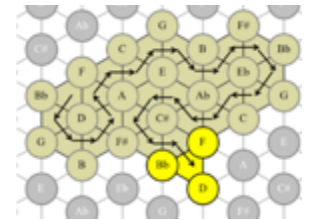


Modèles mathématiques et computationnels dans la chanson

Analyse de la musique et des répertoire III :
Musiques actuelles

(partie IV : modèles mathématiques et computationnels)



Moreno Andreatta

IRMA & ITI CREAA, Université de Strasbourg

Equipe Représentations Musicales

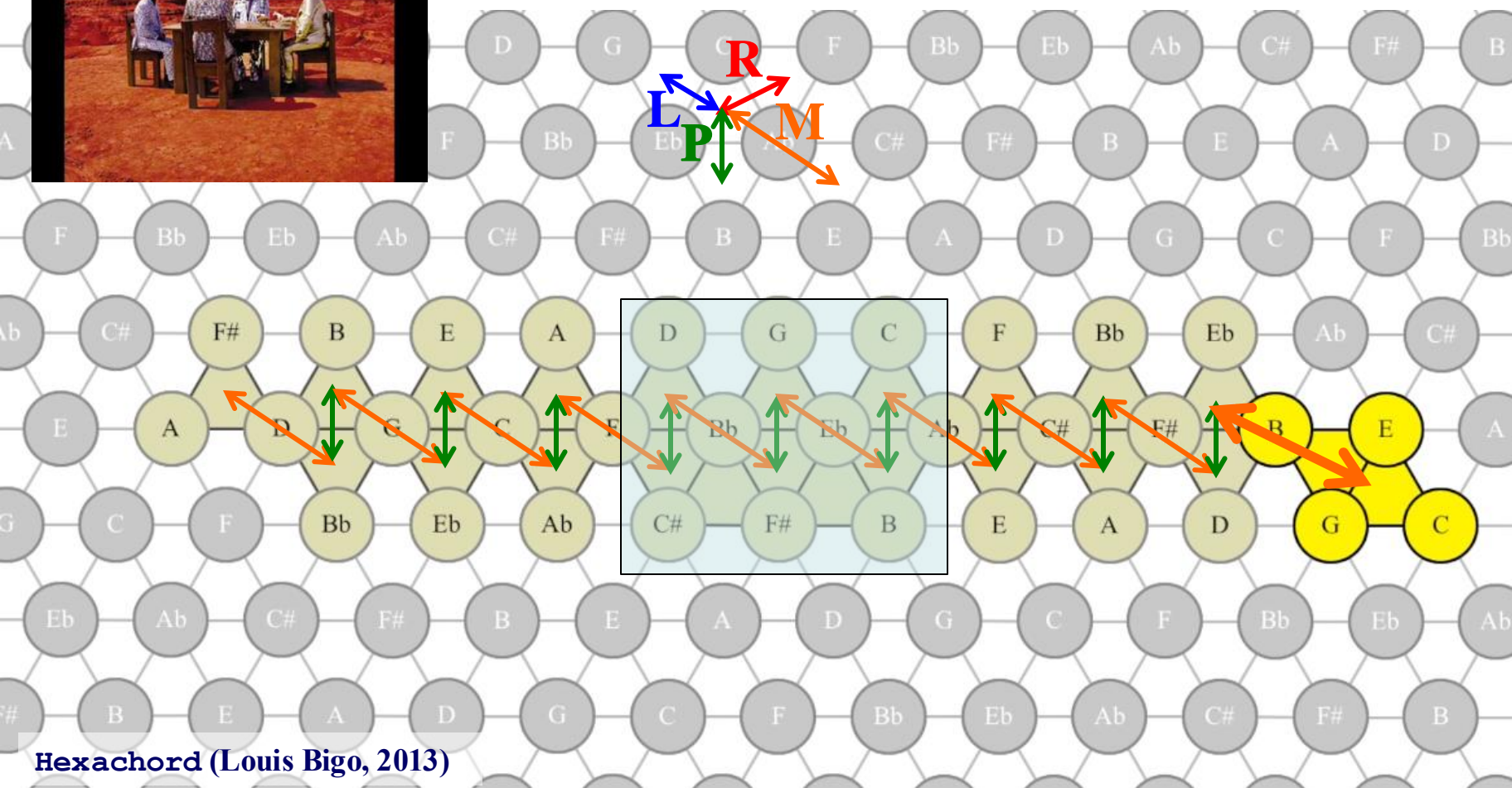
IRCAM / CNRS UMR 9912 / Sorbonne Université



Utilisation inconsciente (?) des symétries chez *Muse*



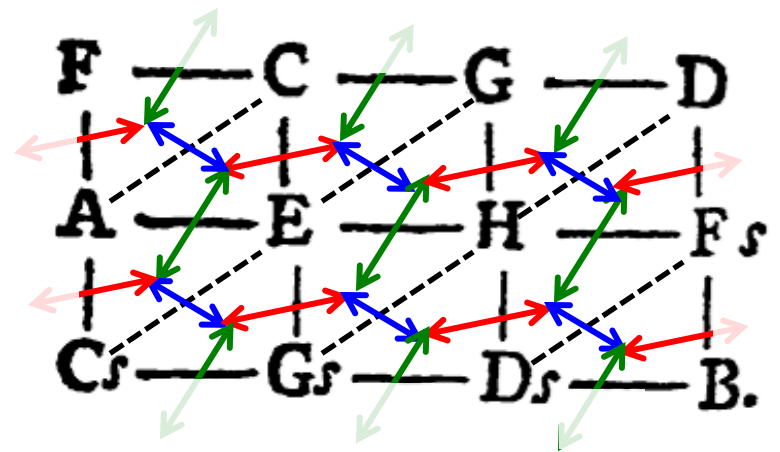
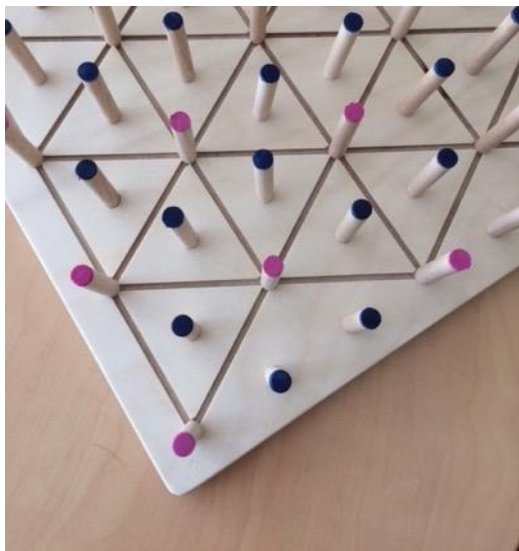
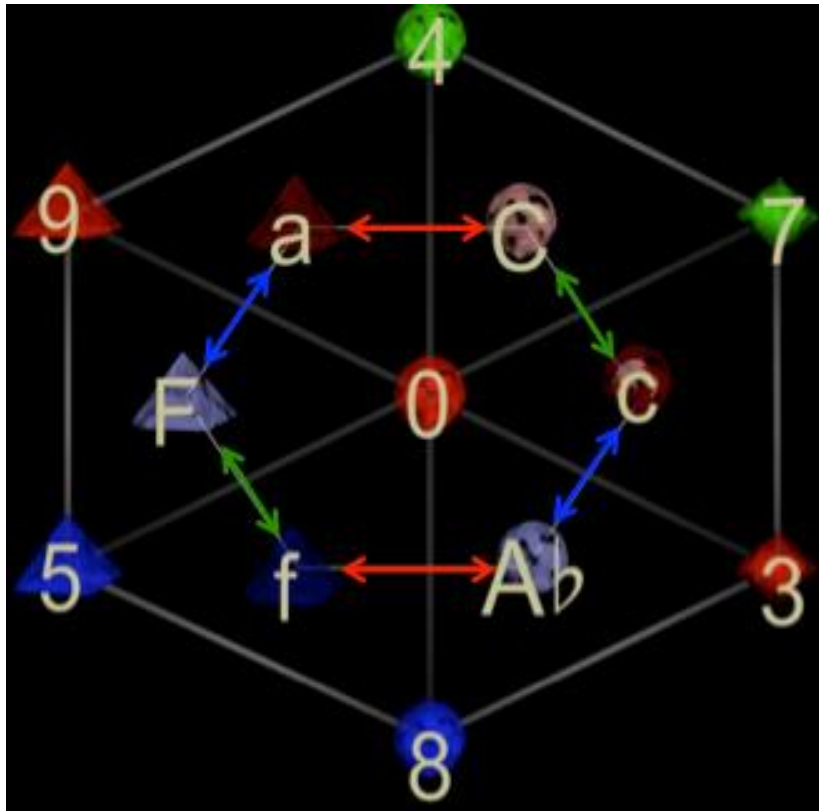
“Take a bow” (*Black Holes and Revelations*, 2006)



Hexachord (Louis Bigo, 2013)

→
axe temporel

Le Tonnetz (ou nid musical d'abeilles)

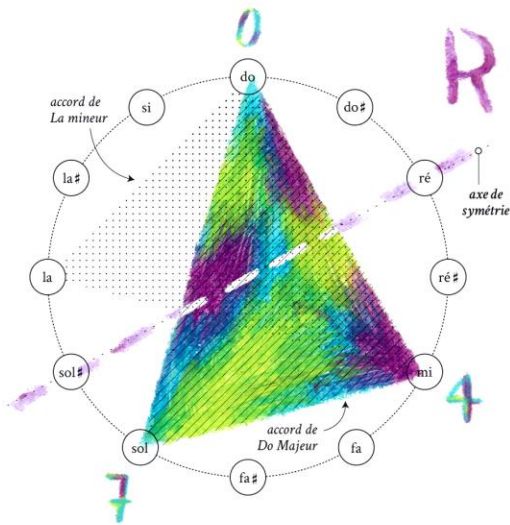


Speculum Musicum (1773)



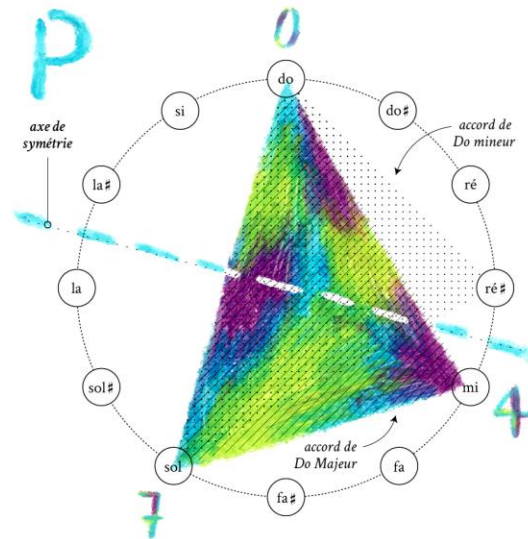
Leonhard Euler

Les trois symétries néo-riemanniennes



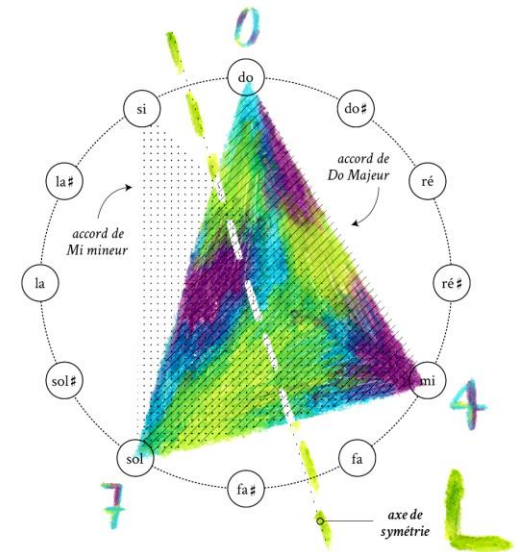
R = RELATIF

C majeur
 ↑↓
A mineur



P = PARALLÈLE

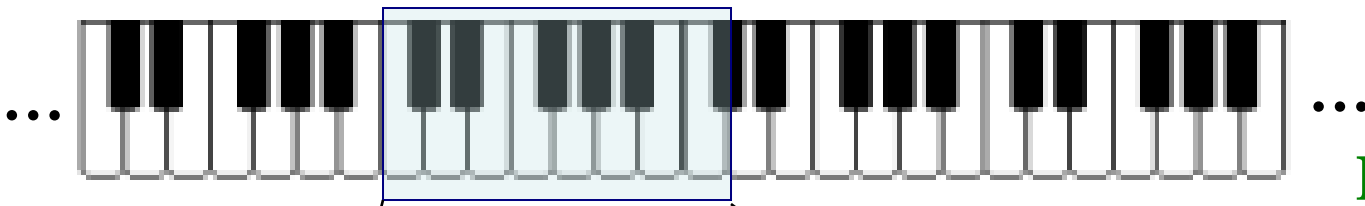
C majeur
 ↑↓
C mineur



**L = LEADING-TONE
 (EXCHANGE)**

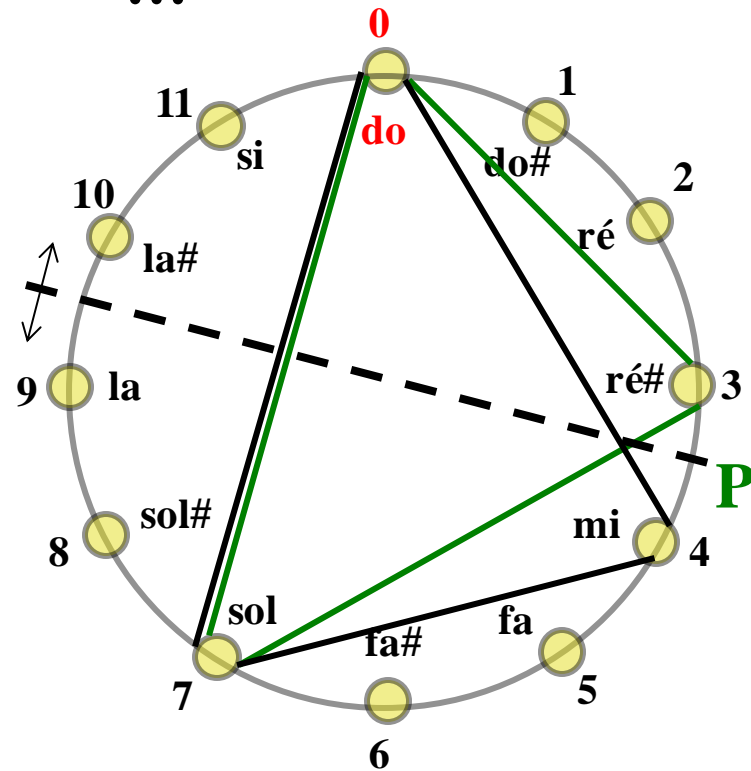
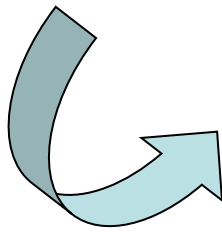
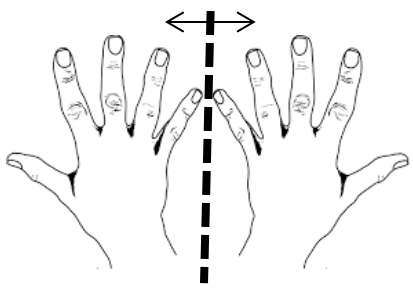
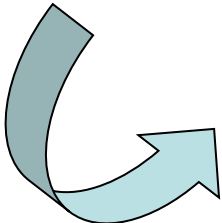
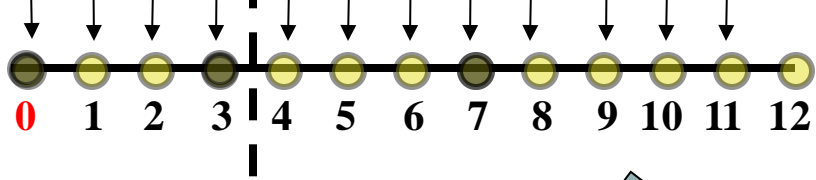
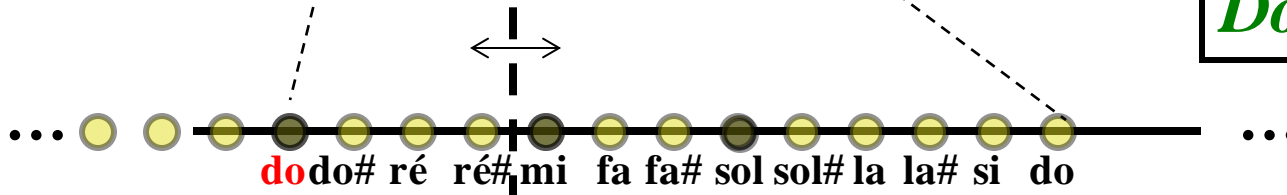
C majeur
 ↑↓
E mineur

