Informatics for Musicology (IPM) 2024/25

Jupyter Notebooks

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Class from 12-Nov:

> 1st part - Continued exploration of the IPM (Haskell) libraries for 'Computer-Aided Musicology': sampling (completion), pedal note interleaving (`intersperse`) and rhythmic manipulation. Introduction to harmonic analysis by verticalization (chord extraction via functions `sample` and `chordify`).
>
> 2nd part - **Presentation of the 2nd practical work** : producing a video of the *performance* of a song with simultaneous viewing of the animated score. (Like, for example, in this video where David Bruce's Lick Quartet is played .) Tools:
>
> > - Openshot - to edit and generate the video
> > - ABC - to generate animated scores
> > - Quicktime - to make screen videos
> > - VLC - to view/convert formats (etc)
>
> Others:
>
> > - Powerpoint - to produce images, slides
> > - Audacity – for audio editing (if needed)

⚠️ **Important** : run without moving the next cells.

Standard modules:

In [ ]:
```
: opt  no - lint
: m  Data . Char
: m  Date . List
: m  Date . Ratio
```

Modules developed for the discipline:

In [ ]:
```
: l  ../ src / Cp . hs
: l  ../ src / Reducer . hs
: l  ../ src / Ipm . hs
: l  ../ src / Abc . hs
```

Data ("case studies"):

In [ ]:
```
: l  ../ src / CS . hs
```

🔴Sampling (completion)

9.1 - Remember the case study *Canon per 3 Violini e Basso* by Johann Pachelbel (1653-1706):

In [ ]:
```
pachelbel  n  =  abcPlay  "D"  "C"  ( take  n  quatern )
---
( pachelbel  30  .  P )  [ v1 , v2 , v3 , v4 ]
```

a) What do you think is the purpose of defining the function `pachelbel` ?

b) Analyze the construction of the next cell and anticipate its result:

In [ ]:
```
( pachelbel  57  .  sample  bin  .  P )  [ v1 , v2 , v3 , v4 ]
```

9.2 - Interpret the sampling of the four voices from the following cell and try it out:

In [ ]:
```
s    =  3 % 4 : 1 % 4 : s
r    =  1 % 2 : r
t    =  1 % 4 : 1 % 2 : 1 % 4 : t
---
v1'  =  sample  s  v1
v2'  =  sample  r  v2
v3'  =  sample  ( tail  s )  v3
v4'  =  sample  t  v4
---
( pachelbel  57  .  P )  [ v1' , v2' , v3' , v4' ]
```

As already done above, appreciate the result above using `abcShow` etc.

In [ ]:
```
abcShow
```

(At home: try other samples that make the result so abstract that Pachelbel's original is no longer noticeable.)

🔴Interleaving

9.3 - Execute the next cell and answer: what does the function do `intersperse` ?

In [ ]:
```
a  =  map  fst  frerej
b  =  intersperse  "C"  a
c  =  zip  b  half
d  =  zip  a  una
---
abcPlayM  "F"  "C"  ( d  #  c )
```

9.4 - Consider the following fragment from a well-known work by Isaac Albéniz (1860-1909):

In [ ]:
```
( abcPlayM  "G"  "3/4"  .  dgroup  una )  albeniz
```

Indicate in the next cell how you would remove the *B* note (B) that is repeated continuously ("catchphrase") while maintaining the structure of the song (measures, etc.).

In [ ]:

And how would I go about reintroducing that note back into the song?

In [ ]:

🔴Rhythm manipulation

9.5 - Start by considering:

Designation	Meaning	Detailed description
`f × g`	parallel	applies `f` and `g` in parallel, ie at the same time: `(f × g)(a,b)=(f a, g b)` . Because it is more practical, we often use it `f >< g` instead of `f × g`

After analyzing the following definitions of stylistic resources in music,

In [ ]:
```
increase  =  map  ( id  ×  ( 2 * ))
decrease  =  map  ( id  ×  ( / 2 ))
retrograde  =  reverse
```

replace `id` each of them below and observe the result:

In [ ]:
```
( abcplease  .  id )  carnaval_serrano
```

In [ ]:
```
( abcplease  .  id )  carnaval_serrano
```

9.6 - Interpret the following definition. What does the function that is declared there do?

