

Corelli & Rule-of-the-Octave Data

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Goals

- Search for bass lines in the music of Corelli which are stepwise in motion
- Require 5 steps up or down in a sequence
- Allow for interpolated patterns (C E D F E G F A G B)
- What sonority distributions occur on each scale degree?

Download the data

humcat -s h://corelli | humsplit

```
op01n01a.krn      op01n11d.krn      op3n6-03.krn      op4n8-01.krn      op5n6-04.krn      op6n2-04.krn
op01n01b.krn      op01n12a.krn      op3n6-04.krn      op4n8-02.krn      op5n6-05.krn      op6n3-01.krn
op01n01c.krn      op01n12b.krn      op3n7-01.krn      op4n8-03.krn      op5n7-01.krn      op6n3-02.krn
op01n01d.krn      op01n12c.krn      op3n7-02.krn      op4n9-01.krn      op5n7-02.krn      op6n3-03.krn
op01n02a.krn      op01n12d.krn      op3n7-03.krn      op4n9-02.krn      op5n7-03.krn      op6n3-04.krn
op01n02b.krn      op3n1-01.krn      op3n7-04.krn      op4n9-03.krn      op5n7-04.krn      op6n3-5abcd.krn
op01n02c.krn      op3n1-02.krn      op3n8-01.krn      op4n9-04.krn      op5n8-01.krn      op6n3-5efg.krn
op01n02d.krn      op3n1-03.krn      op3n8-02.krn      op5n1-02.krn      op5n8-02.krn      op6n4-01.krn
op01n03a.krn      op3n1-04.krn      op3n8-03.krn      op5n1-03.krn      op5n8-03.krn      op6n4-02.krn
op01n03b.krn      op3n10-01.krn   op3n8-04.krn      op5n1-04.krn      op5n8-04.krn      op6n4-03.krn
op01n03c.krn      op3n10-02.krn   op3n9-01.krn      op5n10-01.krn   op5n9-01.krn      op6n4-04.krn
op01n04a.krn      op3n10-03.krn   op3n9-02.krn      op5n10-02.krn   op5n9-02.krn      op6n4-05.krn
op01n04b.krn      op3n10-04.krn   op3n9-03.krn      op5n10-03.krn   op5n9-03.krn      op6n5-01.krn
op01n04c.krn      op3n11-01.krn   op3n9-04.krn      op5n10-04.krn   op5n9-04.krn      op6n5-02.krn
op01n04d.krn      op3n11-02.krn   op4n1-01.krn      op5n10-05.krn   op6n1-01.krn      op6n5-04.krn
op01n05a.krn      op3n11-03.krn   op4n1-03.krn      op5n11-01.krn   op6n1-02.krn      op6n5-05.krn
op01n05b.krn      op3n11-04.krn   op4n10-02.krn     op5n11-02.krn   op6n1-03.krn      op6n6-01.krn
op01n05c.krn      op3n12-01.krn   op4n10-03.krn     op5n11-03.krn   op6n1-04.krn      op6n6-02.krn
op01n05d.krn      op3n12-02.krn   op4n11-01.krn     op5n11-04.krn   op6n1-05.krn      op6n6-03.krn
op01n06a.krn      op3n12-03.krn   op4n11-02.krn     op5n11-05.krn   op6n1-06.krn      op6n6-04.krn
op01n06b.krn      op3n12-04.krn   op4n11-03.krn     op5n2-01.krn    op6n10-01.krn     op6n6-05.krn
op01n06c.krn      op3n12-05.krn   op4n12-01.krn     op5n2-02.krn    op6n10-02.krn     op6n7-01.krn
op01n06d.krn      op3n12-06.krn   op4n12-02.krn     op5n2-03.krn    op6n10-03.krn     op6n7-02.krn
op01n07a.krn      op3n12-07.krn   op4n12-03.krn     op5n2-04.krn    op6n10-04.krn     op6n7-03.krn
op01n07b.krn      op3n2-01.krn    op4n2-01.krn      op5n2-05.krn    op6n10-05.krn     op6n7-04.krn
op01n07c.krn      op3n2-02.krn    op4n2-03.krn      op5n3-01.krn    op6n10-06.krn     op6n7-05.krn
op01n08a.krn      op3n2-03.krn    op4n3-01.krn      op5n3-02.krn    op6n11-01.krn     op6n7-06.krn
op01n08b.krn      op3n2-04.krn    op4n3-02.krn      op5n3-03.krn    op6n11-02.krn     op6n8-01.krn
op01n08c.krn      op3n3-01.krn    op4n3-03.krn      op5n3-04.krn    op6n11-03.krn     op6n8-02.krn
op01n08d.krn      op3n3-02.krn    op4n3-04.krn      op5n3-05.krn    op6n11-04.krn     op6n8-03.krn
op01n09a.krn      op3n3-03.krn    op4n4-01.krn      op5n4-01.krn    op6n11-05.krn     op6n8-04.krn
op01n09b.krn      op3n3-04.krn    op4n4-02.krn      op5n4-02.krn    op6n11-06a.krn    op6n8-05.krn
op01n09c.krn      op3n4-01.krn    op4n4-03.krn      op5n4-03.krn    op6n11-06bcd.krn  op6n8-06.krn
op01n09d.krn      op3n4-02.krn    op4n5-01.krn      op5n4-04.krn    op6n11-06e.krn    op6n8-07.krn
op01n10a.krn      op3n4-03.krn    op4n5-02.krn      op5n4-05.krn    op6n11-06fg.krn   op6n9-01.krn
op01n10b.krn      op3n4-04.krn    op4n5-03.krn      op5n5-01.krn    op6n12-01.krn     op6n9-02.krn
op01n10c.krn      op3n5-01.krn    op4n5-04.krn      op5n5-02.krn    op6n12-02.krn     op6n9-03.krn
op01n10d.krn      op3n5-02.krn    op4n6-02.krn      op5n5-04.krn    op6n12-03.krn     op6n9-04.krn
op01n10e.krn      op3n5-03.krn    op4n6-03.krn      op5n5-05.krn    op6n12-04.krn     op6n9-05.krn
op01n11a.krn      op3n5-04.krn    op4n7-01.krn      op5n6-01.krn    op6n12-05.krn     op6n9-06.krn
op01n11b.krn      op3n6-01.krn    op4n7-03.krn      op5n6-02.krn    op6n2-02.krn
op01n11c.krn      op3n6-02.krn    op4n7-04.krn      op5n6-03.krn    op6n2-03.krn
```

