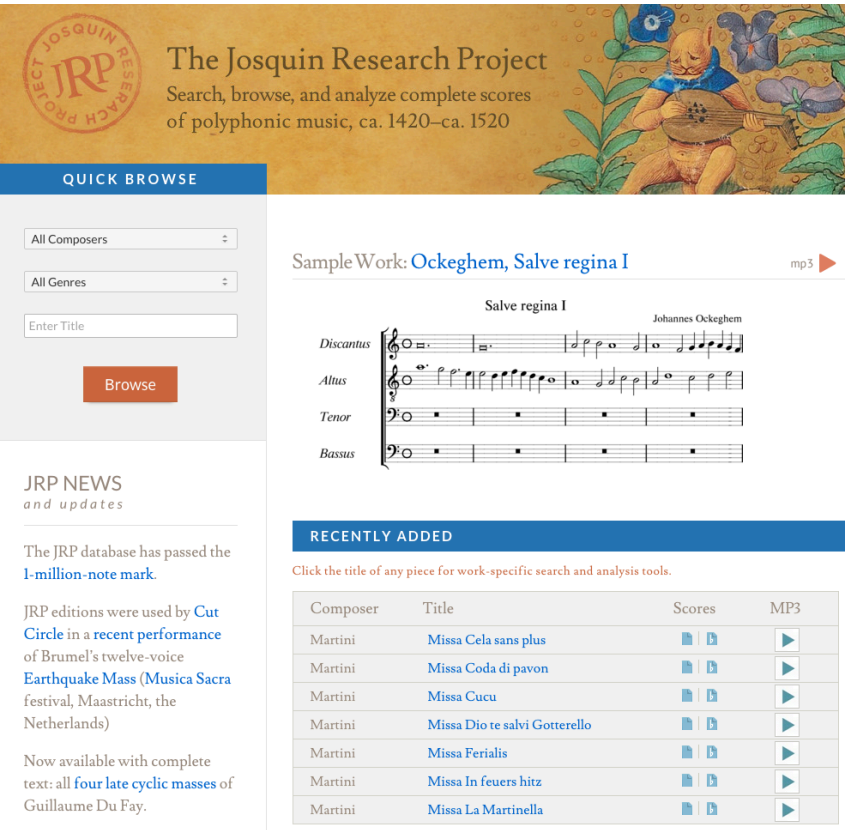
pitch: cdefgab
contour: up up up up up up

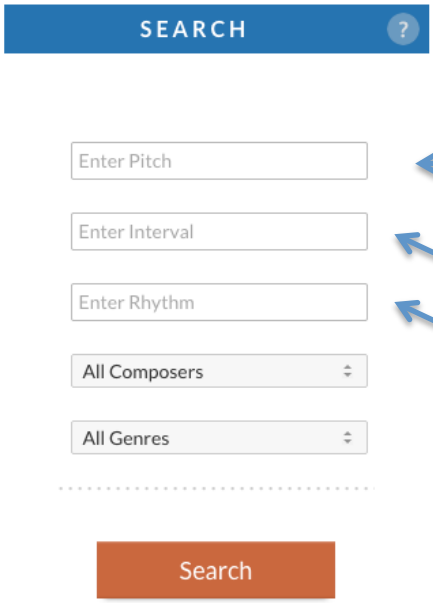
Prevent matches across fermatas:

```
tindex --fermata *.krn > index2.dat
themax -p "cdefgab" index2.dat --loc
    chor190.krn::1   48-54
    chor325.krn::1   17-23
```

Josquin Research Project website

- front-end for tindex/themax/theloc
  http://josquin.stanford.edu





themax input fields

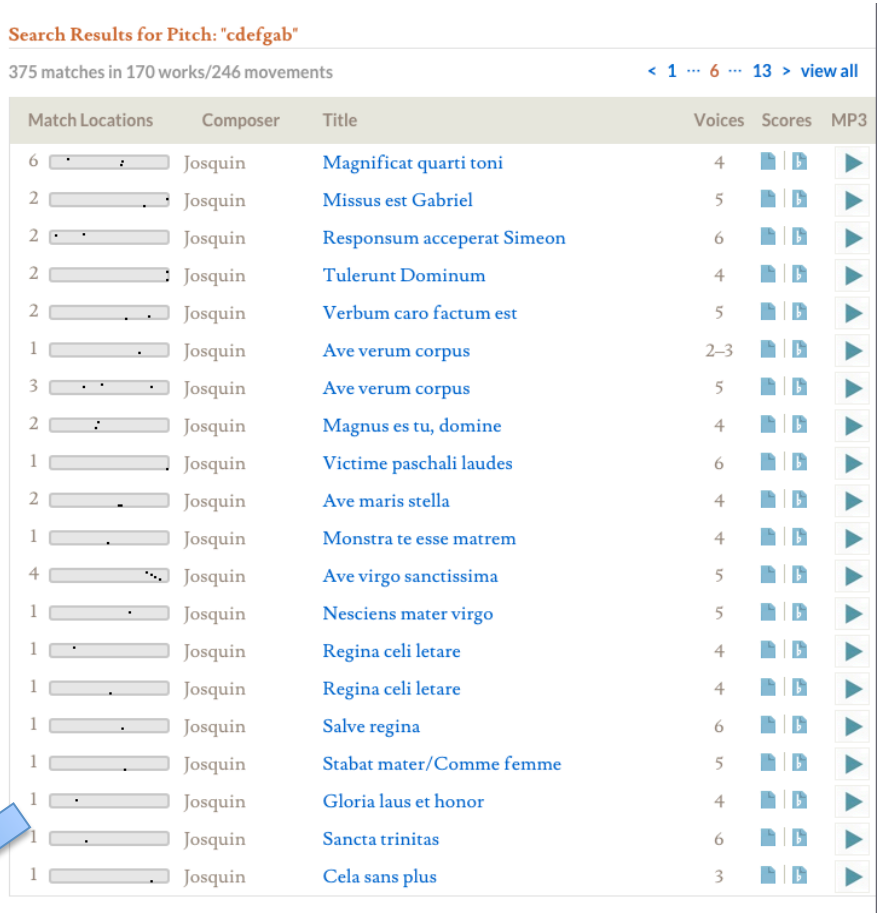
-D option
(diatonic search
ignoring accidentals)