In [ ]:
```
rev  m  =  zip    ( reverse  p )  d
       where  ( p , d )  =  unzip  m
```

Confirm your interpretation by running the next cell:

In [ ]:
```
( abcPlayM  "F"  "4/4"  .  rev )  frerej
```

9.7 - Take inspiration from the previous function to declare the following one, which should replace the rhythm of the melody `m` with `r` :

In [ ]:
```
chgr  r  m  =  undefined
```

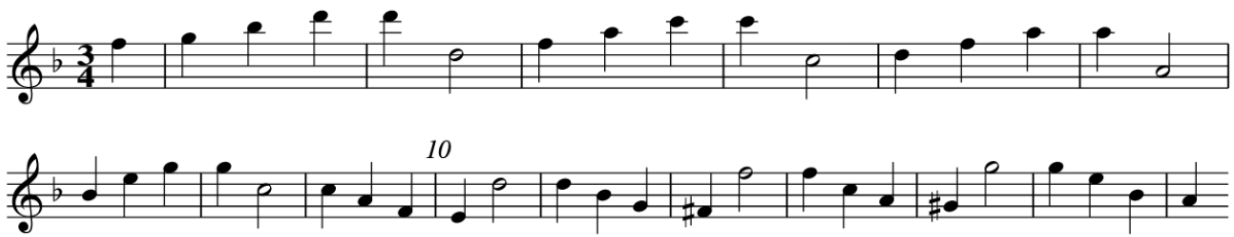
Then use it to show the frerej notes all as semibreves and without any repetitions.

In [ ]:
```
x  =  undefined
---
abcplease  x
```

9.8 - Let's return to the theme of the *Abegg Variations* , opus 1 by Robert Schumann:

In [ ]:
```
c  =  1 % 4 : tern
---
abcPlay  "F"  "3/4"  c  abegg
```

Show what you have to do `reverse abegg` to get the following effect (variant of the melody in retrograde motion):



In [ ]:
```
```

🔴"Chordification"

9.9 - Let the following cell be given:

In [ ]:
```
h =  [ "C" , "E" , "G" , "B " , "e" , "g" , "c'" , "a" , "f" , "c" , "G" , "E " , "C" , "G," ]
a = zip  h  una
---
abcplease  a
```

Read the following and draw conclusions about the difference in meaning between `chordify` and `sample` :

In [ ]:
```
abcplease  ( sample  tern  a )
```

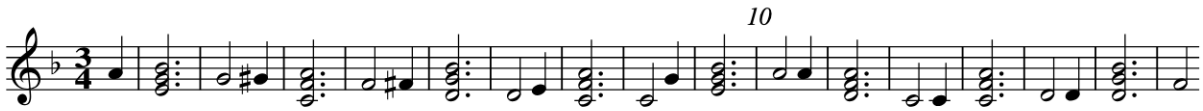
In [ ]:
```
abcplease  ( chordify  tern  a )
```

In [ ]:
```
c  =  1 % 4 : tern
---
abcPlay  "F"  "3/4"  c  abegg
```

9.10 - Use `chordify` in the next cell to replace the arpeggios of the odd measures of the *Abegg Variations* theme (opus 1 by Robert Schumann) with the respective chords.

In [ ]:
```
c = 1 % 4 : tern
s  =  undefined
---
( abcPlay  "F"  "3/4"  c  ....  chordify  ...  abegg
```