Bass line

- The bass line is the first spine in all files
- To extract only the first spine from a file (bash shell syntax):

```
for i in *.krn
do
  extract -p 1 $i > `basename $i .krn`.bass
  echo $i is done
done
```

```
cat *.bass | census -k
```

Number of notes: 29772

Create a thema search index

```
tindex *.krn | grep ::1 > bass.tindex
```

“grep ::1” extracts the bass-line entries from the index (don’t need to use extract).

Search by scale degree

<http://extras.humdrum.org/man/themax/#scaledegree>

`themax -d "1 2 3 4 5" bass.tindex`

op01n01a.krn::1	10	op3n1-01.krn::1	2	op5n10-01.krn::1	19
op01n01b.krn::1	81	op3n1-03.krn::1	5 68 107	op5n10-05.krn::1	45
op01n02d.krn::1	147	op3n1-04.krn::1	127	op5n2-02.krn::1	43
op01n03a.krn::1	2	op3n12-03.krn::1	14	op5n4-05.krn::1	149
op01n03c.krn::1	83	op3n12-05.krn::1	6	op5n6-02.krn::1	190
op01n04a.krn::1	41	op3n3-01.krn::1	48	op5n7-02.krn::1	100
op01n04d.krn::1	35	op3n4-04.krn::1	124	op5n8-01.krn::1	2
op01n07a.krn::1	22 66 71 131	op3n5-02.krn::1	109	op6n1-05.krn::1	78 118
op01n07c.krn::1	56 140 158 165	op3n5-04.krn::1	37	op6n11-01.krn::1	26
op01n08a.krn::1	5	op4n1-03.krn::1	29	op6n2-02.krn::1	14 57
op01n08b.krn::1	1 24	op4n11-03.krn::1	52	op6n3-04.krn::1	11 36 42
op01n08d.krn::1	3 32	op4n12-01.krn::1	26	op6n4-03.krn::1	36 43
op01n11a.krn::1	2	op4n3-01.krn::1	56	op6n5-01.krn::1	48 119
op01n11c.krn::1	11 27	op4n5-02.krn::1	153	op6n5-02.krn::1	38
op01n12a.krn::1	1	op4n7-04.krn::1	13	op6n7-03.krn::1	74
op01n12d.krn::1	11 68 125	op5n1-04.krn::1	164	op6n8-03.krn::1	44 57 123 159