Les inversions sont des symétries axiales

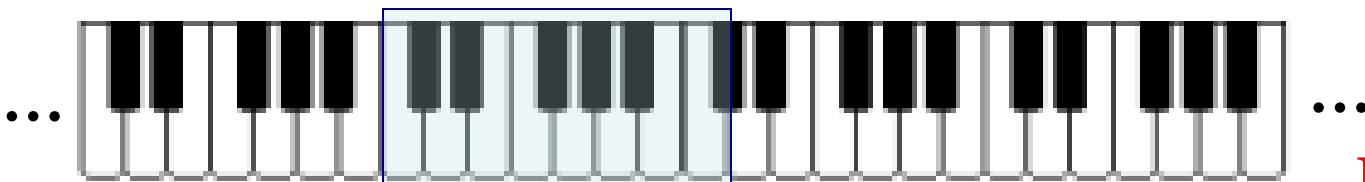


P comme **parallèle**

Do maj = {0,4,7}
Do min = {0,3,7}

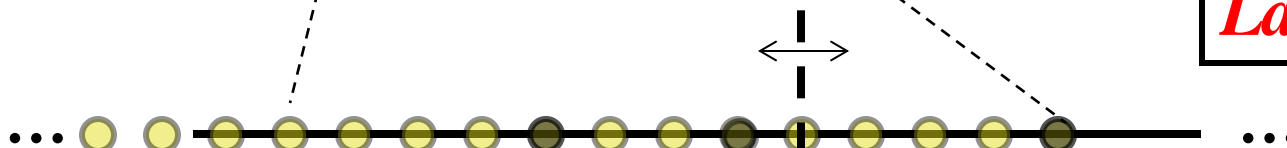


Les inversions sont des symétries axiales

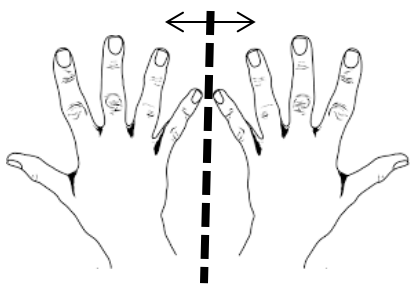
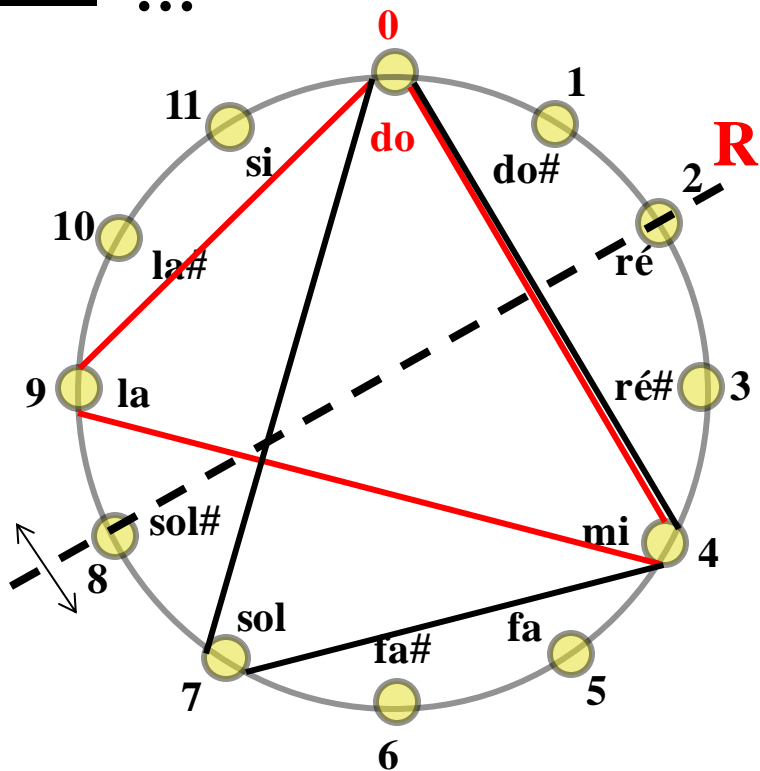
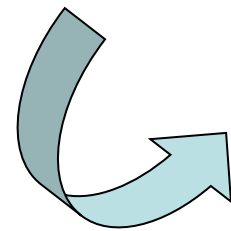
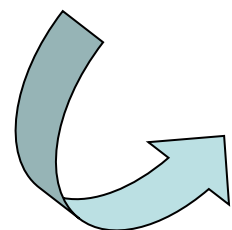
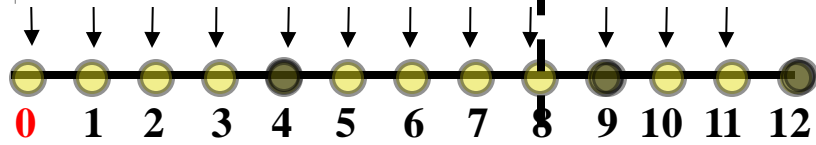
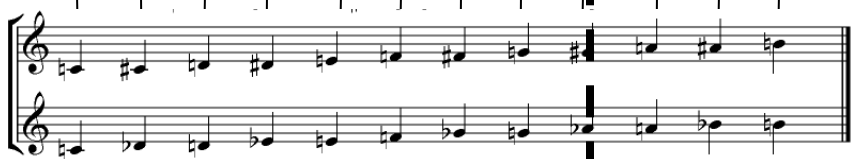


R comme **relatif**

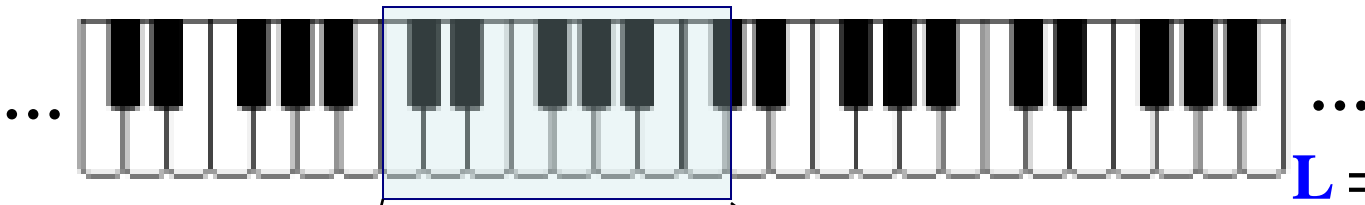
Do maj = {0,4,7}
La min = {0,4,9}



do do# ré ré# mi fa fa# sol sol# la la# si do



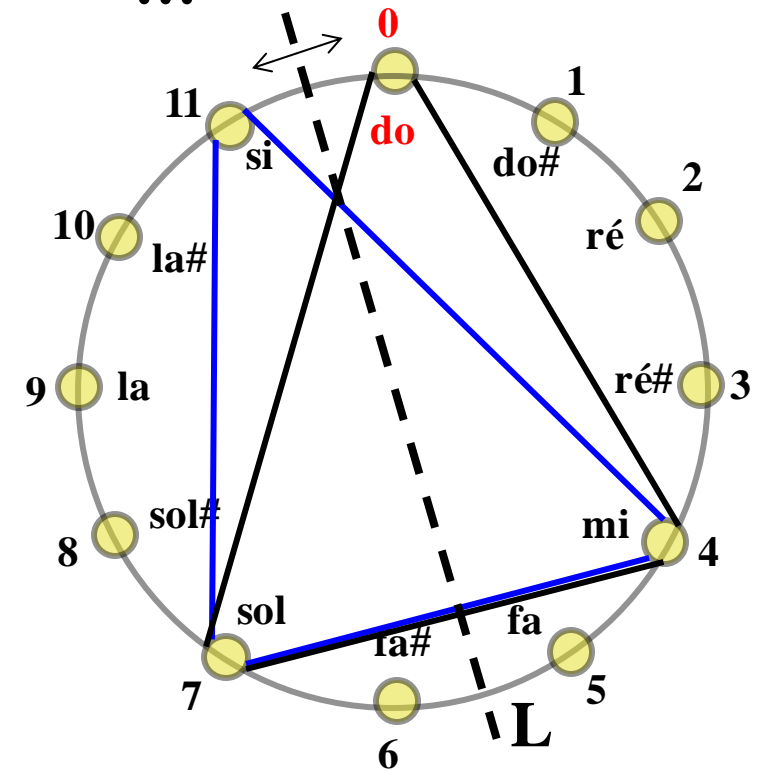
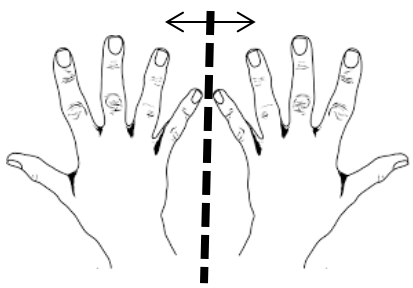
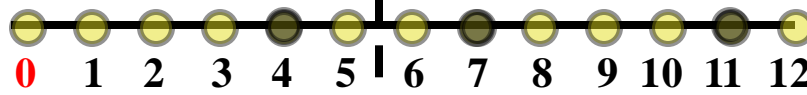
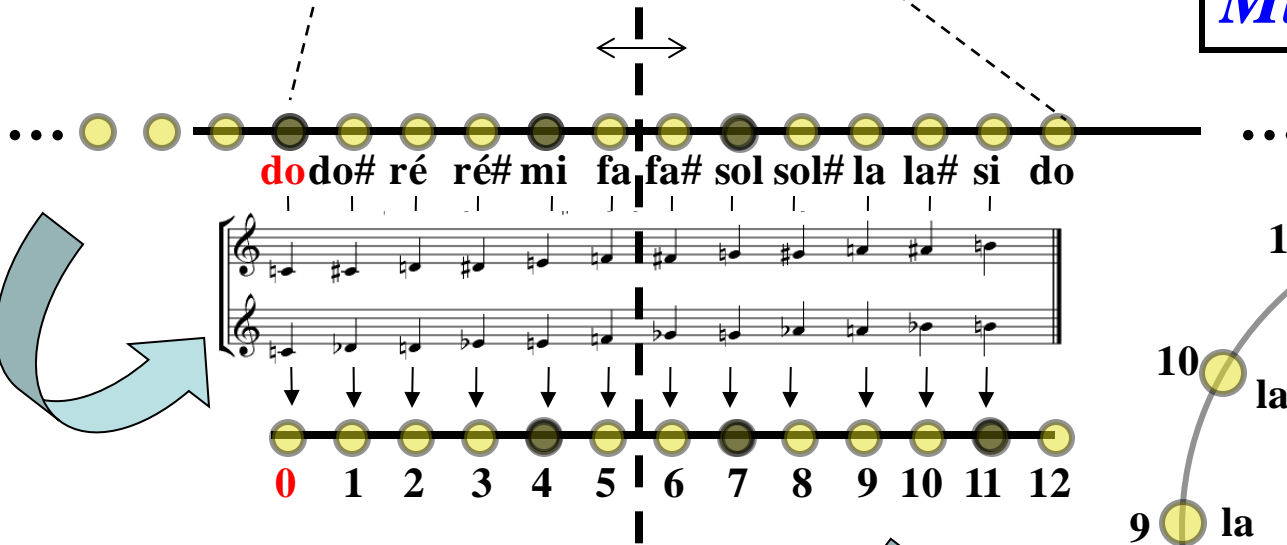
Les inversions sont des symétries axiales