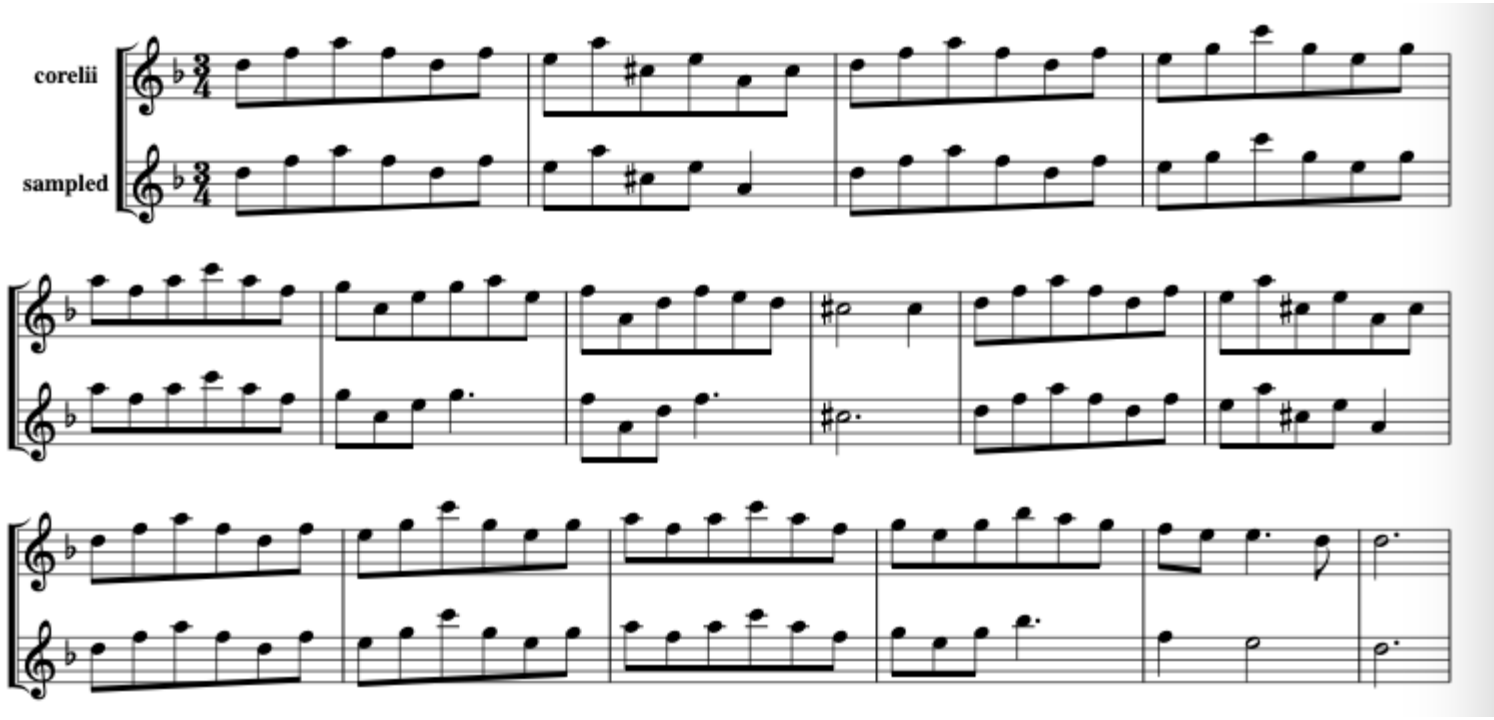
9.11 - What function `f` must be interleaved for the result of the previous paragraph to be the following?



In [ ]:
```
f  =  collapse
---
( abcPlay  "F"  "3/4"  c  .  chordify  s  .  f )  abegg
```

🔴Harmonic analysis by sampling and "chordification"

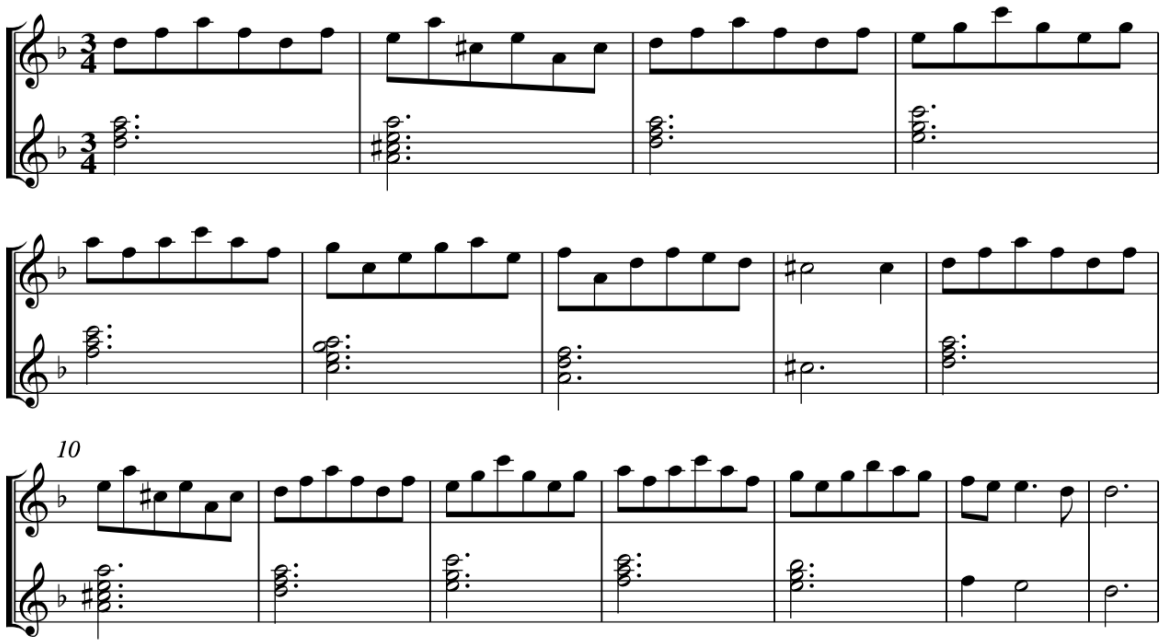
9.12 - The image shows a fragment of the sonata La Folia by Arcangelo Corelli (second variation), recording in the other pentagram a sampling that removes passing notes, thus highlighting those with tonal relevance:



Construct the sampling sequence `a` that produces the effect shown in the figure.