- numbers are the starting note in the file where the match occurs

Report starting/ending note

- show the starting/ending note index of the match:

```
themax -d "1 2 3 4 5" bass.tindex --loc
```

```
op01n01a.krn::1 10-14
op01n01b.krn::1 81-85
op01n02d.krn::1 147-151
op01n03a.krn::1 2-6
op01n03c.krn::1 83-87
op01n04a.krn::1 41-45
op01n04d.krn::1 35-39
op01n07a.krn::1 22-26 66-70 71-75 131-135
op01n07c.krn::1 56-60 140-144 158-162 165-169
op01n08a.krn::1 5-9
op01n08b.krn::1 1-5 24-28
op01n08d.krn::1 3-7 32-36
op01n11a.krn::1 2-6
op01n11c.krn::1 11-15 27-31
op01n12a.krn::1 1-5
```

Measure/Beat locations

themax -d "1 2 3 4 5" bass.tindex --loc

op01n01a.krn::1	10=3B1-14=3B3
op01n01b.krn::1	81=25B1-85=27B1
op01n02d.krn::1	147=86B1-151=88B3
op01n03a.krn::1	2=1B4-6=2B3
op01n03c.krn::1	83=50B3-87=51B2.5
op01n04a.krn::1	41=16B1-45=18B1
op01n04d.krn::1	35=12B1-39=13B3
op01n07a.krn::1	22=8B1-26=8B3 66=16B4-70=18B1 71=18B3-75=20B1 131=37B1-135=37B3
op01n07c.krn::1	56=18B5.5-60=19B5.5 140=42B5.5-144=43B5.5 158=48B1-162=49B1 165=50B1-169=51B1
op01n08a.krn::1	5=2B1-9=2B3
op01n08b.krn::1	1=1B1-5=1B3 24=4B3-28=5B1
op01n08d.krn::1	3=3B1-7=3B3 32=18B1-36=19B3
op01n11a.krn::1	2=1B3-6=2B3
op01n11c.krn::1	11=6B1-15=7B2 27=13B1-31=15B1
op01n12a.krn::1	1=1B1-5=1B3

10=3B1-14=3B3

- from note 10 to 14
- from measure 3 to 3
- from beat 1 to 3
(i.e., this is too short)

Myank

op01n01a.krn::1 10=3B1-14=3B3

- mark the match in the original data:

```
echo "op01n01a.krn::1 10-14" | theloc -m
```

- yank only the measures containing a marked note:

```
echo "op01n01a.krn::1 10-14" | theloc -m | myank --marks
```

=3-	=3-	=3-	=3-
8F\L@	8F\L	4.ff\	4.aa\
8G\@	8G\	.	.
8A\@	8A\	.	.
8B\J@	8B\J	8ff\	8aa\
4.c\@	4.c\	4.ee\	8gg\L
.	.	.	(16aa\L
.	.	.	16gg\JJ)
.	.	.	[4aa\
(16B-\LL	(16B-\LL	(16dd\LL	.
16A\JJ)	16A\JJ)	16cc\JJ)	.
=	=	=	=

Displaying in notation

```
echo "op01n01a.krn:::1 10-14" | theloc -m | myank --marks -T | hum2muse \  
| muse2ps =z21c200 | convert -quality 100 -density 300 - -resize 50% output.png
```

3 Grave

The image shows a musical score for measures 10-14 of a piece titled "Grave". The score is written in 4/4 time and features a key signature of one flat (B-flat). It consists of four staves. The first two staves are in the treble clef, and the last two are in the bass clef. The first measure is marked with a "3" above it, indicating a triplet. The notation includes various note values, rests, and phrasing slurs. The bottom staff has a red highlight under the first four notes of the first measure.