L = Leading Tone

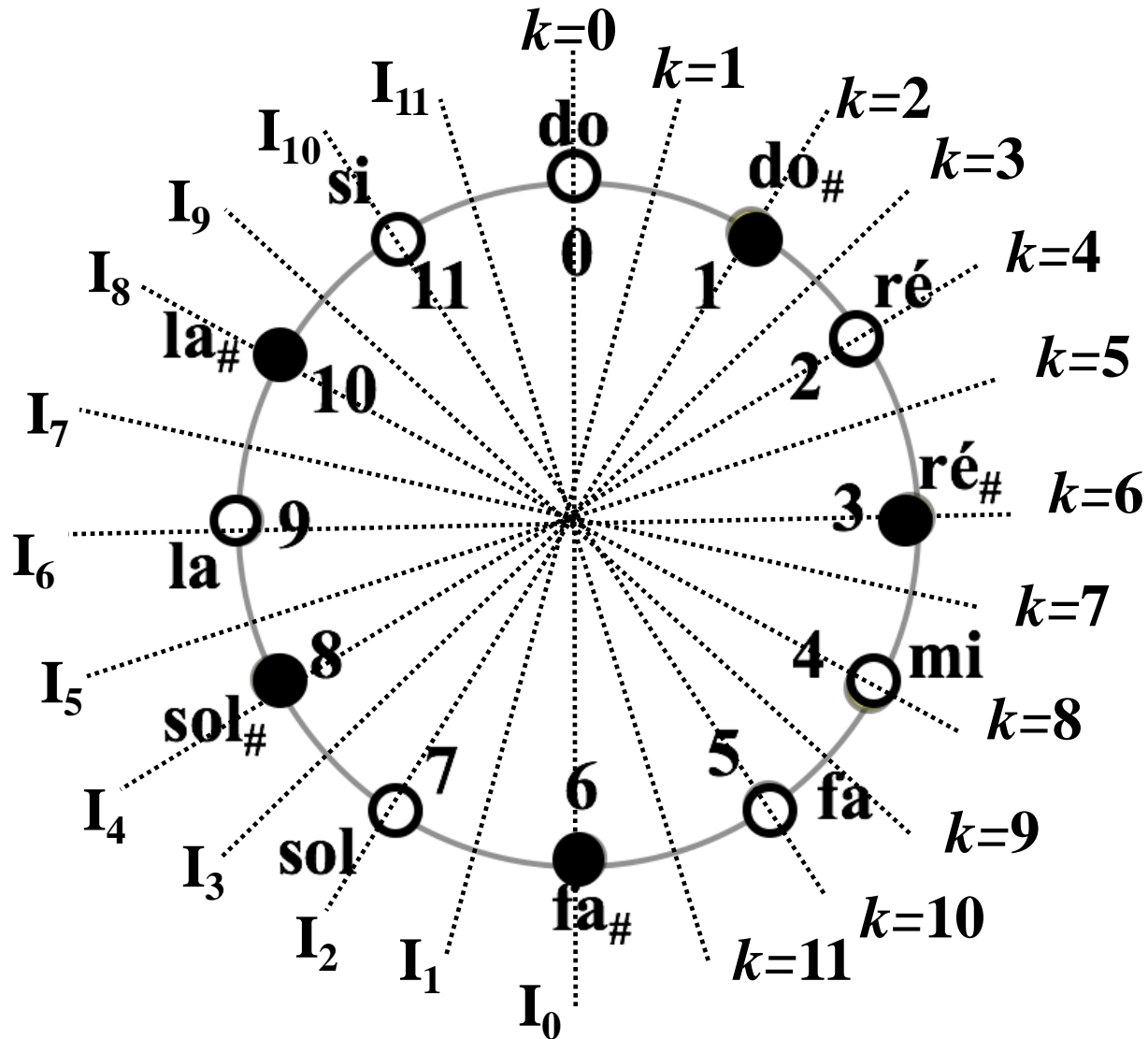
Do maj = {0,4,7}

Mi min = {4,7,11}



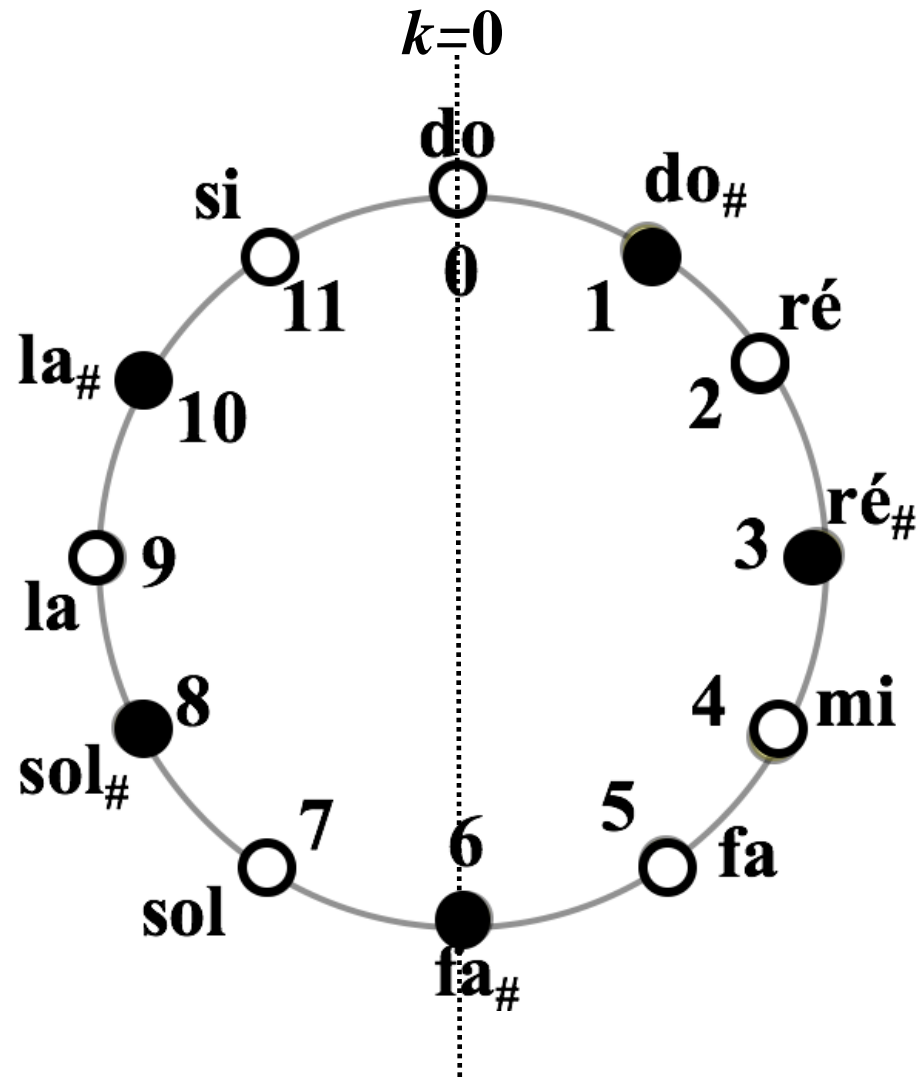
Les inversions sont des symétries axiales généralisées

$$x \xrightarrow{I_k} k-x \text{ modulo } 12$$



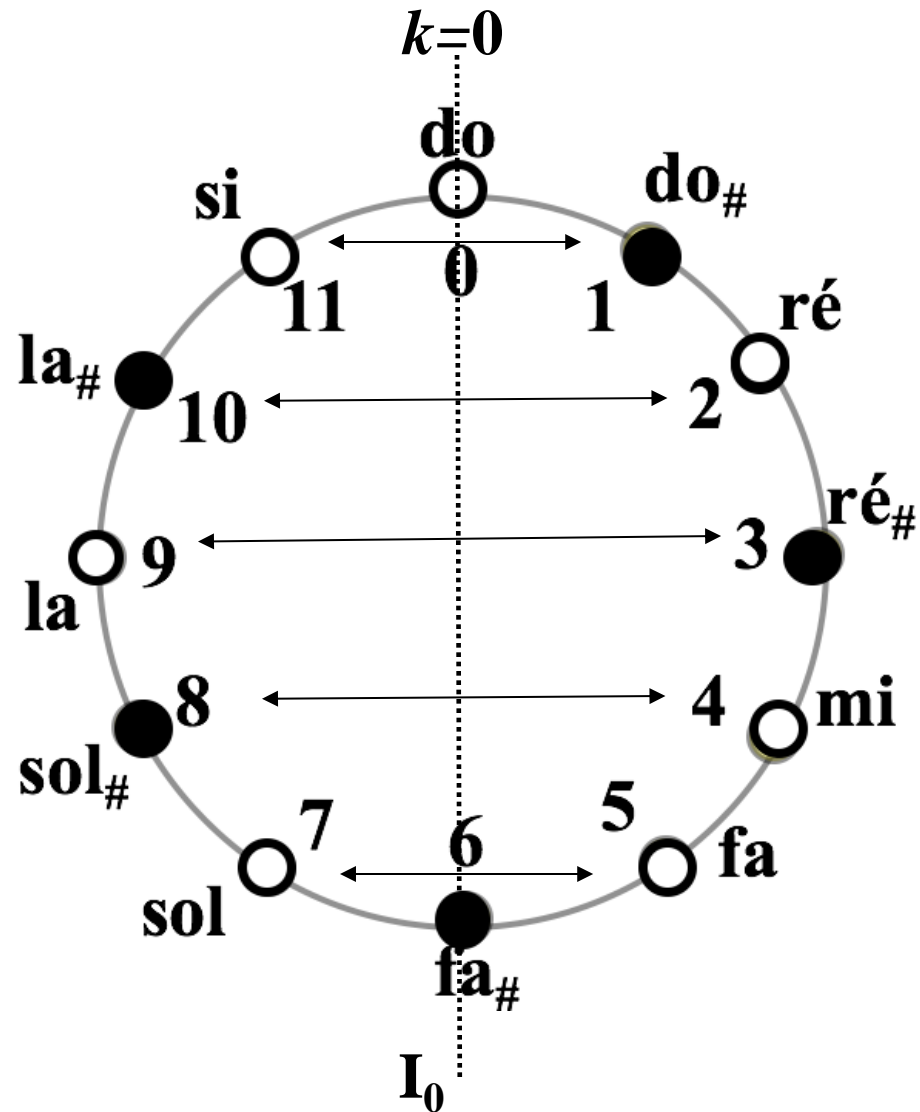
Quelques exemples

$$x \xrightarrow{I_0} -x \text{ modulo } 12$$



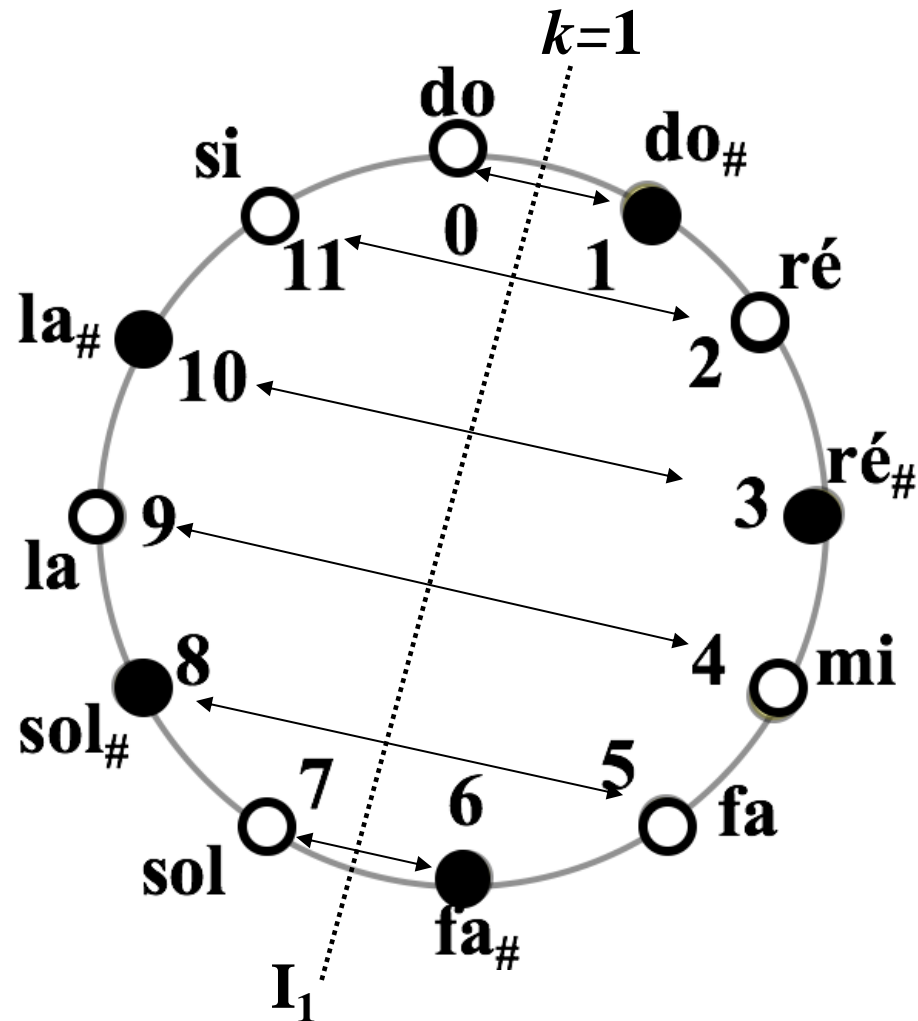
Quelques exemples

$$x \xrightarrow{I_0} -x \text{ modulo } 12$$

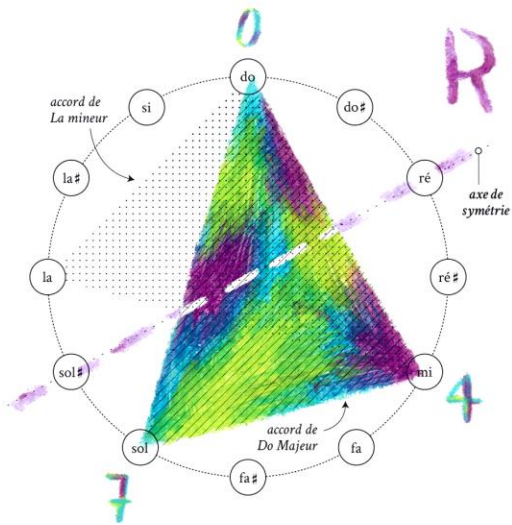


Les inversions sont des symétries axiales généralisées

$$x \xrightarrow{I_1} 1-x \text{ modulo } 12$$



Retour sur les trois symétries néo-riemanniennes



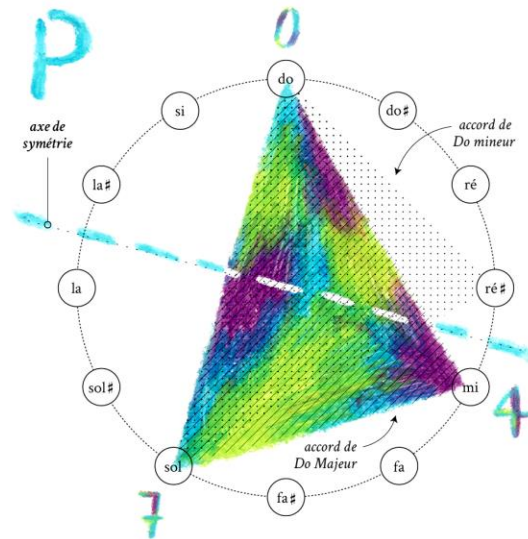
R = RELATIF

$I_k = ?$

C majeur



A mineur



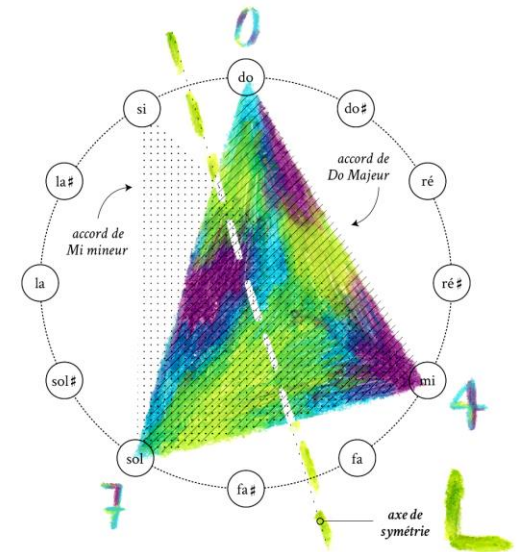
P = PARALLÈLE

$I_k = ?$

C majeur



C mineur



**L = LEADING-TONE
(EXCHANGE)**

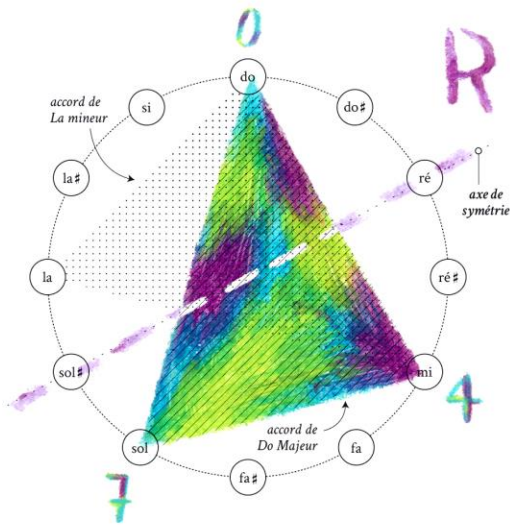
$I_k = ?$

C majeur



E mineur

Retour sur les trois symétries néo-riemanniennes

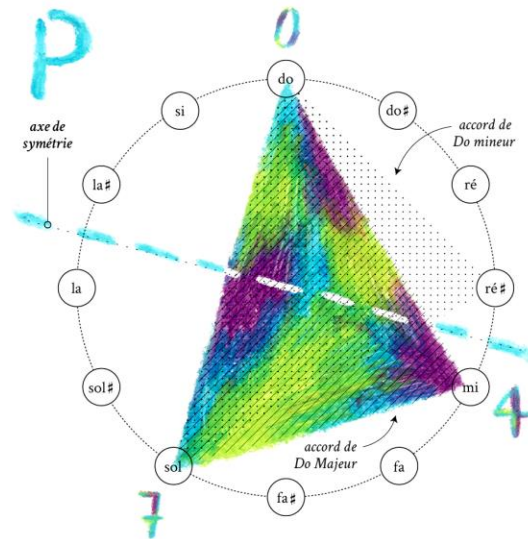


R = RELATIF

C majeur



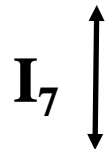
A mineur



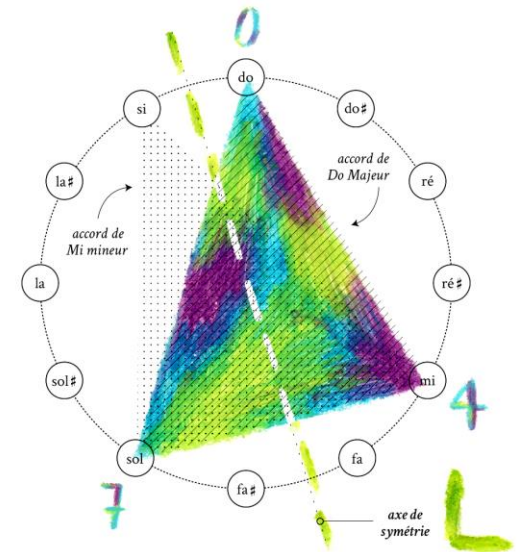
P = PARALLÈLE

$I_k = ?$

C majeur



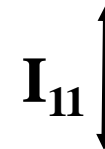
C mineur



**L = LEADING-TONE
(EXCHANGE)**

$I_k = ?$

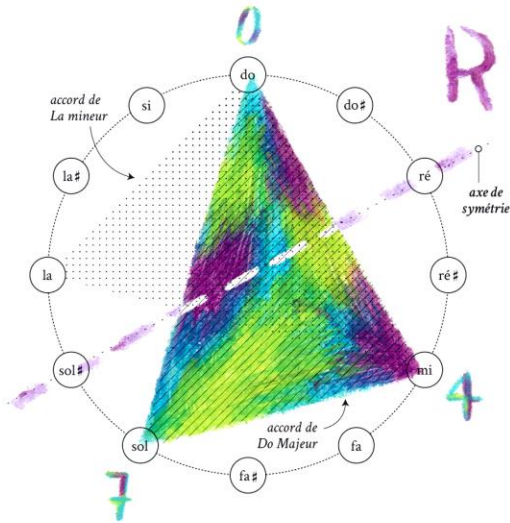
C majeur



E mineur

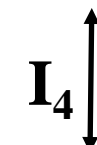
Retour sur les trois symétries néo-riemanniennes