In [ ]:
```
a = undefined
s = sample a corelli
---
s
abcPlayM "F" "3/4" ( corelli # s )
abcShow
```

9.13 - Use the previous `chordify` paragraph `s` to perform the tonal analysis shown:



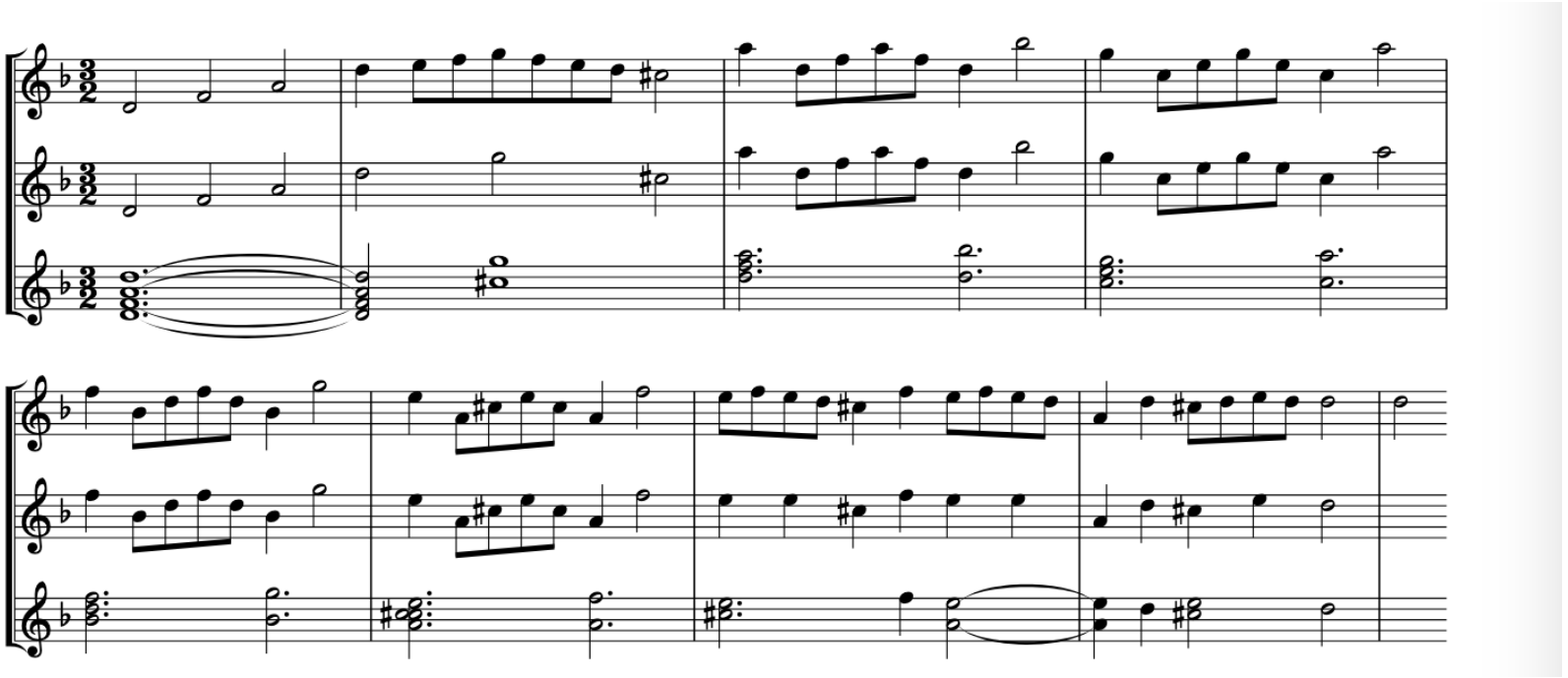
In [ ]:
```
r  =  chordify  ( take  14  tern  ++  finale )  ( octave  ( - 1 )  ( collapse  s ))
---
abcPlayM  "F"  "3/4"  ( corelli  #  r )
```

9.14 - The next cell shows a well-known melody by Henry Purcell (1659-1695) - the Rondo theme from his *Abdelazar suite* :

In [ ]:
```
p  =  purcell  ++  [( "d" , 1 % 2 )]
abcPlayM  "F"  "3/2"  p
```

(In what other celebrated 20th century work was this theme used?)