Interval: -I

Rhythm: -u

JRP Search Results

search results for diatonic pitch sequence “cdefgab”:



Search Results for Pitch: "cdefgab"

375 matches in 170 works/246 movements

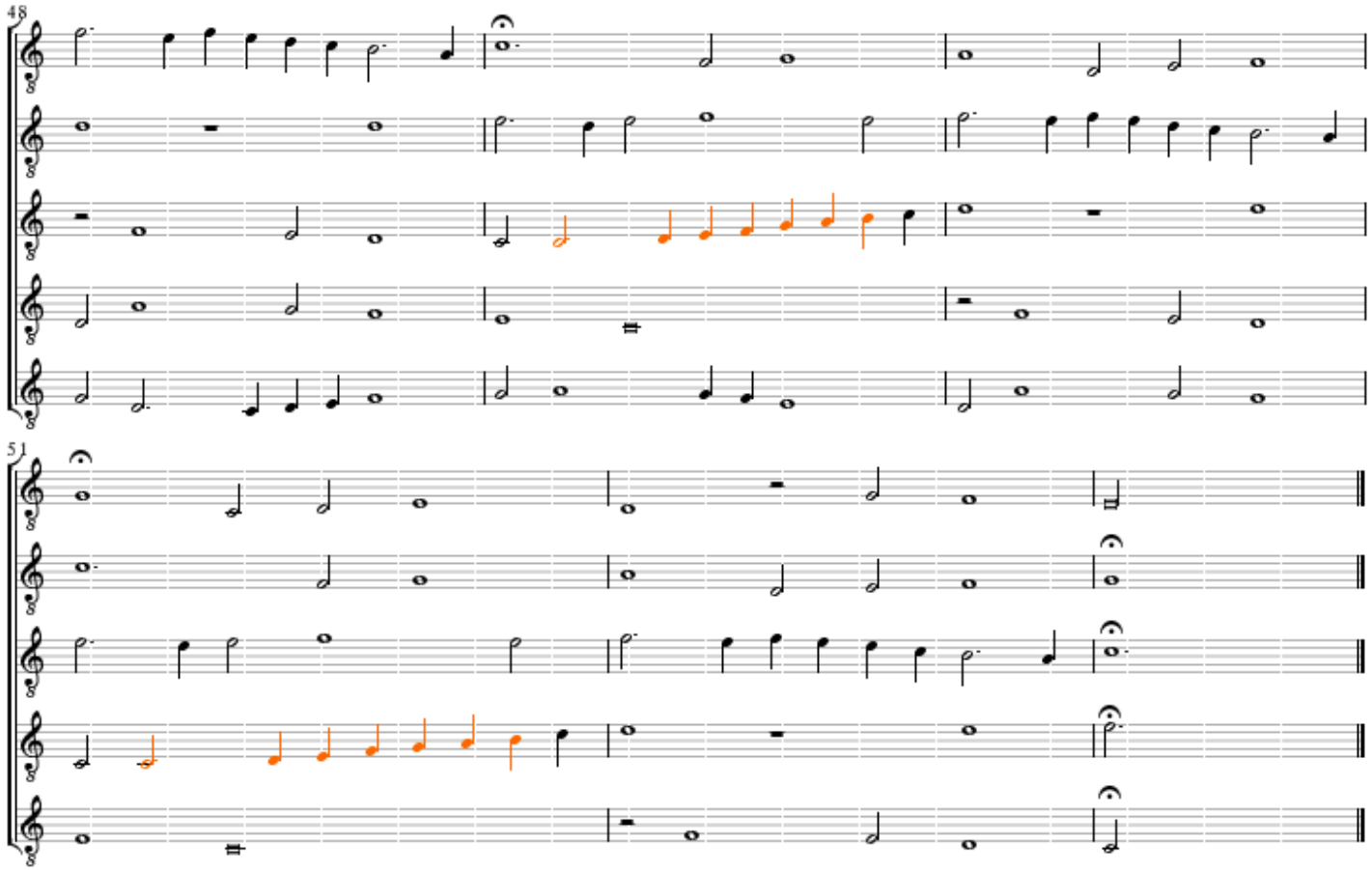
< 1 ··· 6 ··· 13 > view all

Match Locations	Composer	Title	Voices	Scores	MP3
6	Josquin	Magnificat quarti toni	4		
2	Josquin	Missus est Gabriel	5		
2	Josquin	Responsum acceperat Simeon	6		
2	Josquin	Tulerunt Dominum	4		
2	Josquin	Verbum caro factum est	5		
1	Josquin	Ave verum corpus	2–3		
3	Josquin	Ave verum corpus	5		
2	Josquin	Magnus es tu, domine	4		
1	Josquin	Victime paschali laudes	6		
2	Josquin	Ave maris stella	4		
1	Josquin	Monstra te esse matrem	4		
4	Josquin	Ave virgo sanctissima	5		
1	Josquin	Nesciens mater virgo	5		
1	Josquin	Regina celi letare	4		
1	Josquin	Regina celi letare	4		
1	Josquin	Salve regina	6		
1	Josquin	Stabat mater/Comme femme	5		
1	Josquin	Gloria laus et honor	4		
1	Josquin	Sancta trinitas	6		
1	Josquin	Cela sans plus	3		