$$x \xrightarrow{\mathbf{I}_1} 1-x \text{ modulo } 12$$

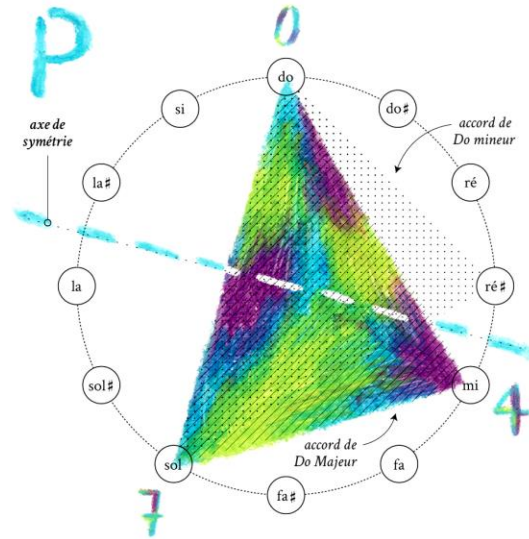


R = RELATIF

$\{0,4,7\}$

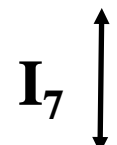


$\{4-0,4-4,4-7\} = \{4,0,9\}$

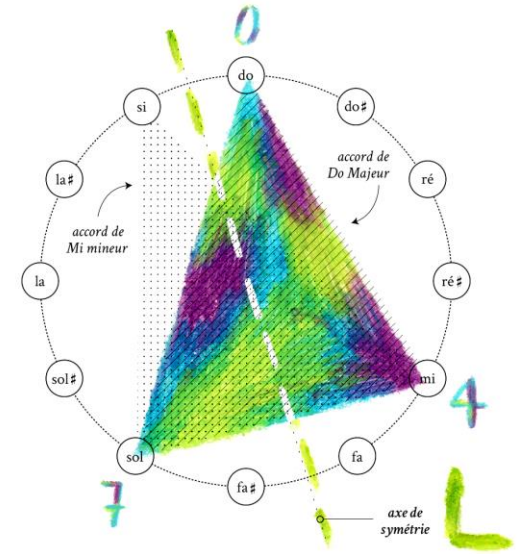


P = PARALLÈLE

C majeur

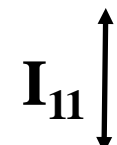


C mineur



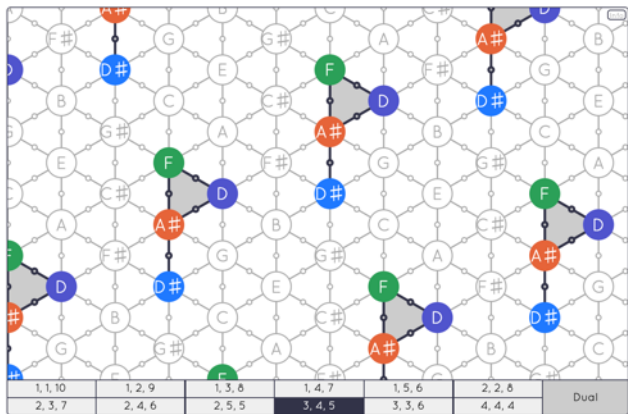
L = LEADING-TONE (EXCHANGE)

C majeur

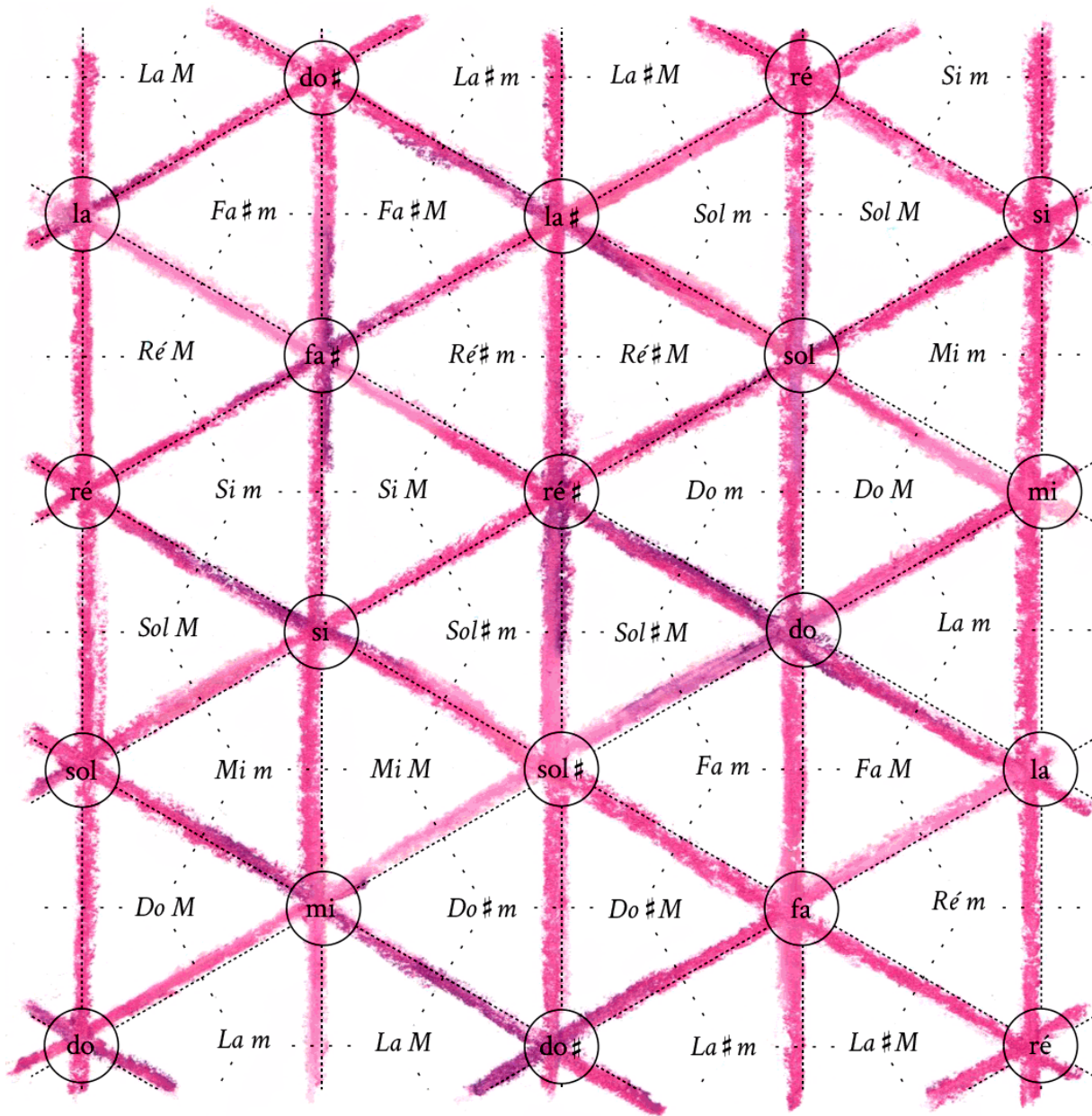
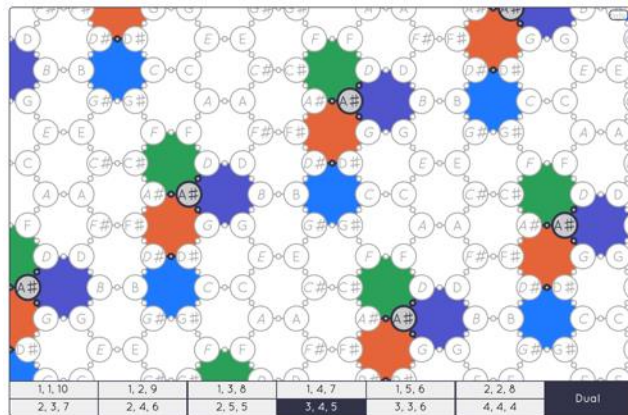
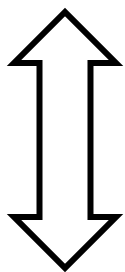