Use, in the following cell, `sample` to `chordify` perform the following tonal analysis of this melody:



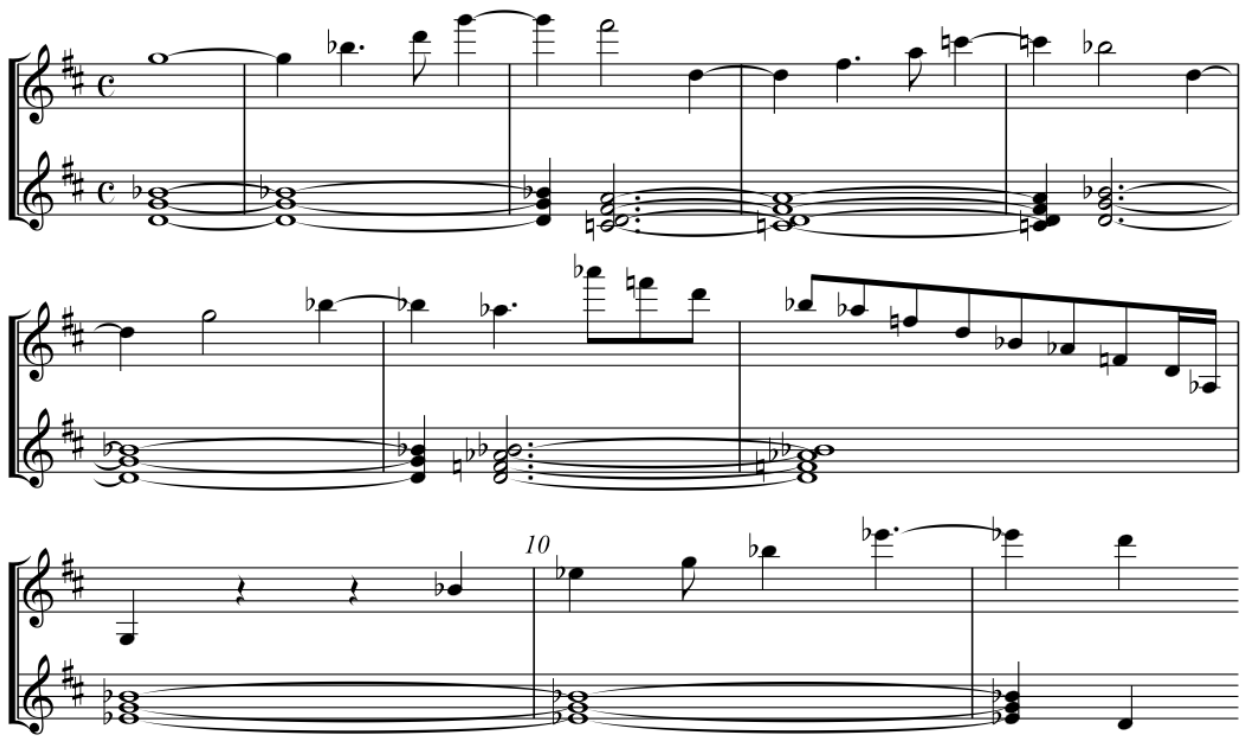
In [ ]:
```
chord  =  undefined
---
( abcPlayM  "F"  "3/2"  .  P )  [ p ,  samp ,  chord ]
```

9.15 - Remember question **8.8** from the previous *notebook* , where a sampling sequence was requested s that can be written as follows (analyze its construction):

In [ ]:
```
s =  5 % 4 : p  ++  take  3  bin  ++  p  ++  take  5  bin  ++  p  ++  take  9  half  ++  q  ++  take  5  una
   p  =  [ 3 % 8 ,  1 % 8          ]
   q  =  [ 1 % 16 , 1 % 16         ]
   r  =  [ 1 % 8 ,  1 % 4 ,  5 % 8 ,  1 % 4 ]

sampling  =  sample  s  op61i
---
abcPlayM  "D"  "C"  sampling
```

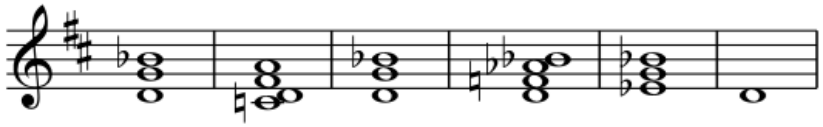
Use this result to produce the harmonic reduction shown in the figure:



In [ ]:

```
...
---
abcPlayM  "D"  "C"  ....
```

9.16 - Finally, indicate how to obtain the harmonic reduction that the figure shows based on the result of the previous cell.



In [ ]:
```
( abcPlay  "D"  "none"  ...
```