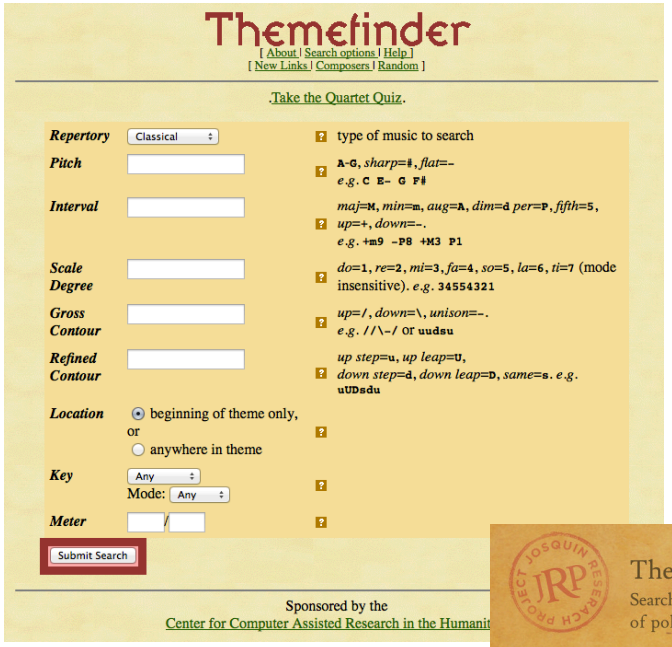
count and location of matches within score

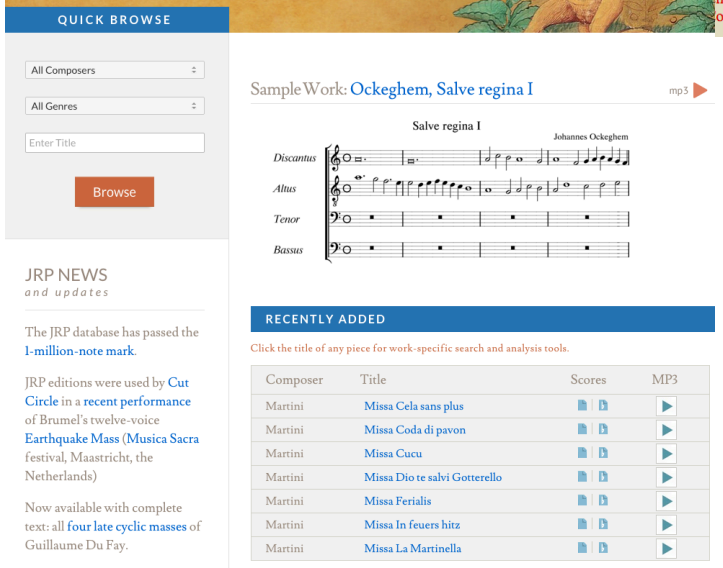
Graphical display of search results

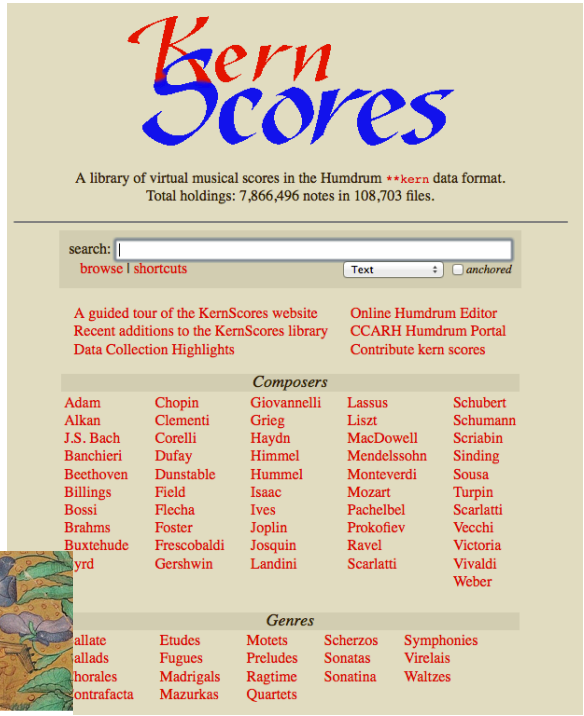
- Click on location thumbnail to view score with matches highlighted:



Themefinder/Kernscores







Search Engine

Score Database

Harmonic searching

Are there more major or minor sonorities in Bach chorales:

```
tntype *.krn | grep 3-11A | wc –l
```
5225

```
tntype *.krn | grep 3-11B | wc –l
```
10625