E mineur

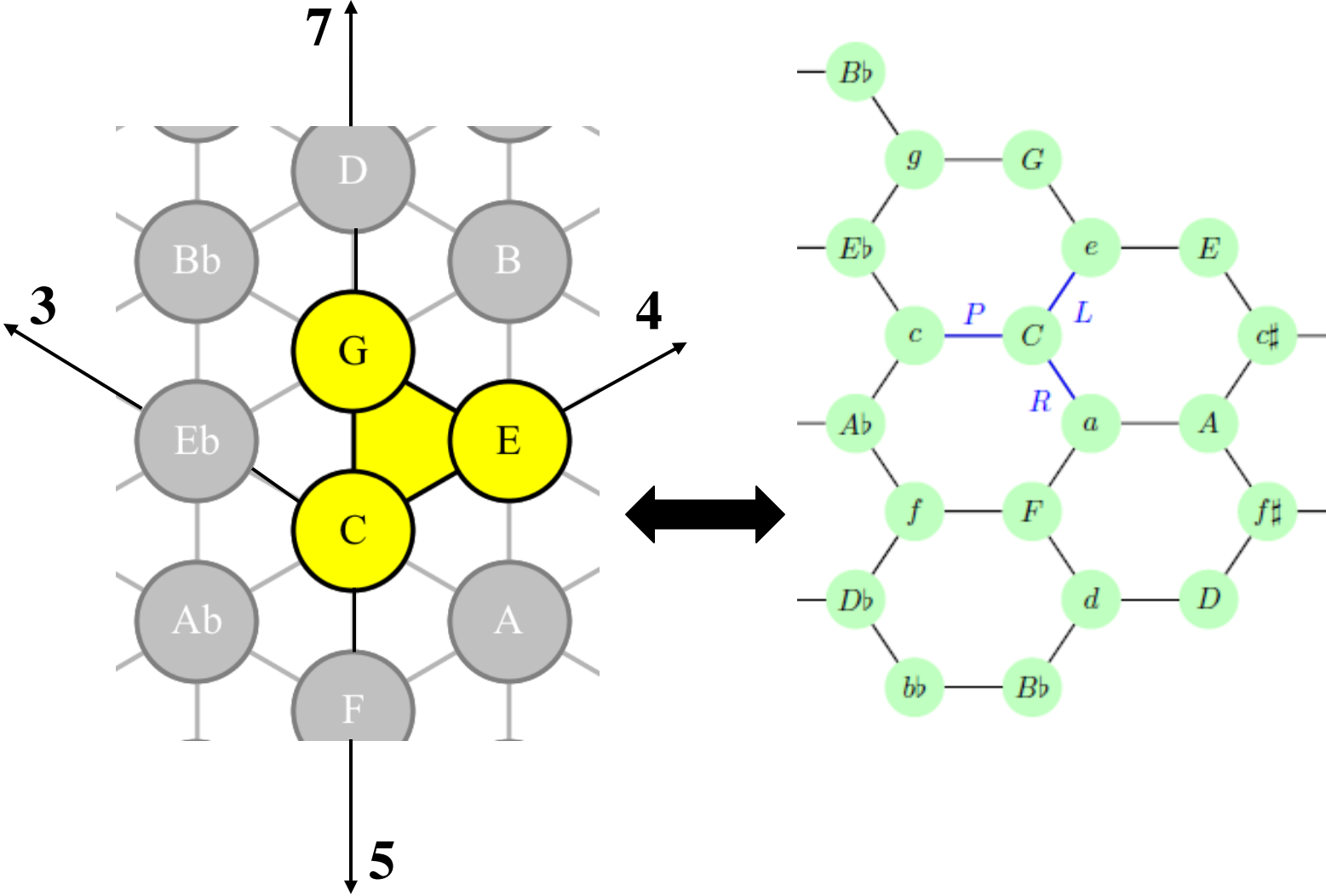
Du *Tonnetz* à l'espace dual



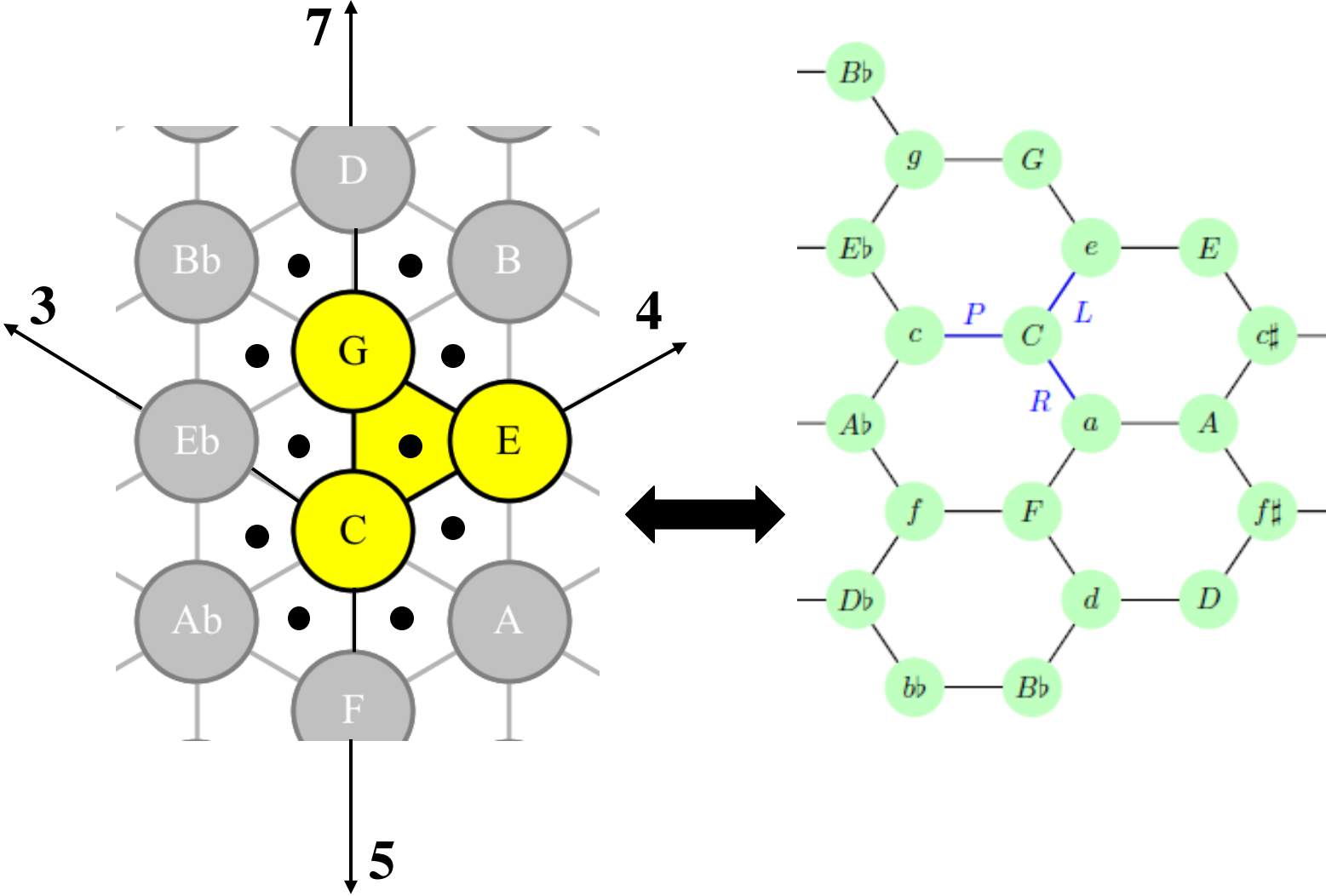
duality



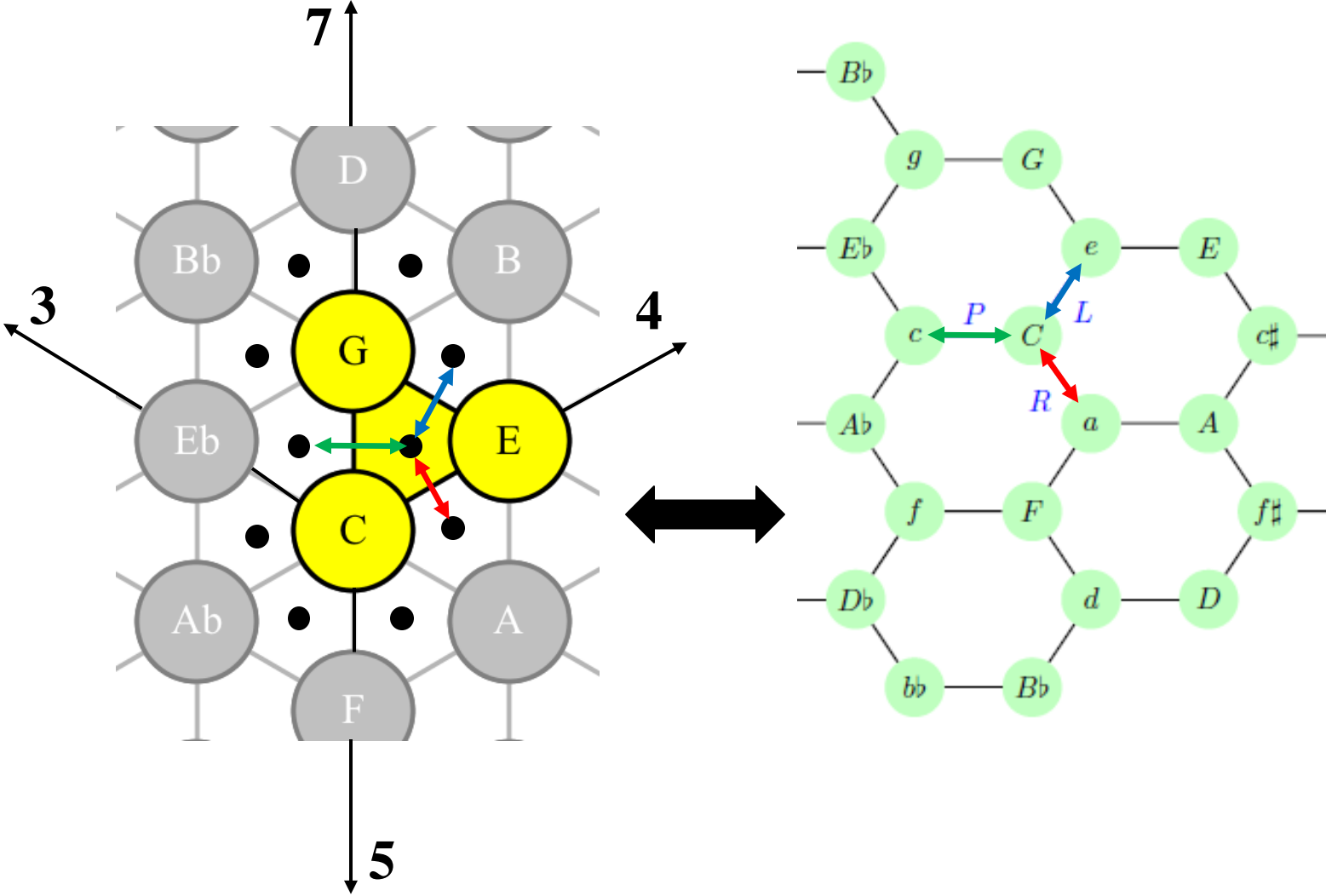
Construction du maillage hexagonal à partir du Tonnetz



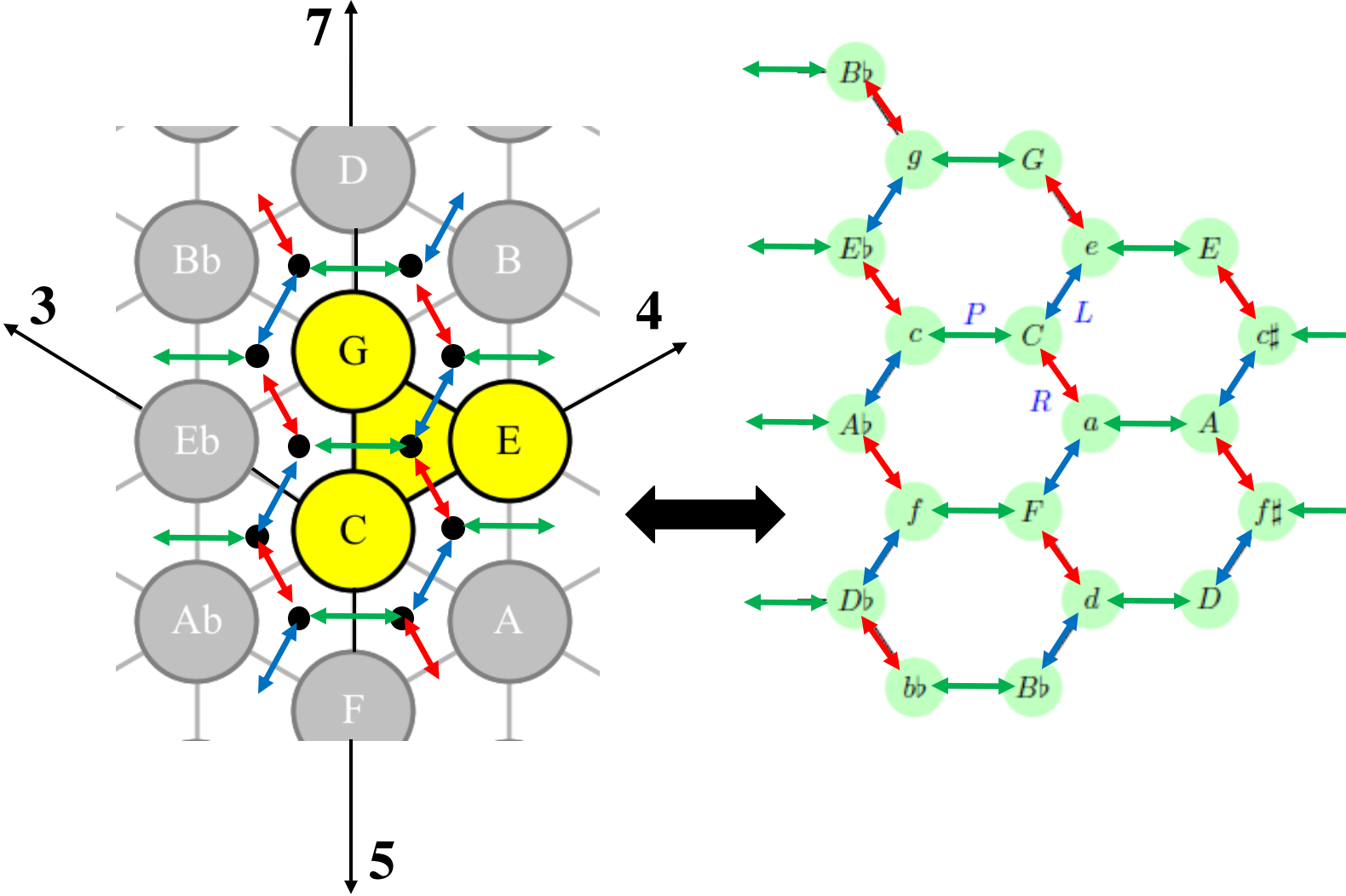
Construction du maillage hexagonal à partir du Tonnetz



Construction du maillage hexagonal à partir du Tonnetz

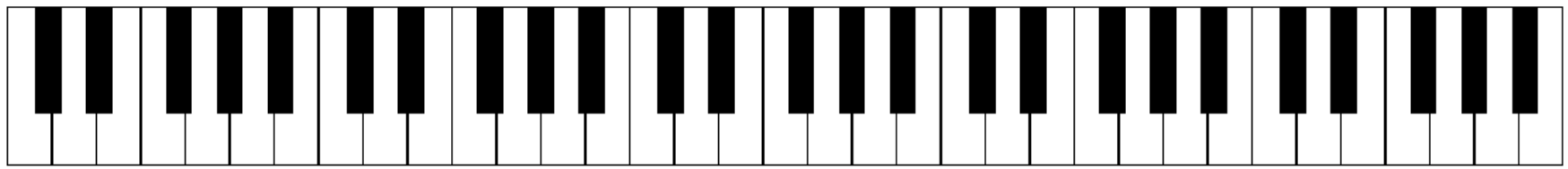
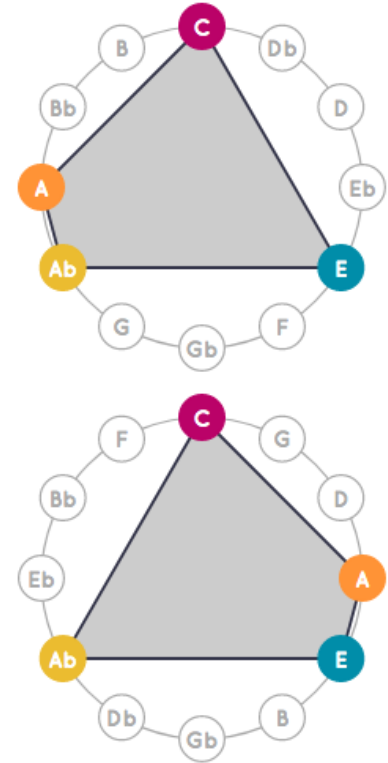
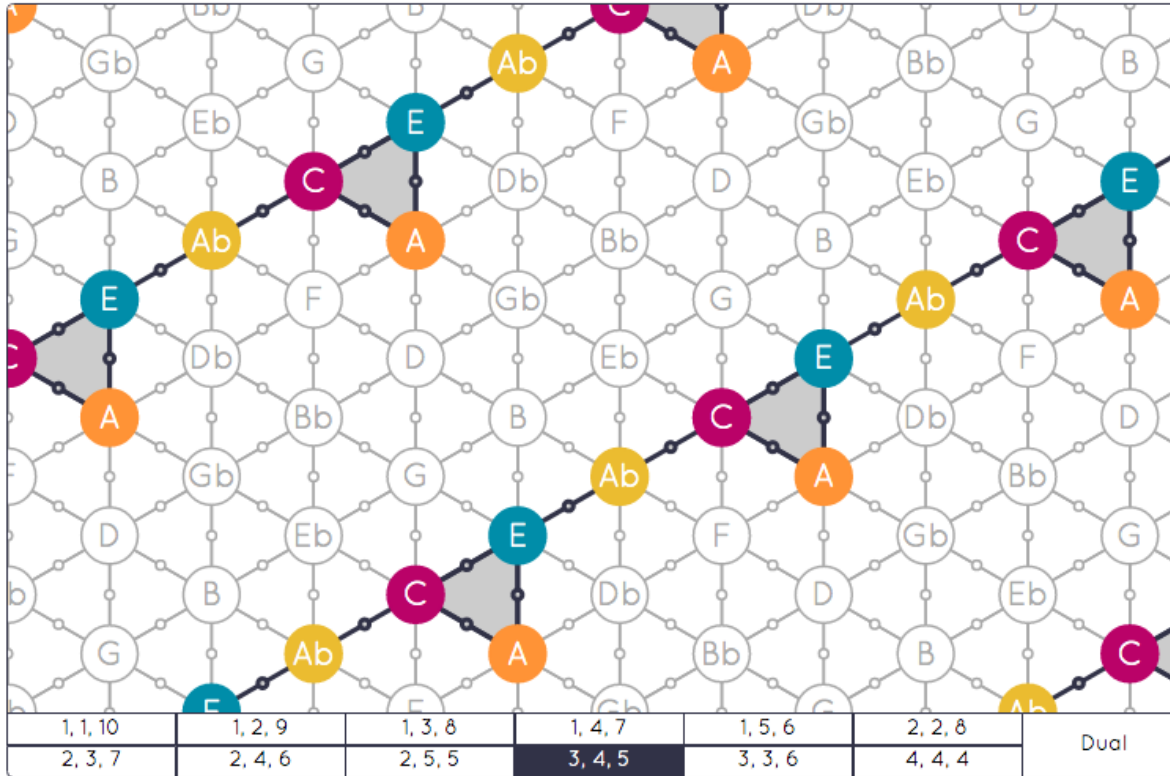


Construction du maillage hexagonal à partir du Tonnetz



Modèles computationnels : The Tonnetz

THE TONNETZ
ONE KEY - MANY REPRESENTATIONS



→ www.thetonnetz.com



MAGIC IN THE AIR

Sol **Ré**
La **Si-**

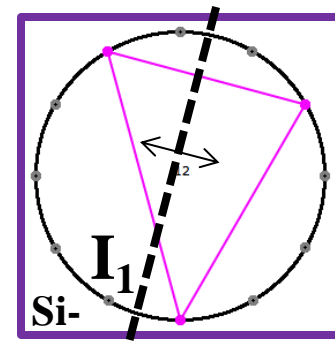
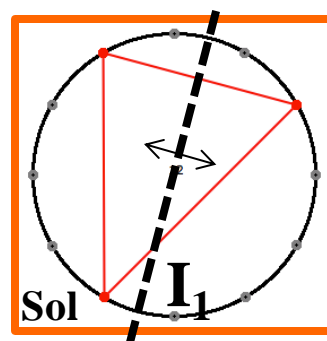
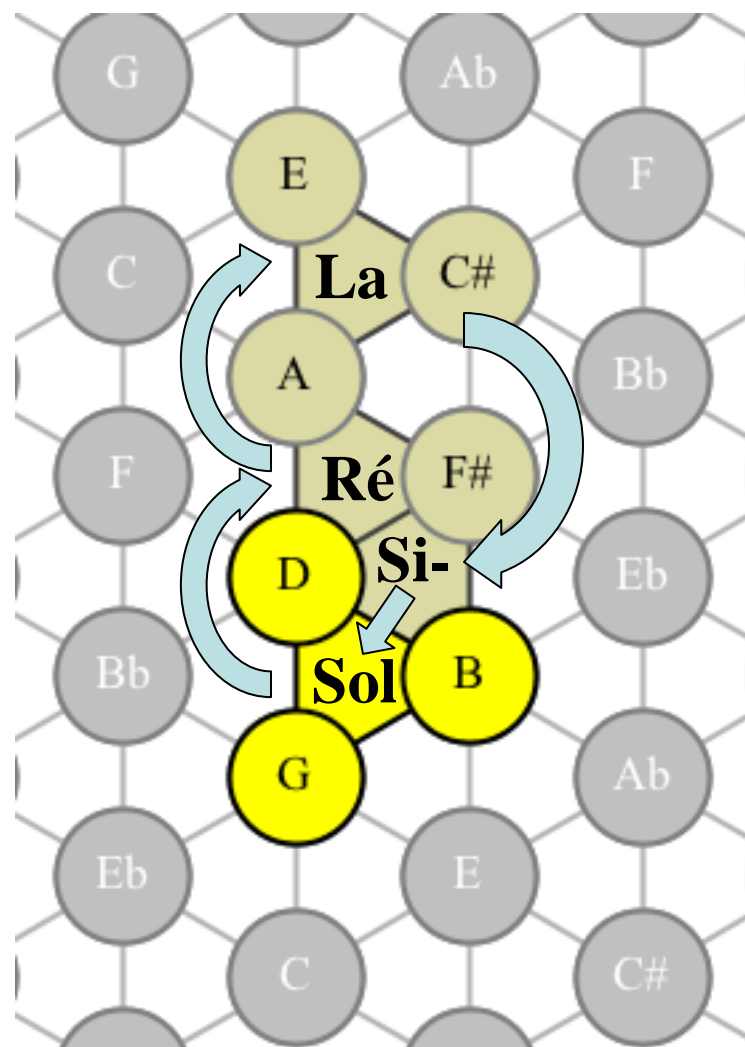
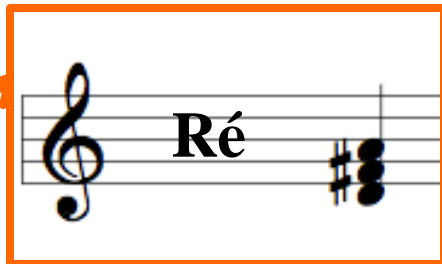
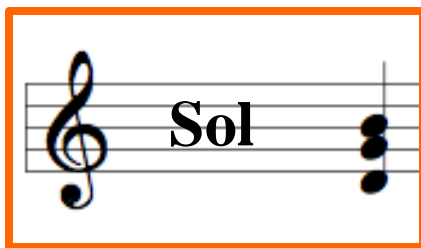
Feel the magic in the air Allez, allez, allez

Levez les mains en l'air Allez, allez, allez
 (x2)