Make a PDF file of matches

```
#!/usr/bin/perl
```

```
use strict;  
my $line;
```

```
while ($line = <>) {  
    createMatchEpsFiles($line);  
}  
print "CREATING Results.pdf...\n";  
'cat TEMP-*.eps | ps2pdf -sPAPERSIZE=letter -- > Results.pdf';  
'rm -f TEMP-*.eps';
```

```
sub createMatchEpsFiles {  
    my ($filematches) = @_;  
    chomp $filematches;  
    my @fields = split (/\\t+/, $filematches);  
    my $filename = $fields[0];  
    $filename =~ s/(\\.[a-z]{3})?::1//i;  
    my $command = "echo \"$filematches\" | theloc -m";  
    $command .= " | myank --marks --double -T | hum2abc -T \"$filename\"";  
    $command .= " | abcm2ps --O - > TEMP-$filename.eps";  
    print "$command\n";  
    '$command';  
}
```

```
themax -d "1 2 3 4 5" bass.tindex --loc | ./matchpdf
```



- save to file “matchpdf”
- make executable:
 - `chmod 0755 matchpdf`
 - or `chmod u+x matchpdf`

Other searches

- Search for falling stepwise motion from 5 to 1:

```
themax -d "5 4 3 2 1" bass.tindex --loc | ./matchpdf
```

- Allow for repeated notes:

```
themax -d "1+ 2+ 3+ 4+ 5+" bass.tindex --loc | ./matchpdf
```

- Allow alternating pitches:

```
themax -d "5+ 3+ 4+ 2+ 3+ 1+" bass.tindex --loc | ./matchpdf
```

- Allow allow for any alternate notes:

```
themax -d "5 . 4 . 3 . 2 . 1" bass.tindex --loc | ./matchpdf
```

- Pattern must start on a down beat (-l is metric position search):

```
themax -d "54321" -l 1 bass.tindex --loc | ./matchpdf
```

more searches

- Search for 5 stepwise rising notes in a row:

```
themax -d "+2 +2 +2 +2" bass.tindex --loc | ./matchpdf
```

- Search for 5 stepwise rising notes in a row, allowing one repeat of notes or a chromatic rise:

```
themax -d "+2 1? +2 1? +2 1? +2 1?" bass.tindex --loc | ./matchpdf
```

Sonorities by scale degree

```
#!/usr/bin/perl
```

```
use FileHandle;
#use IPC::Open2;
use IPC::Open3;
use IO::File;
```

```
use strict;
my $content;
my $matches;
my $line;
```

```
while ($line = <>) {
    $content .= getMatches($line);
}
```

```
my $finalcommand = "dittox | tntype -at | ridx -H | grep @";
$finalcommand .= " | sed 's/.*\t//' | sortcount -pht";
my ($results, $error) = getResults($content, $finalcommand);
die $error if $error !~ /\^\s*$/;
print $results;
```

```
sub getMatches {
    my ($filematches) = @_ ;
    chomp $filematches;
    my @fields = split (/\\t+/, $filematches);
    my $filename = $fields[0];
    $filename =~ s/(\\.[a-z]{3})?::1//i;
    my $command = "echo \"$filematches\" | theloc -m";
    $command .= " | myank --marks --double -T";
    $command .= " | transpose -k c";
    my $result = ` $command `;
    return $result;
}
```

```
sub getResults {
    my ($input, $command) = @_ ;
    local (*READ, *WRITE);
    local *ERROR = IO::File->new_tmpfile;
    my $pid = open3(*WRITE, *READ, ">&ERROR", "$command");
    print WRITE "";
    print WRITE $input;
    close(WRITE);
    my $output = "";
    my $error = "";
    my $udata;
    while (read(READ, $udata, 4096)) {
        $output .= $udata;
    }
    close (READ);
    waitpid($pid, 0);
    seek ERROR, 0, 0;
    while (read(ERROR, $udata, 4096)) {
        $error .= $udata;
    }
    return ($output, $error);
}
```

Sonorities by scale degree (2)