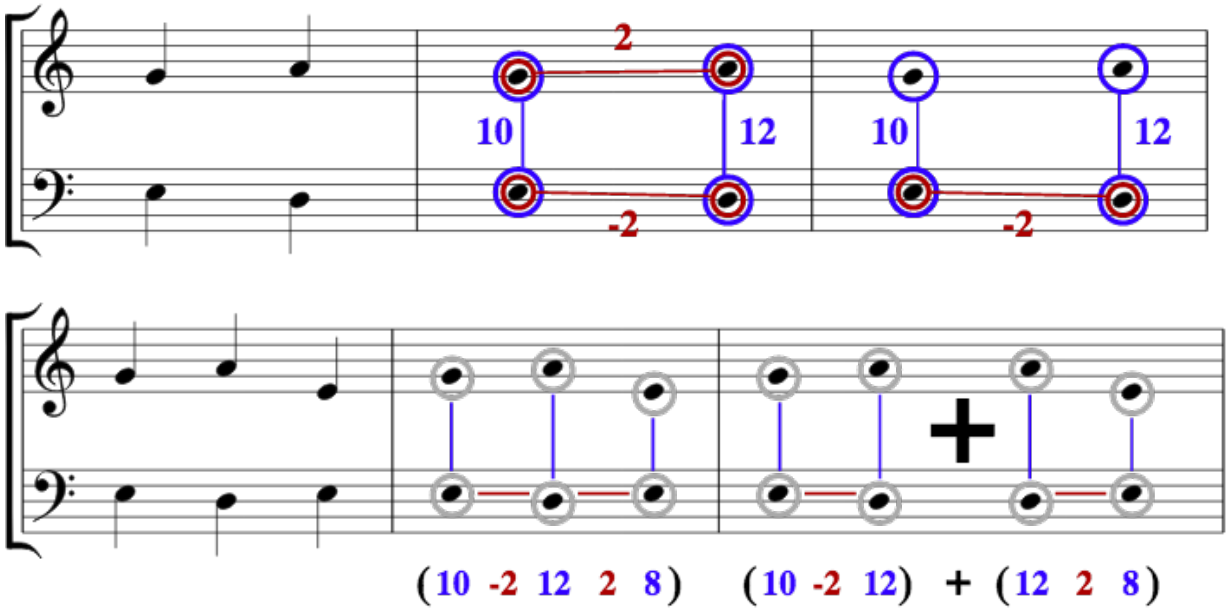
3-11 == “Forte number”: 3 pitch classes in the 11th most compact configuration.

3-11A = most compact inversion of pitch classes (minor triad)
3-11B = least compact inversion of pitch classes (major triad)

In minor keys, are the more major or minor sonorities:

```
tntype `egrep '^\*[a-g].?:' *.krn` | grep 3-11A | wc –l
tntype `egrep '^\*[a-g].?:' *.krn` | grep 3-11B | wc –l
```

cint



Search for parallel 6ths in Bach chorales:

```
cint h://370chorales --raw -Uo | grep '^6.*6$' | sortcount –pt
```

-U = don't extract repeated noted modules
-o = collapse compound intervals to within an octave (octave + 6th → 6th)
--raw = output modules, don't embed within score

http://extras.humdrum.org/man/cint/

cint

What is the most common parallel motion?

```
for var in `seq 1 8`
do
   echo Number of parallel motions for $var:
   cint *.krn --raw -Uo | grep "^$var .* $var$" | wc –l
done
```

Bach Chorales:

```
Number of parallel motions for 1:     2
Number of parallel motions for 2:    22
Number of parallel motions for 3:  5437
Number of parallel motions for 4:  1950
Number of parallel motions for 5:   135
Number of parallel motions for 6:  4890
Number of parallel motions for 7:    35
Number of parallel motions for 8:     9
```