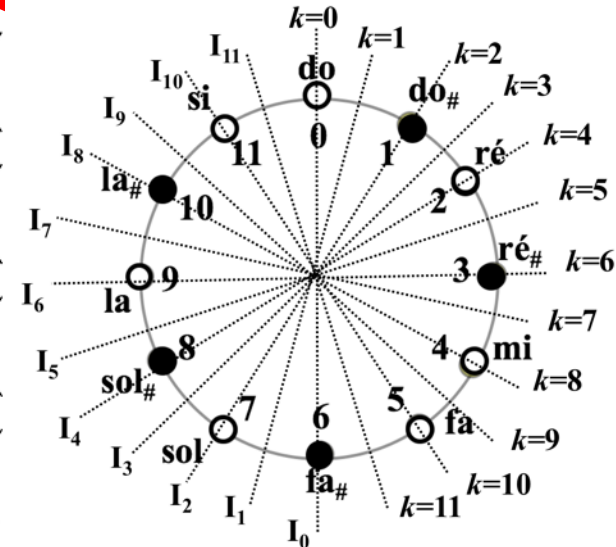
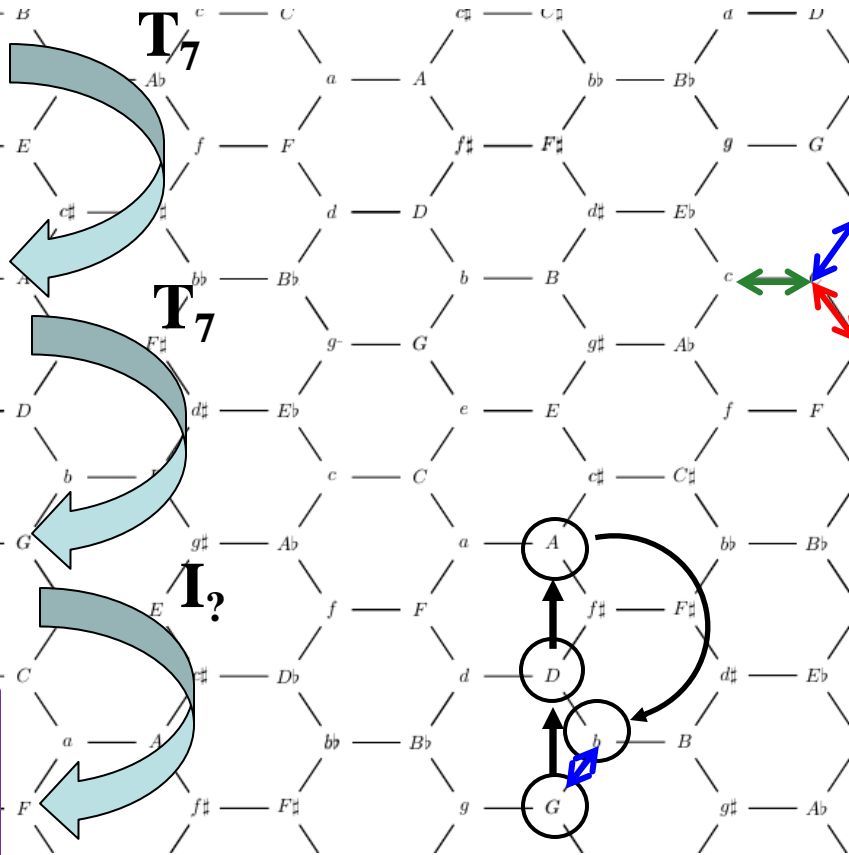
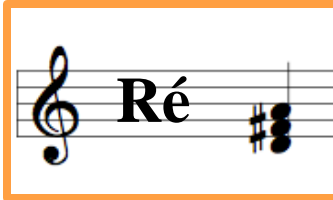
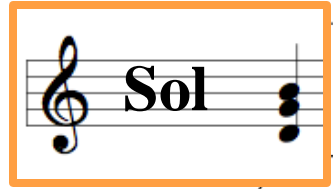
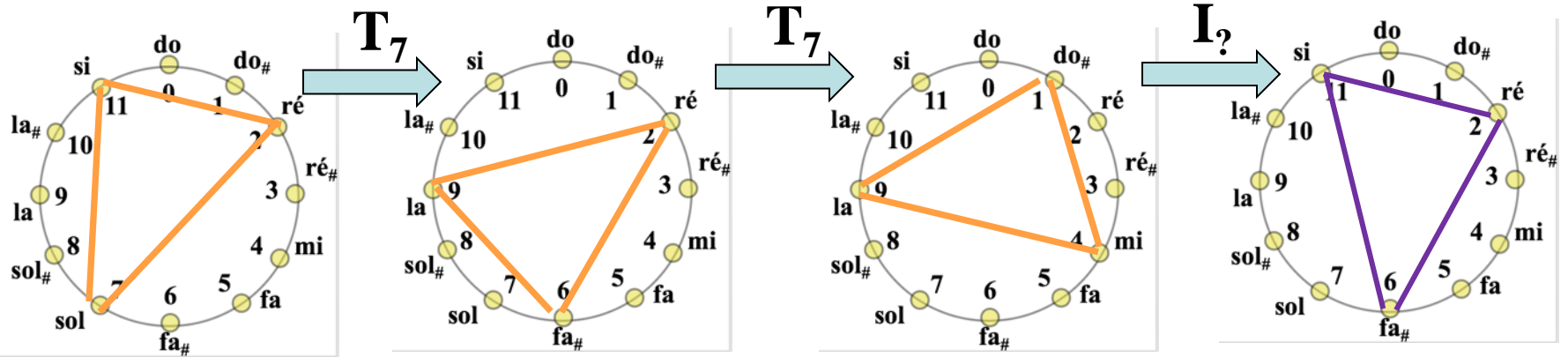
(x4 avec toutes les voix)

Ré
 Comme d'habitude on est calés
La **Si-**
 Comme toujours ça va aller
Sol **Ré**
 On sème l'ambiance à gogo
La **Si-**
 Tous ensemble on fait le show

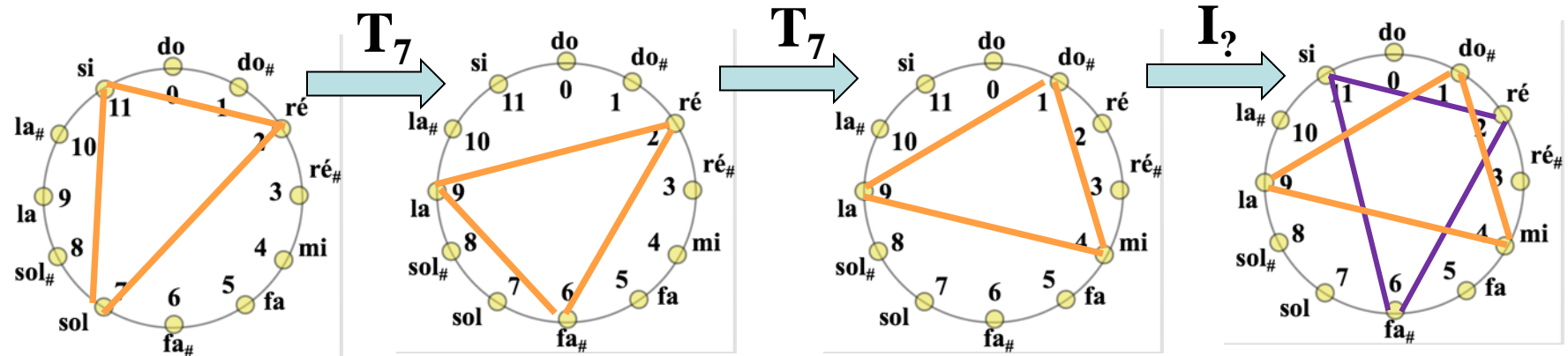
Sol **Ré**
 On t'invite à la magie Y'a pas de raccourci
La **Si-**
 Oublie tes soucis Viens faire la folie
Sol **Ré**
 On t'invite à la magie Y'a pas de raccourci
La **Si-**
 Oublie tes soucis Oh oh oh oh oh oh
Sol
 Feel the magic in the air ...



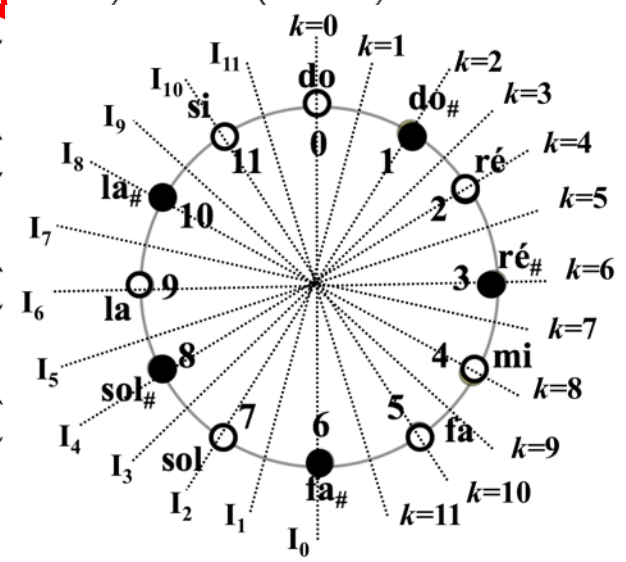
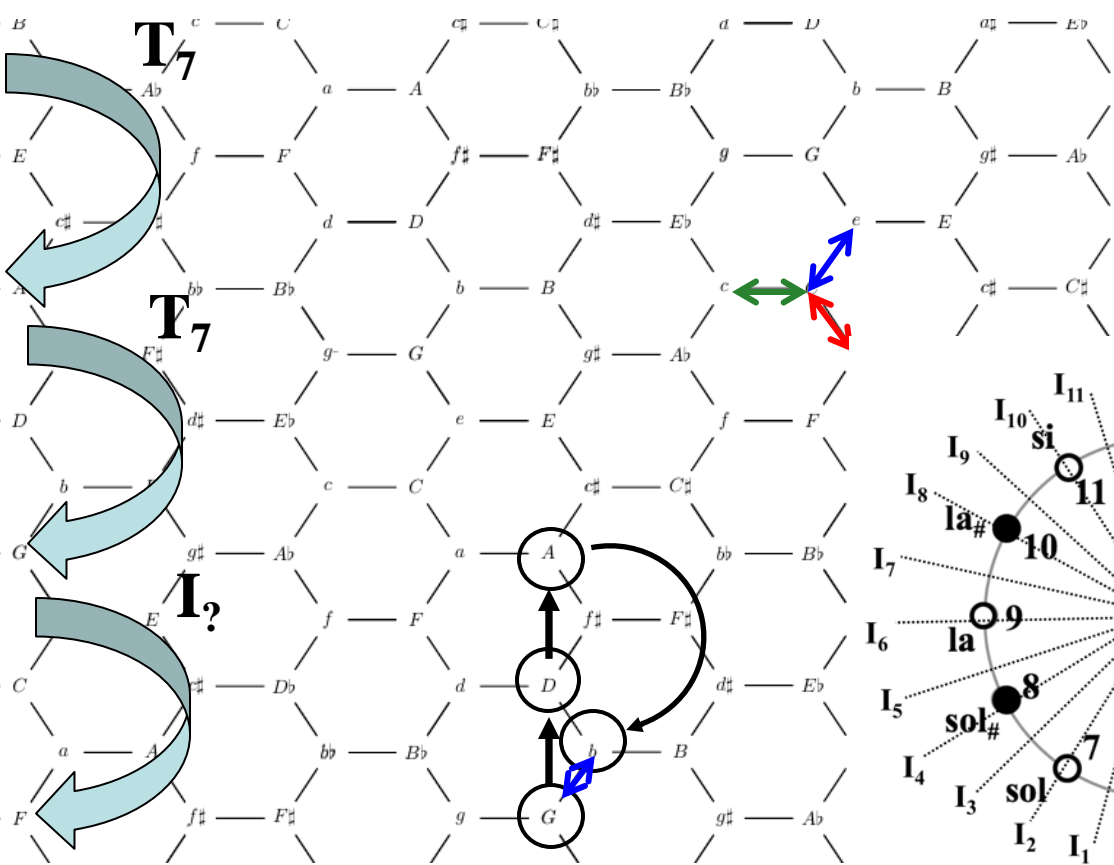
Quelques exemples analytiques



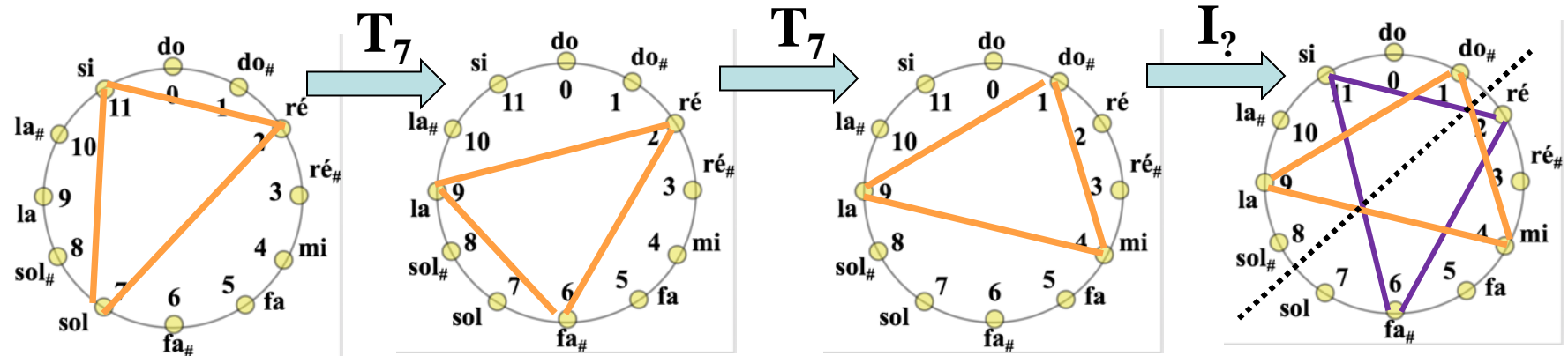
Quelques exemples analytiques



Four musical staves showing chords for Sol, Ré, La, and Si. The Sol chord is highlighted in orange, and the Si chord is highlighted in purple.