themax -d 3 bass.tindex --loc | ./getsonority | less

1	2	3	4	5	6	7
16.67 2-4T00	8.93 2-4T02	11.91 2-3T04	10.07 2-4T05	16.3 3-11BT07	11.75 2-3T09	10.62 2-4T07
15.08 3-11BT00	8.77 3-11BT02	10.13 3-11BT00	9.35 3-11BT05	16.26 2-4T07	7.99 3-11AT09	9.58 2-3T11
11.64 1-1T00	6.75 2-3T02	9.01 2-4T00	7.25 1-1T05	10.85 1-1T07	7.27 2-4T08	9.14 3-11BT07
7.65 2-5T07	6.73 1-1T02	7.82 2-4T03	6.94 2-3T05	7.64 2-5T02	5.54 2-5T04	5.44 3-11BT10
6.78 2-3T00	6.62 2-5T09	5.43 3-11BT03	6.78 2-5T00	4.95 3-9T00	5.45 3-11BT05	5.22 2-4T10
3.66 3-11AT00	4.24 3-11AT02	4.81 1-1T04	5.33 2-3T02	4.44 2-3T07	5.43 1-1T09	3.91 2-3T07
3.36 2-3T09	4.03 3-9T07	3.96 2-5T11	4.96 3-11AT05	3.38 2-3T04	4.45 2-4T05	3.91 1-1T11
2.36 2-4T08	3.44 2-3T11	3.83 3-11AT04	3.91 2-4T02	3.37 3-8AT05	4.45 3-11AT05	3.38 3-11AT07
2.23 3-9T05	3.29 2-2T00	3.77 1-1T03	3.44 3-11AT02	2.67 2-5T07	3.48 3-11BT08	3.14 1-1T10
2.17 3-11AT09	3.07 3-8AT00	3.54 2-3T00	3.03 3-11BT02	2.2 2-2T05	3.43 3-7AT07	2.92 2-3T10
1.9 2-5T00	3.05 3-7AT00	3.33 3-11AT00	3.02 2-3T06	2.14 3-11AT04	3.25 2-3T05	2.82 3-10T11
1.87 2-2T00	2.38 2-5T02	2.76 3-11BT04	1.91 3-7AT00	1.93 3-11AT07	2.85 1-1T08	2.79 2-5T05
1.29 3-11BT08	2.04 2-4T10	2.04 3-7AT02	1.67 2-2T05	1.7 2-4T03	2.84 2-2T07	2.17 3-11AT10
1.17 3-7BT07	1.96 3-10T11	1.76 2-5T10	1.53 3-4AT04	1.62 2-2T07	2.41 3-11BT09	1.6 3-11BT11
1.05 3-7AT07	1.93 2-4T01	1.76 2-4T04	1.29 3-10T11	1.38 4-27BT11	1.95 3-4AT07	1.58 3-7AT09
1.02 3-7AT00	1.82 3-11BT10	1.38 2-2T02	1.22 3-7BT00	1.35 3-11BT00	1.8 2-4T09	1.41 3-8AT08
0.97 2-2T10	1.72 1-1T01	1.2 3-10T04	1.12 3-10T06	1.31 3-11BT03	1.56 2-5T03	1.39 2-5T06
0.96 3-6T00	1.64 3-11AT10	1.07 2-5T03	1.09 3-6T05	1.22 3-7BT02	1.48 2-5T09	1.31 2-6T05
0.93 3-8AT10	1.62 2-2T02	1.04 2-5T04	1.08 3-2BT05	1.07 3-11BT04	1.31 2-3T06	1.26 2-2T09
0.89 2-4T09	1.57 3-11BT01	1.01 3-11AT09	1.08 4-26T09	0.78 2-4T04	1.25 3-9T02	1.21 3-9T03
0.83 3-4BT00	1.38 2-3T10	0.99 3-9T0	1.03 3-4BT00	0.76 3-7AT05	1.03 2-2T09	1.16 2-5T11

Sonorities by scale degree (2)

themax -d 3 bass.tindex --loc | ./getsonority | less

1

16.67 2-4T00
15.08 3-11BT00
11.64 1-1T00
7.65 2-5T07
6.78 2-3T00
3.66 3-11AT00
3.36 2-3T09
2.36 2-4T08
2.23 3-9T05
2.17 3-11AT09
1.9 2-5T00
1.87 2-2T00
1.29 3-11BT08
1.17 3-7BT07
1.05 3-7AT07
1.02 3-7AT00
0.97 2-2T10
0.96 3-6T00
0.93 3-8AT10
0.89 2-4T09
0.83 3-4BT00

3-11BT00 == 3-11B: (major triad) T00: I

3-11AT00 == 3-11A: (minor triad) T00: i

3-9T05 == {F,G,C} : start of 4-3 suspension on C: CFG → CEG

3-11AT09 == {A,C,E}: vi

3-11BT08 == {Ab,C,Eb}: bVI

3-7BT07 == {C,G,Bb}: V7/IV (missing 3rd)

3-7AT07 == {C,G,A}

3-7AT00 == {C,D,F}