Total number of modules: cint *.krn --raw -Uo | wc -l 69418

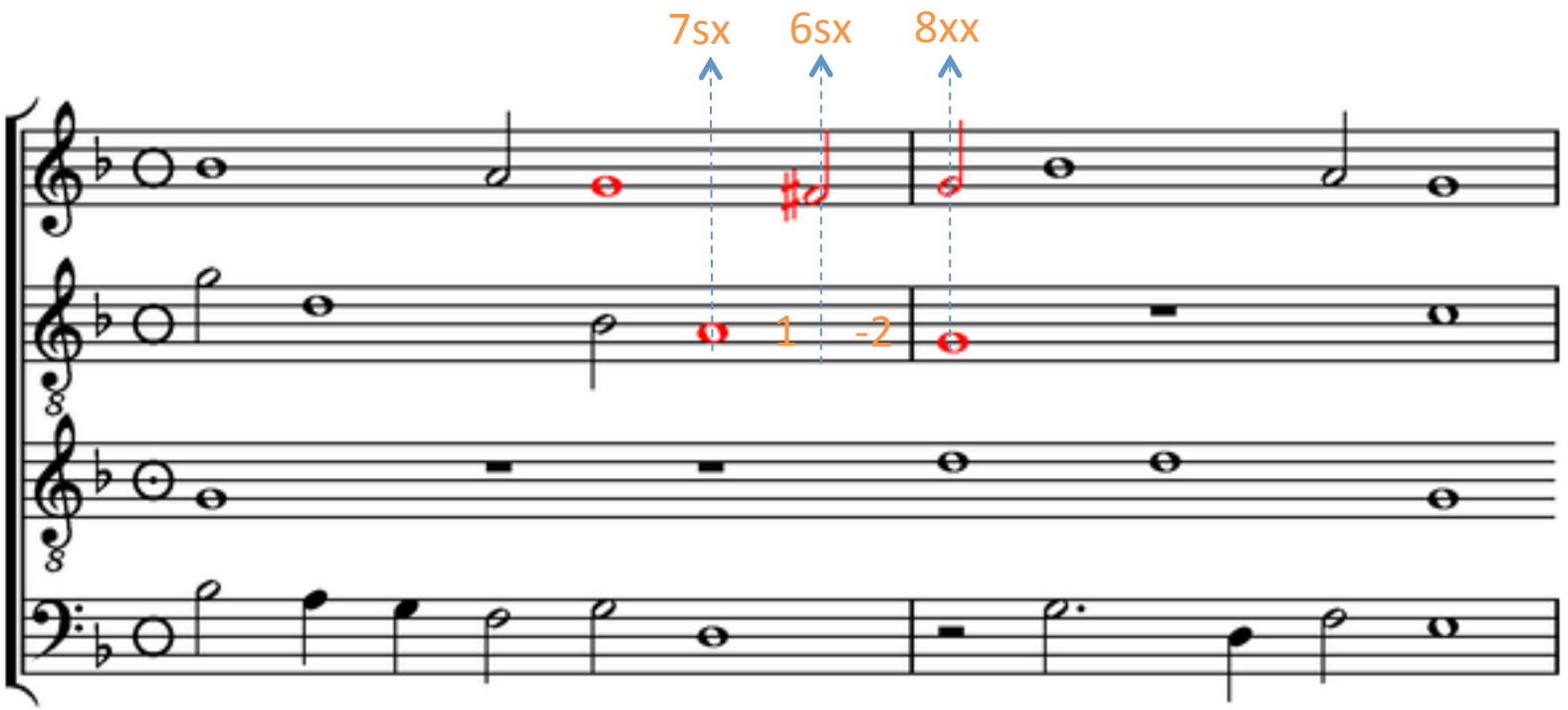
18% of music involves parallel motion

Cint searching

cint --search "7xs 1 6sx -2 8xx" -x -n 2 jrp://Bus1001a

| myank –m 7-8 | hum2muse | muse2ps =z21j

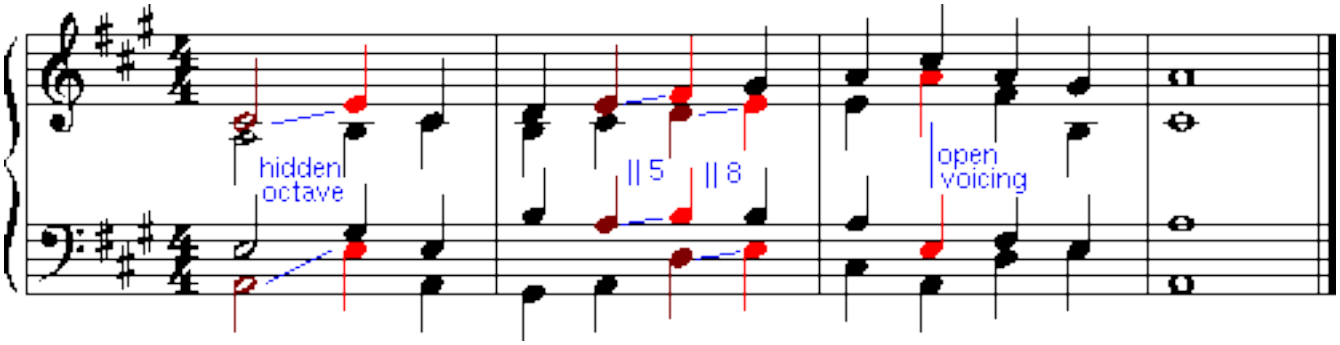
-x: add attack states
-n2: 2 module chain