Quelques exemples analytiques

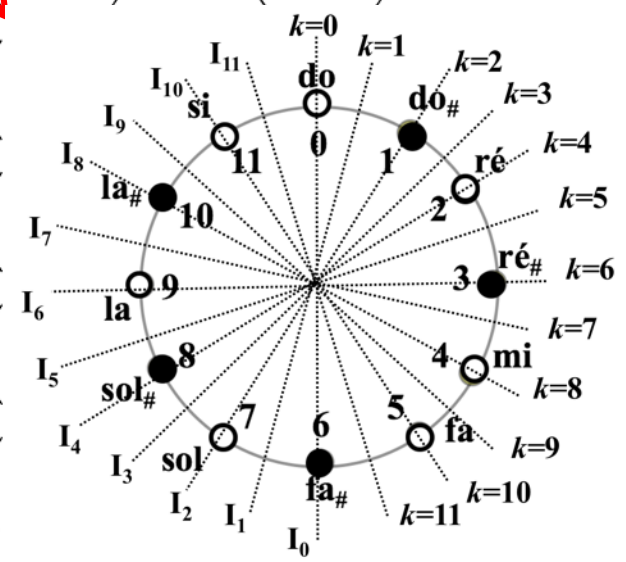
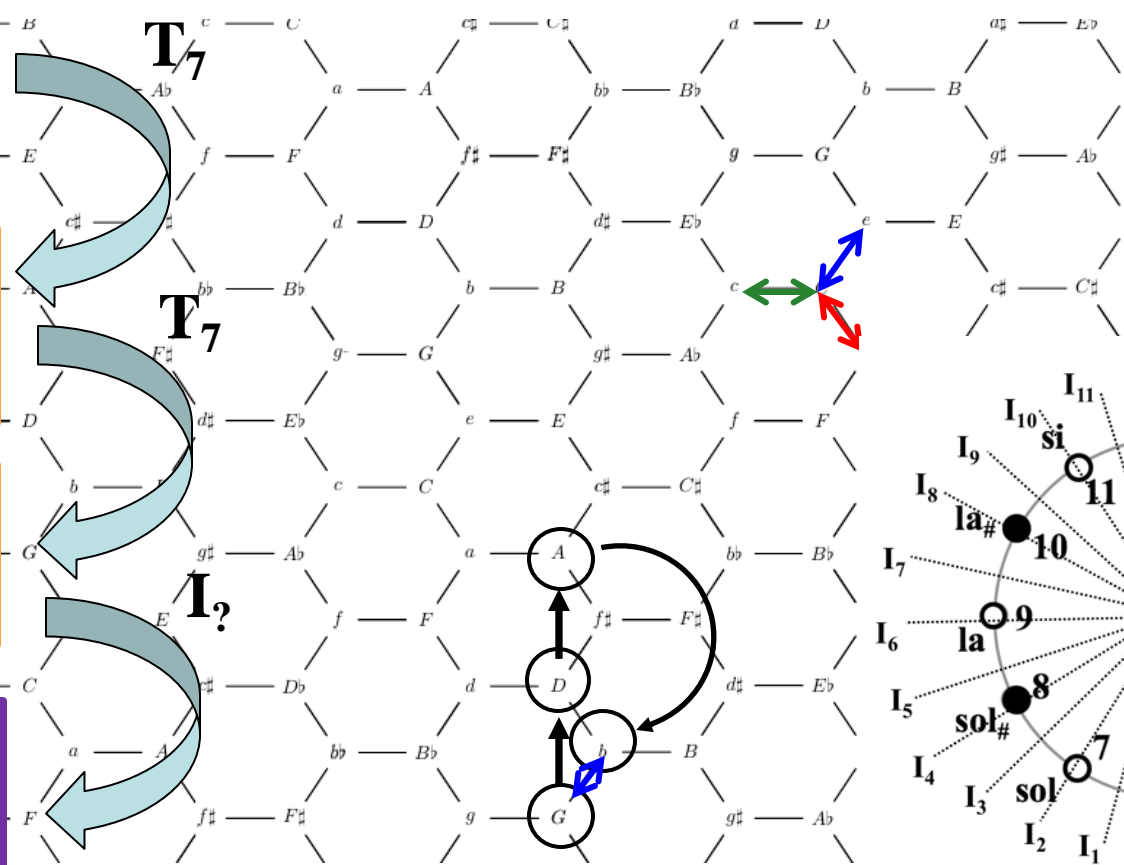


Musical staff showing the note Sol (G3) on a treble clef. The note is highlighted with an orange border.

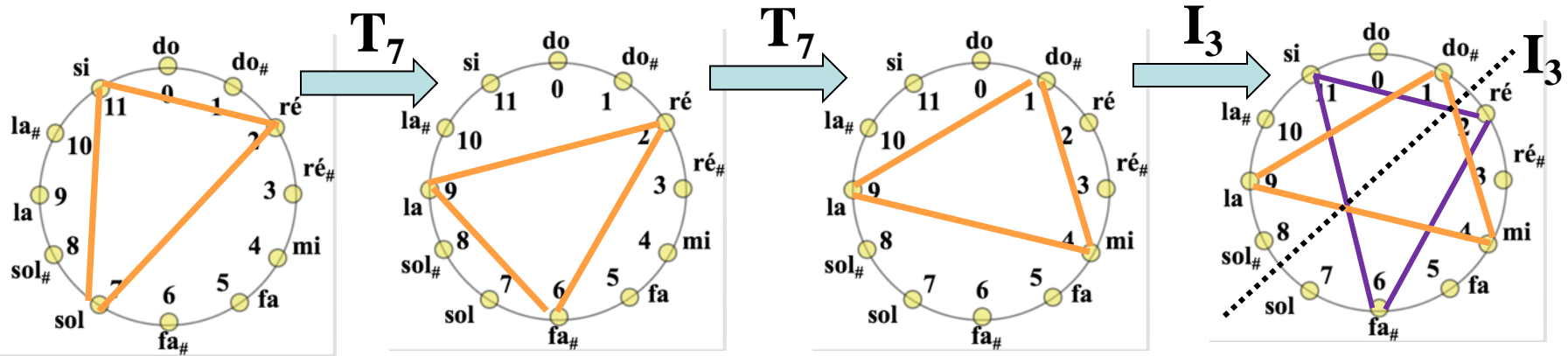
Musical staff showing the note Ré (D4) on a treble clef. The note is highlighted with an orange border.

Musical staff showing the note La (A3) on a treble clef. The note is highlighted with an orange border.

Musical staff showing the note Si (B3) on a treble clef. The note is highlighted with a purple border.



Quelques exemples analytiques

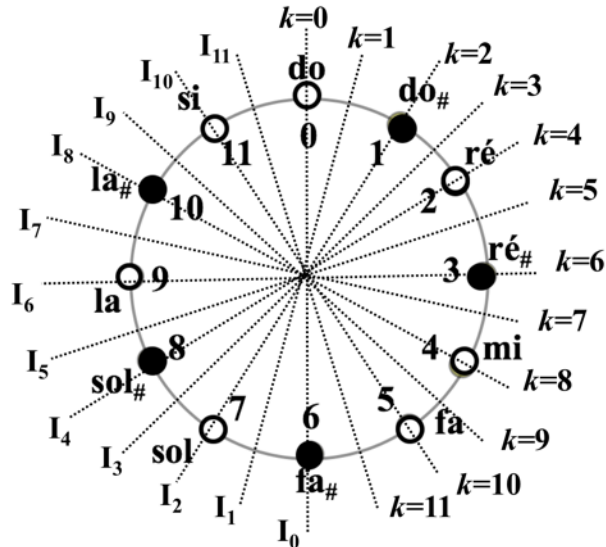
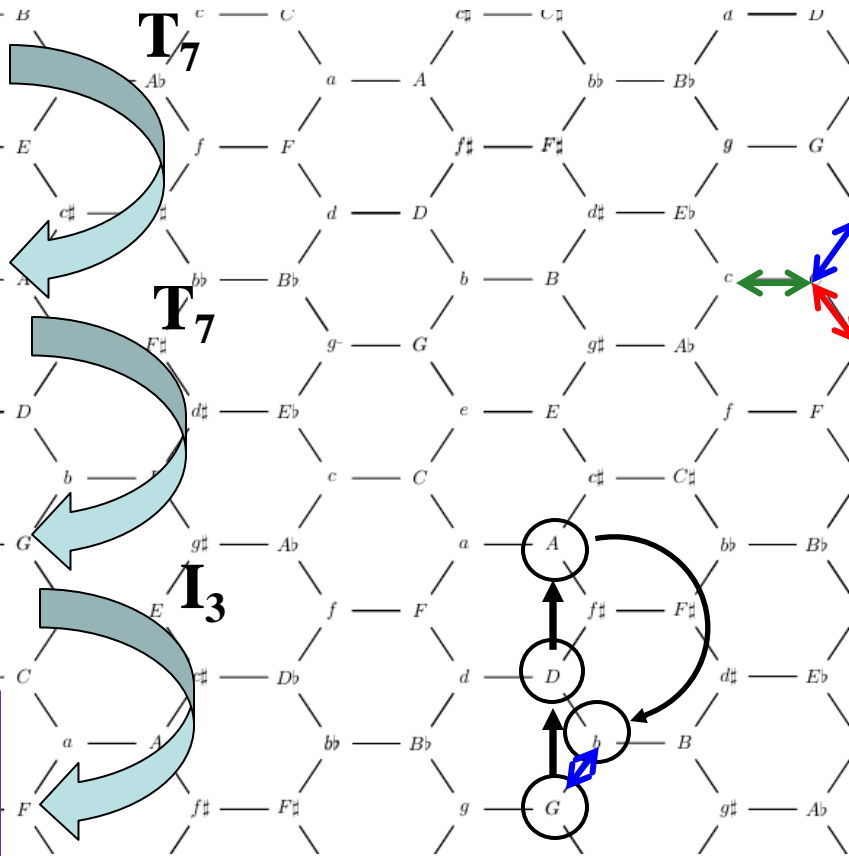


Musical staff showing the note Sol (G) on a treble clef.

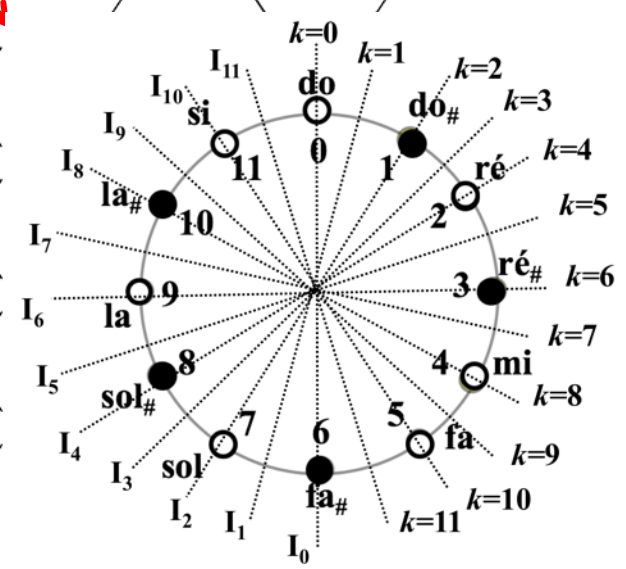
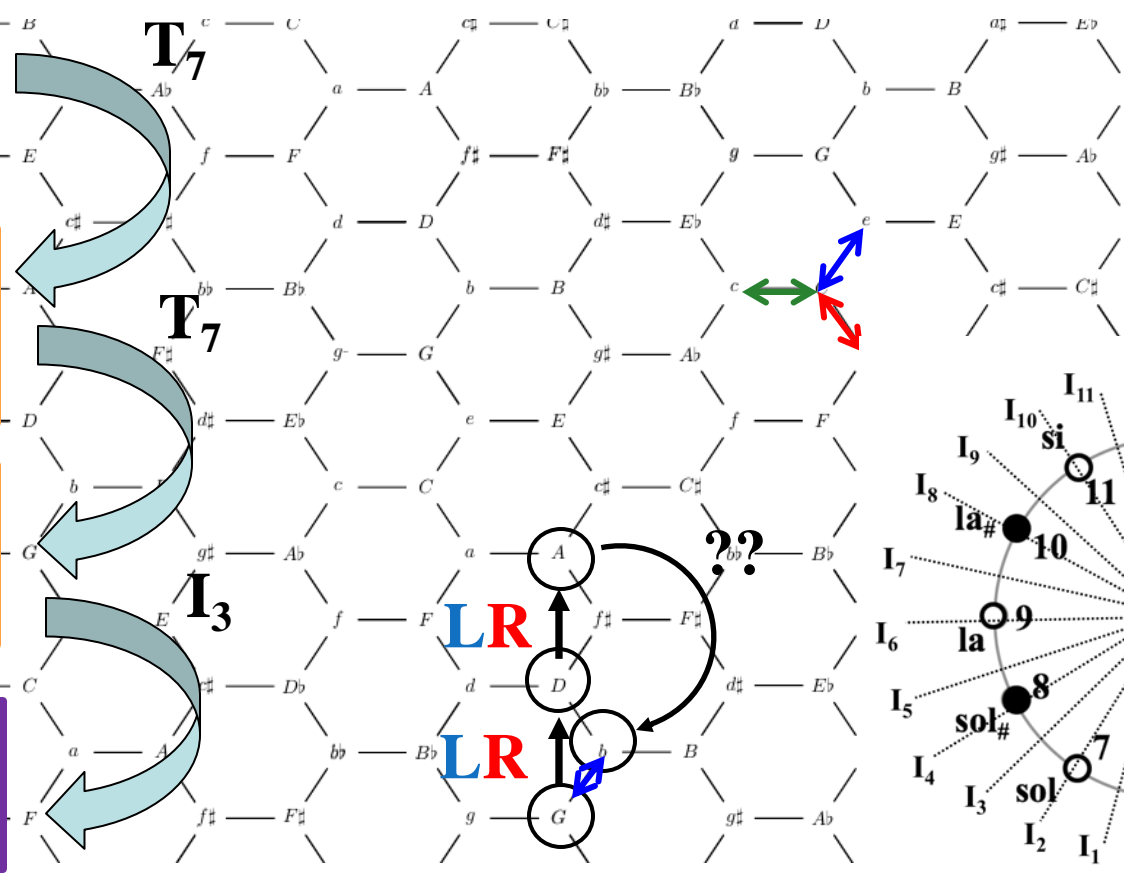
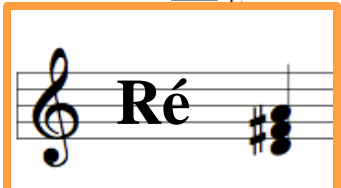
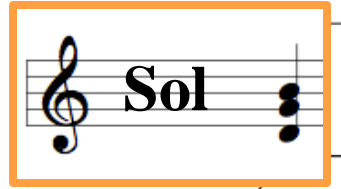
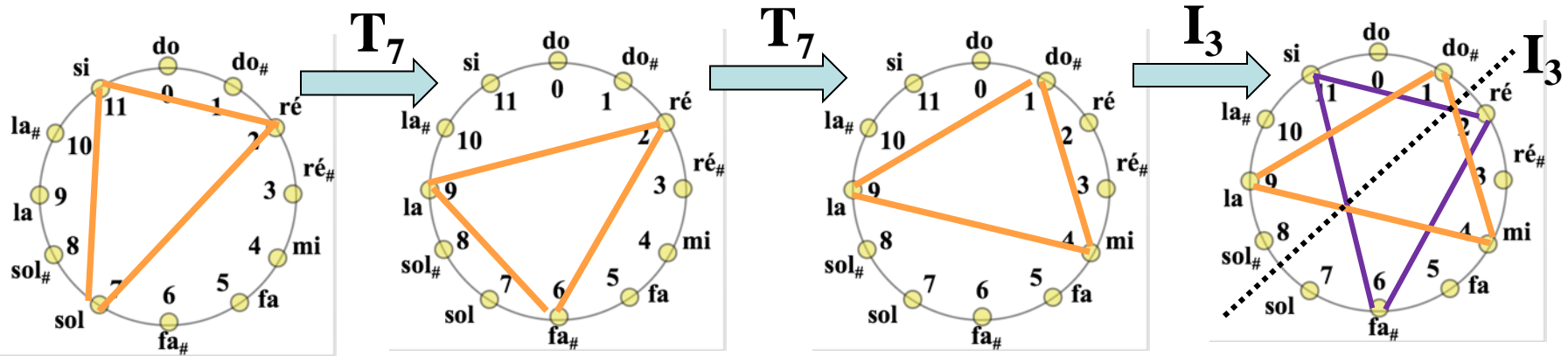
Musical staff showing the note Ré (D) on a treble clef.

Musical staff showing the note La (A) on a treble clef.

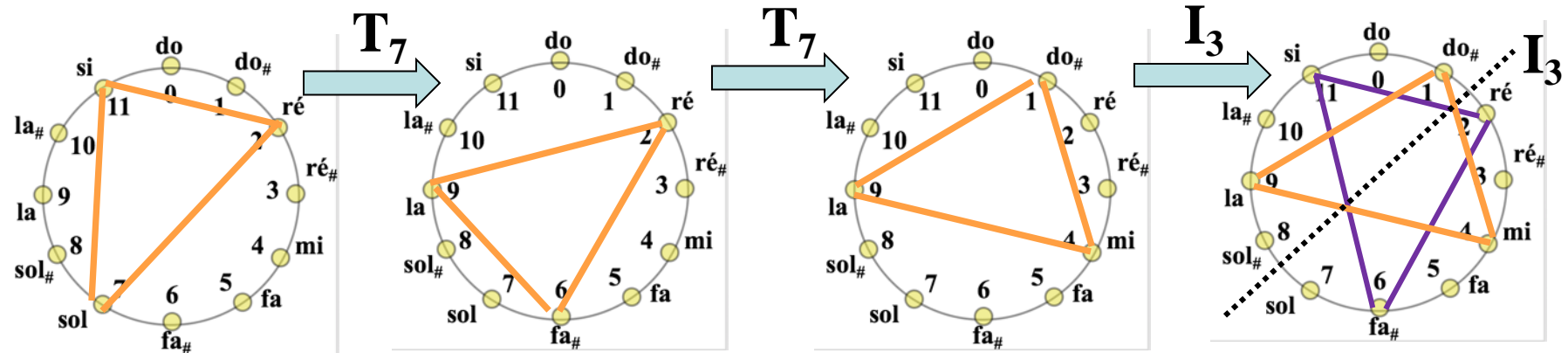
Musical staff showing the note Si (B) on a treble clef.