chorck

Like “proof”: checks data semantics

http://extras.humdrum.org/man/chorck



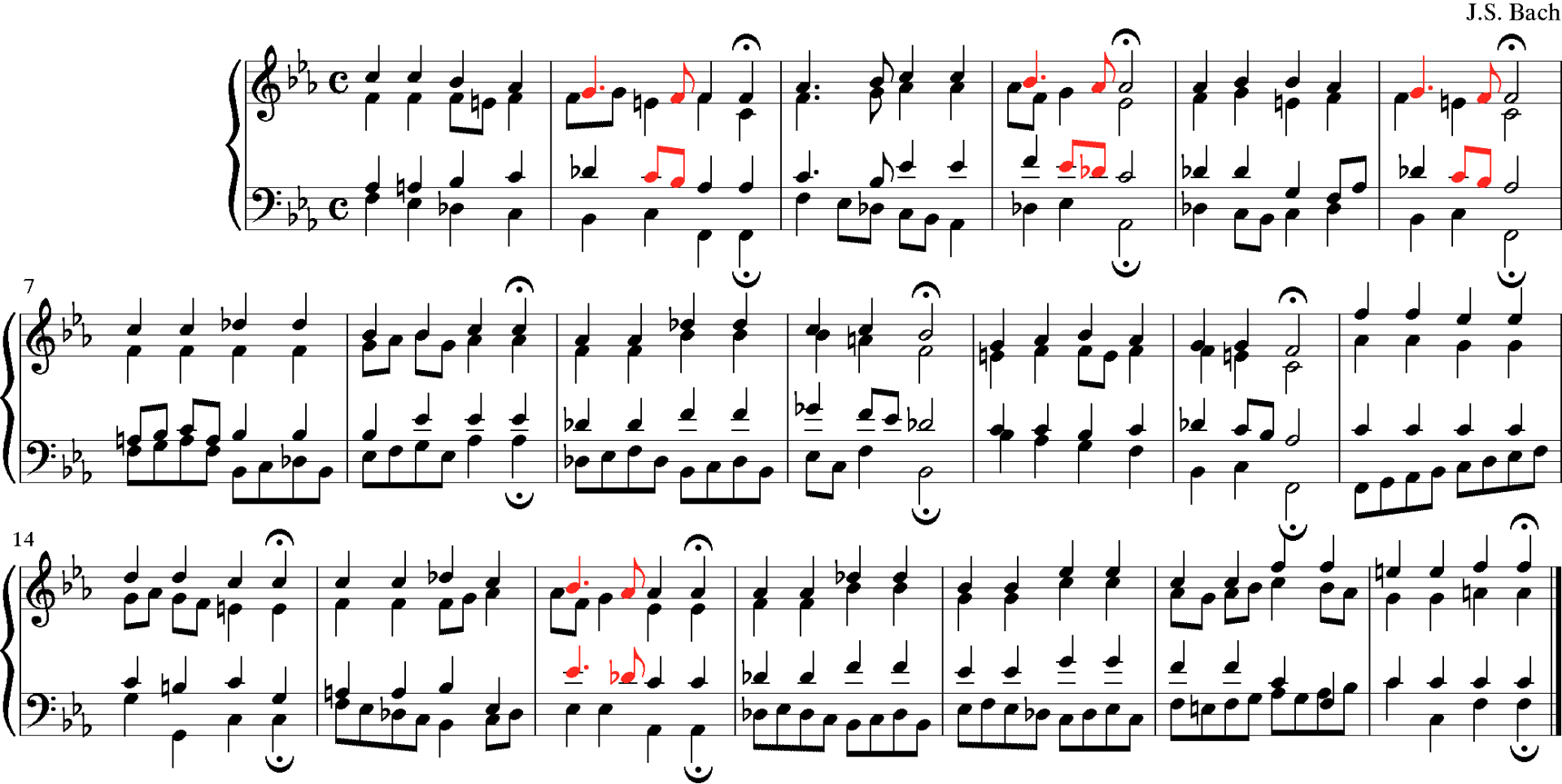
chorck h://371chorales/chor008.krn -w

3. Contrary parallel 5th between tenor and soprano on line 26
3. Contrary parallel 5th between tenor and soprano on line 40
3. Contrary parallel 5th between tenor and soprano on line 52
5. Hidden 5th between soprano and alto on line 54
5. Hidden 5th between soprano and bass on line 54
5. Hidden 5th between soprano and tenor on line 70
5. Hidden 5th between soprano and bass on line 70
5. Hidden 5th between soprano and tenor on line 85
8. Open spacing between alto and tenor on line 120
8. Open spacing between alto and tenor on line 121
3. Contrary parallel 5th between tenor and soprano on line 125
5. Hidden 5th between soprano and tenor on line 137
5. Hidden 5th between soprano and tenor on line 146
7. Voice crossing between tenor and bass on line 154
8. Open spacing between alto and tenor on line 154
7. Voice crossing between tenor and bass on line 155
8. Open spacing between alto and tenor on line 155

satb2gs

Convert 4-part SATB score to grand staff score:

```
parallel h://371chorales/chor008.krn | satb2gs | autostem | hum2muse \
    | muse2ps =z14v120,120j | pstopnm -dpi=300 | convert - -trim output.png
```

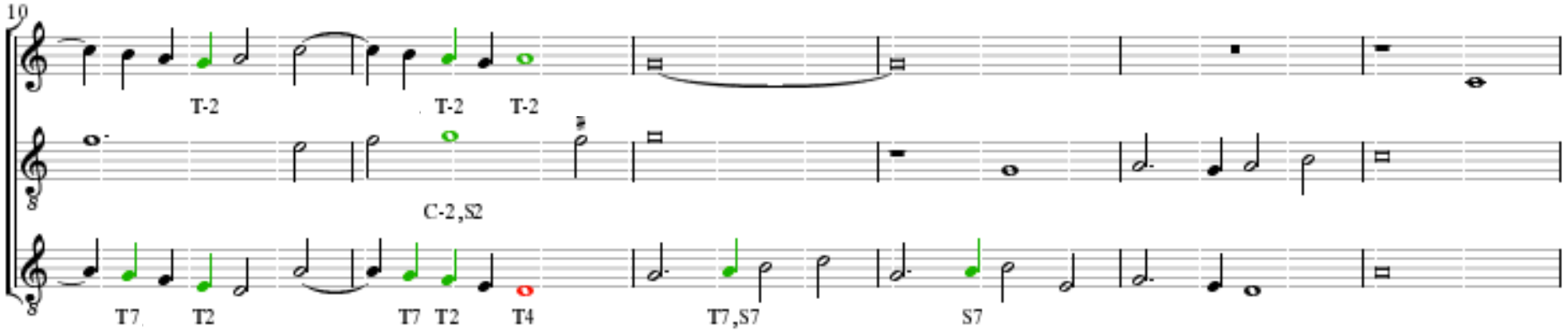


JRP Analysis Tool: dissonant

dissonant jrp://Jos2721 | myank –m 10-15

**kern	**text	**kern	**text	**kern	**text
=10	=10	=10	=10	=10	=10
4A]	.	1.f	.	4cc]	.
4G>	T7	.	.	4b	.
4F	.	.	.	4a	.
4E<	T2	.	.	4g<	T-2
2D	.	.	.	2a	.
[2A	.	2e	.	[2cc	.

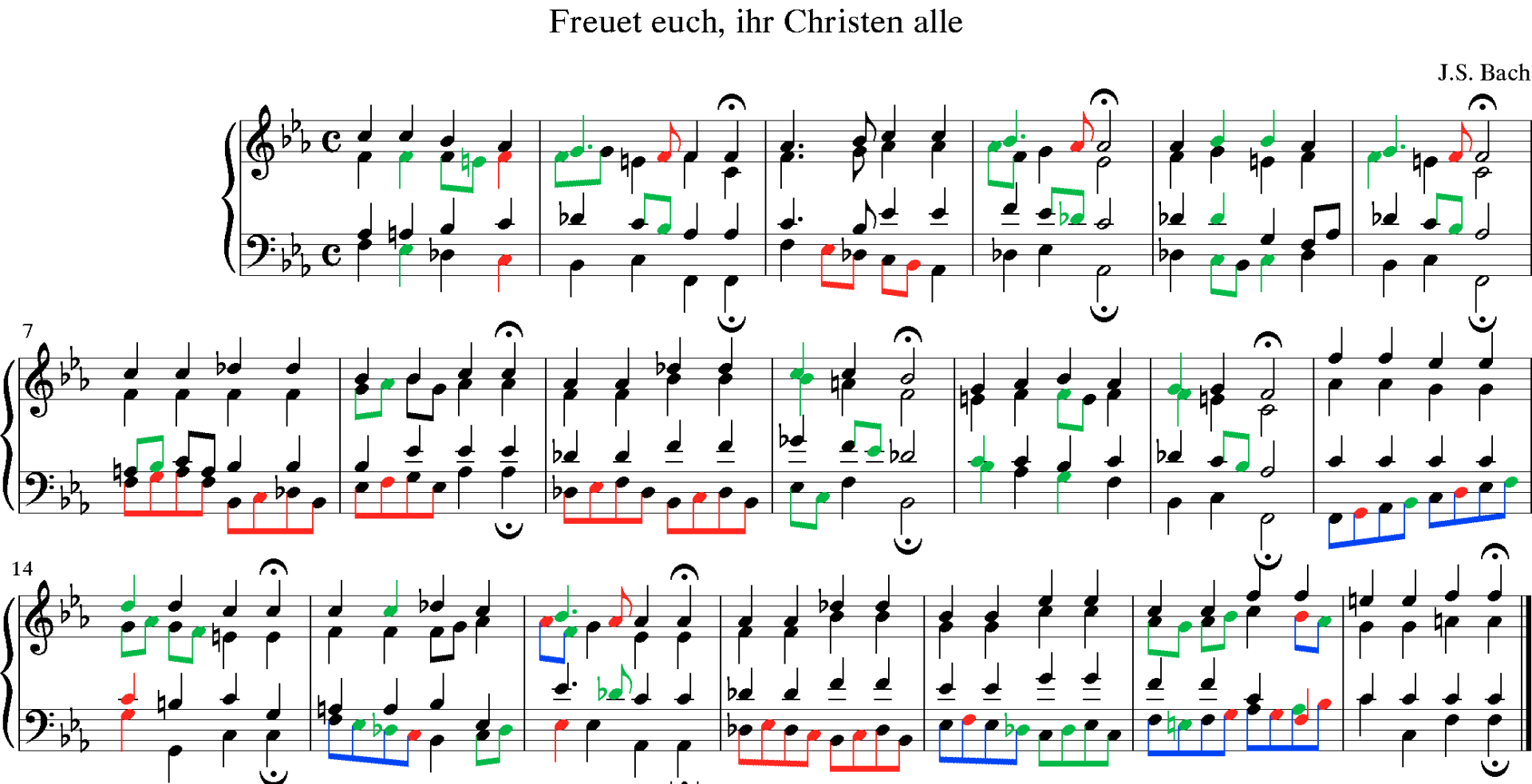
http://josquin.stanford.edu/data?a=dissonantpdf&f=Jos2721-La_Bernardina



http://museinfo.sapp.org/examples/humdrum/dissonant.cpp

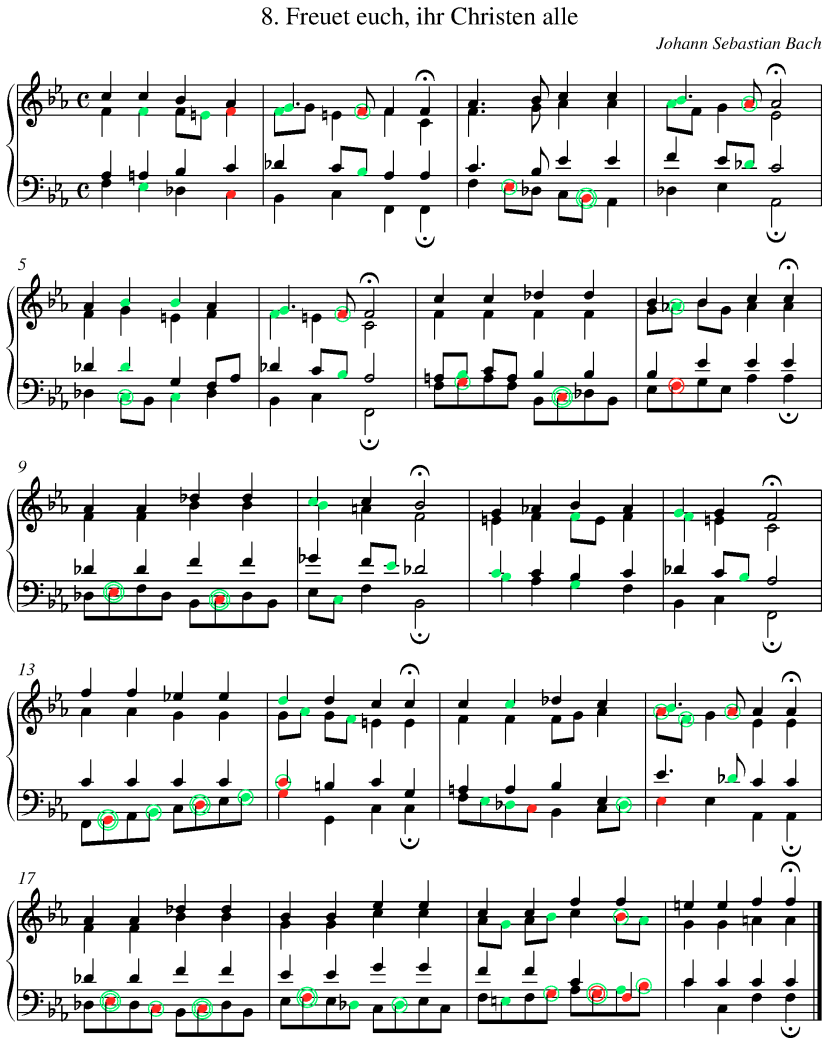
dissonant

```
dissonant h://371chorales/chor008.krn | extractx -i'**kern' | satb2gs | autostem | \
    hum2muse | muse2ps =z14jv120,100 | pstopnm -dpi=300 | convert - -trim output.png
```



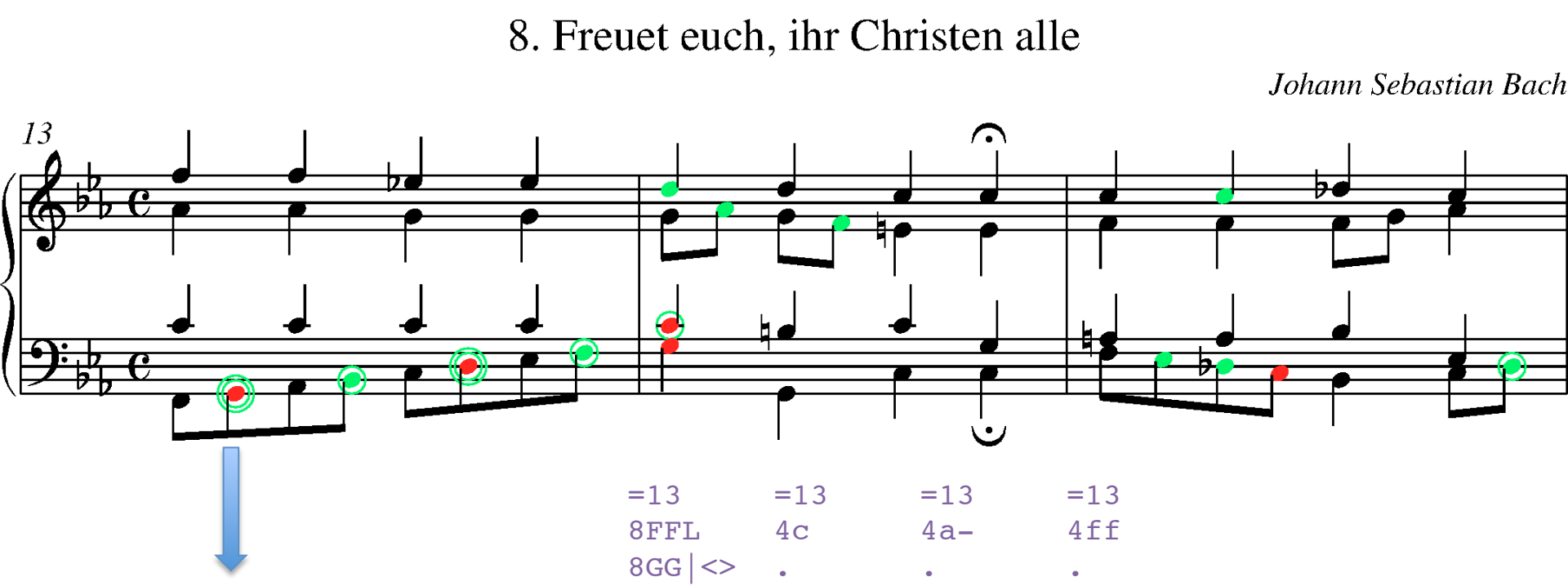
dissonant/abcm2ps

```
dissonant h://371chorales/chor008.krn | extractx -i'**kern' | satb2gs | autostem | hum2abc \
    | abcm2ps -s 0.8 - -O - | pstopnm -dpi=300 | convert - -trim output.png
```



dissonant/abcm2ps

```
dissonant h://371chorales/chor008.krn | extractx -i'**kern' | myank -m13-15 | satb2gs \
    | hum2abc | abcm2ps - -O - | pstopnm -dpi=300 | convert - -trim output.png
```



4th below tenor
2nd below alto
2nd above soprano

```
=13     =13     =13     =13
8FFL    4c      4a-     4ff
8GG|<>  .       .       .
8AA-    4c      4a-     4ff
8BB-J<> .       .       .
8CL     4c      4g      4ee-X
8D|><   .       .       .
8E-     4c      4g      4ee-
8FJ<>   .       .       .
```

JRP Analysis Tool: parallel

http://josquin.ccarh.org/data?composer=Joa&repertory=parallel

```
for i in `seq -w 371`
do
   echo \!\!chorale $i
   parallel -l h://371chorales/chor$i.krn
done | less
```

```
parallel h://371chorales/chor008.krn | autostem | hum2muse | muse2ps =z6j \
    | pstopnm -dpi=300 | convert - -trim output.png
```