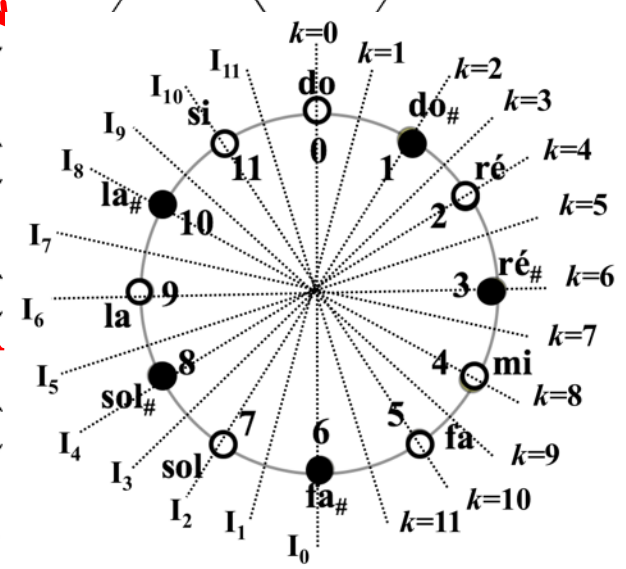
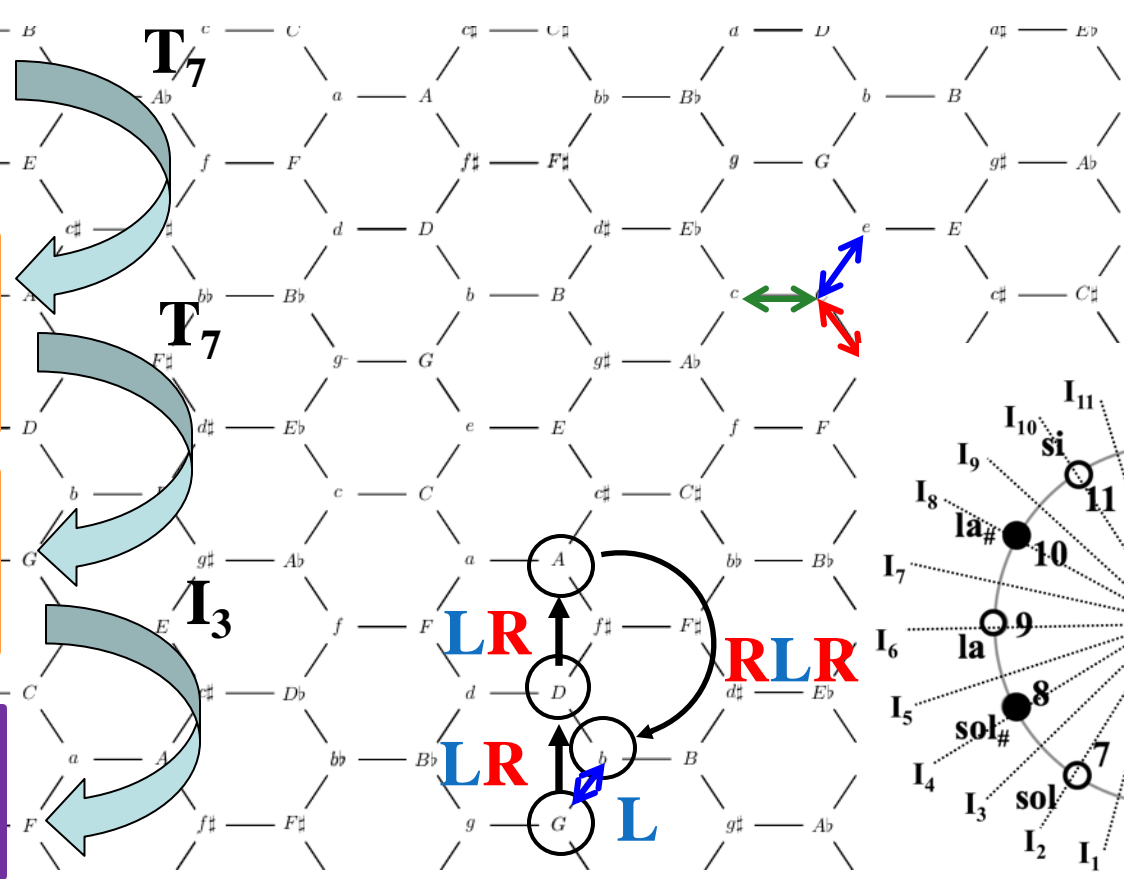
Quelques exemples analytiques



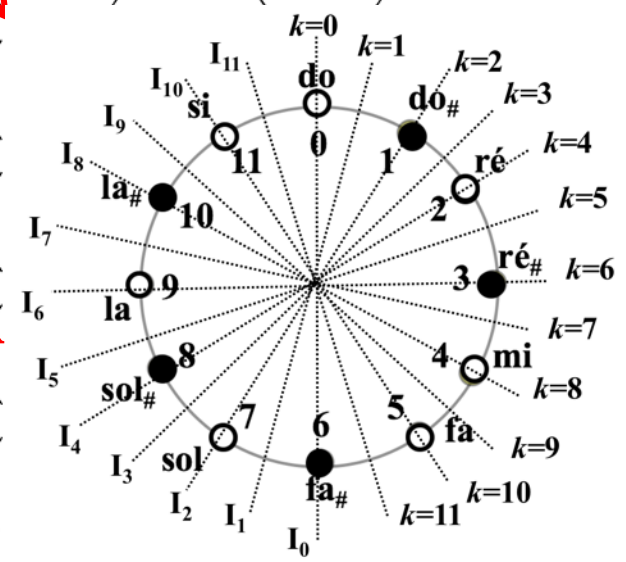
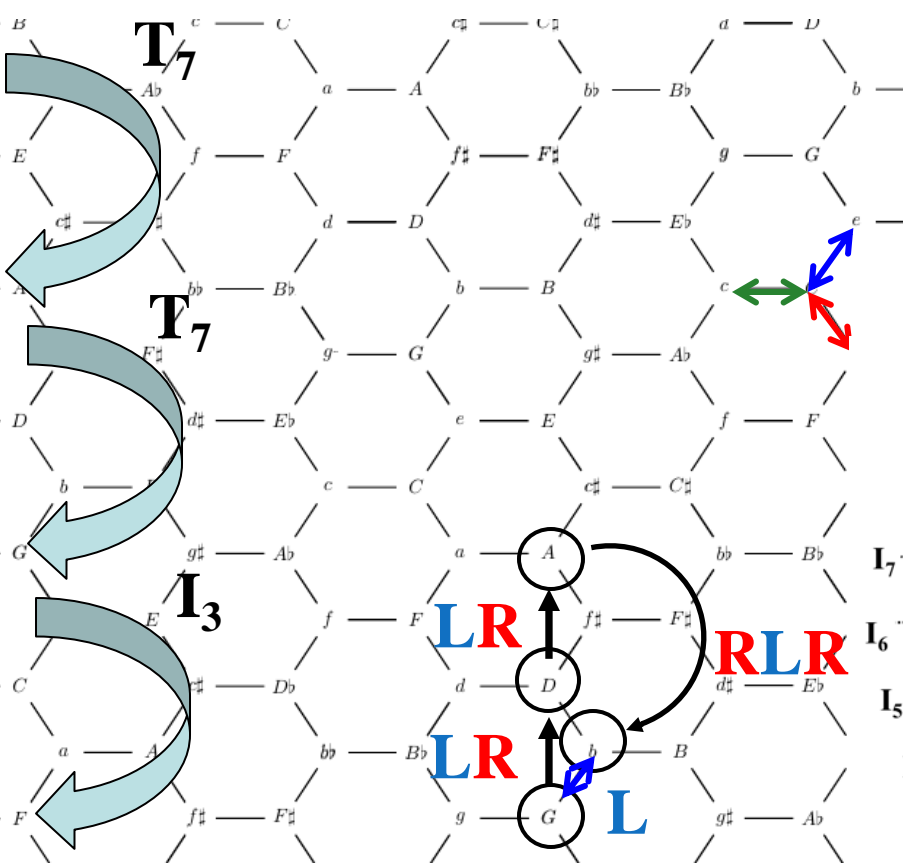
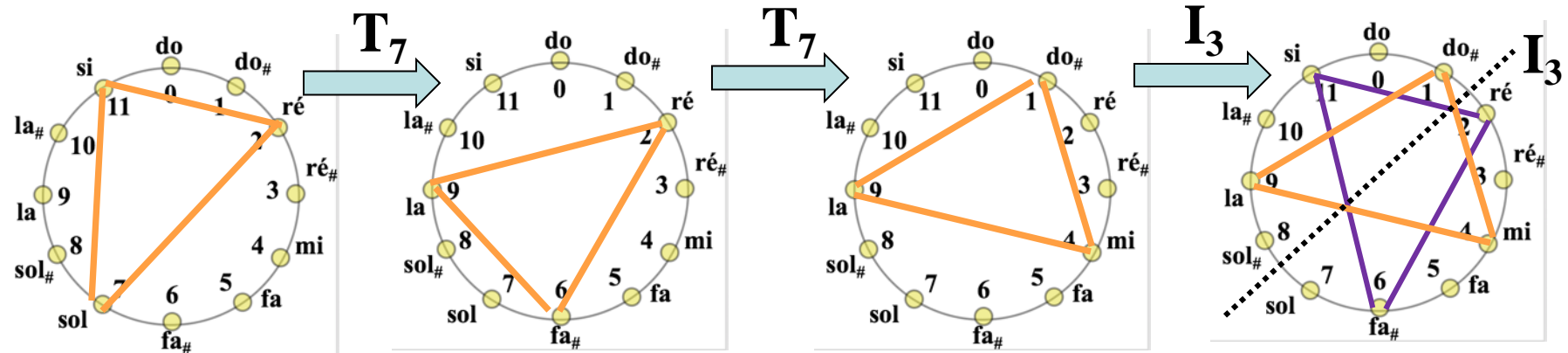
Quelques exemples analytiques



Four musical staves showing chords for Sol, Ré, La, and Si. The Sol and Ré chords are highlighted with orange boxes, and the Si chord is highlighted with a purple box.



Quelques exemples analytiques



La trajectoire spatiale de l'Anatole

Harmonic Progressions

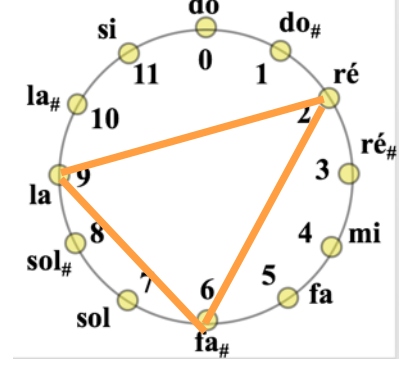
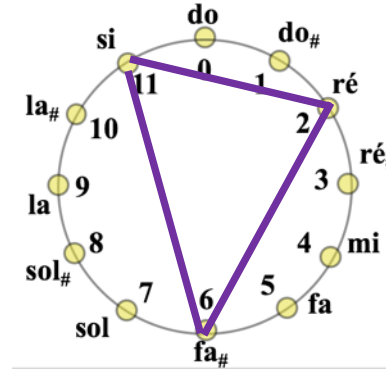
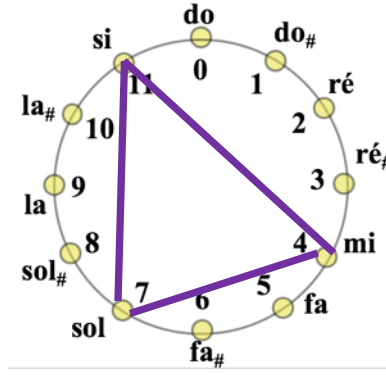
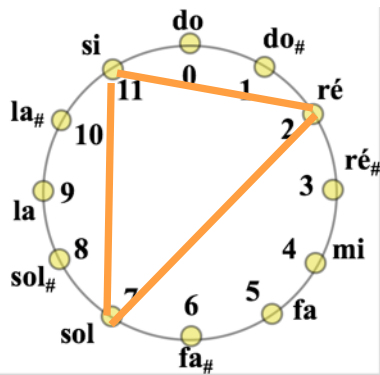
In Paolo Conte

Sotto le Stelle del Jazz



Supervision Moreno Andreatta
Modelisation Gilles Baroin 2016

Quelques exemples analytiques : une Anatole...



G



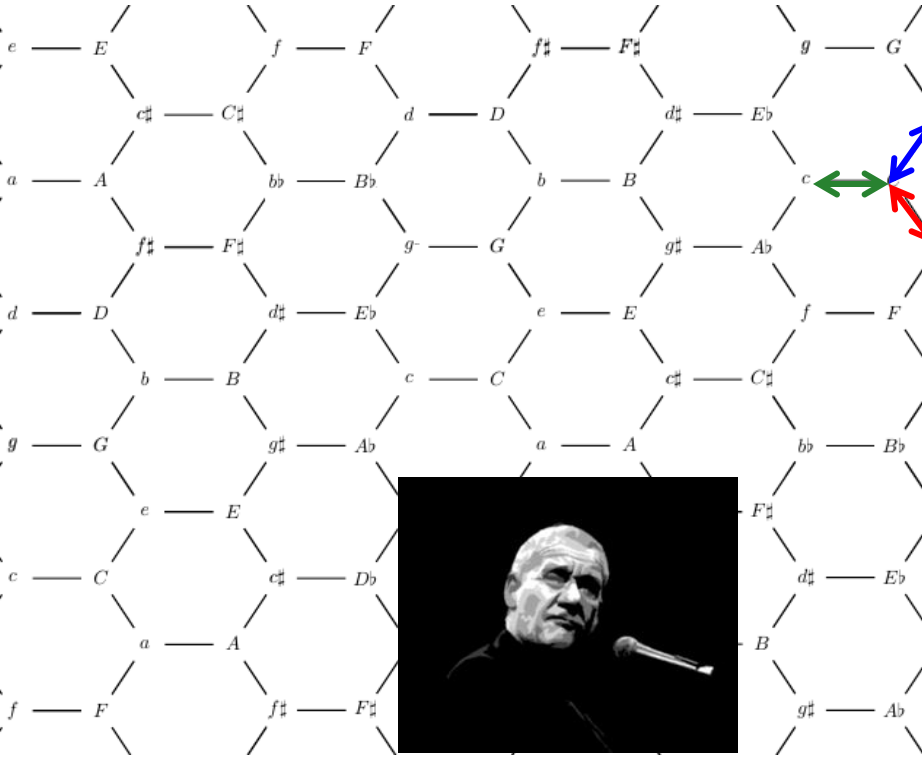
Em



Bm



D

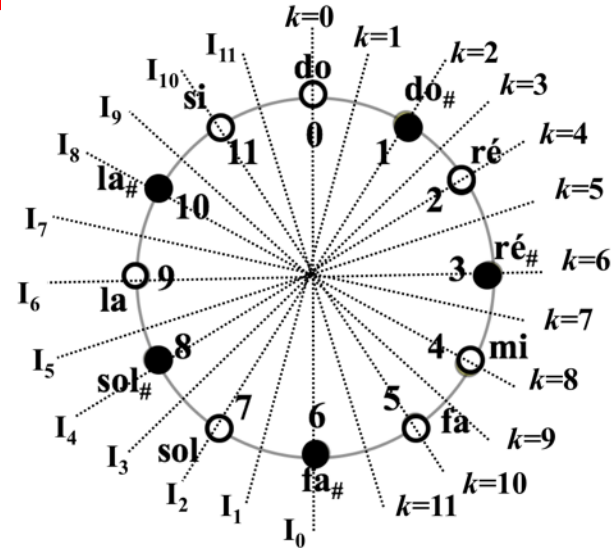


iii → V → I → vi

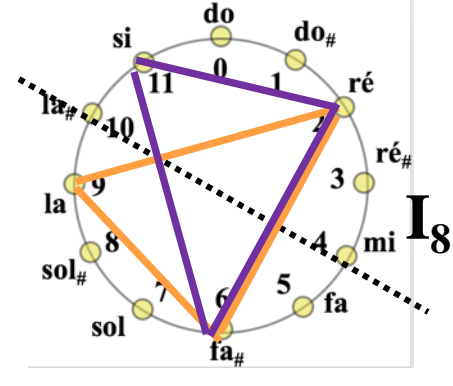
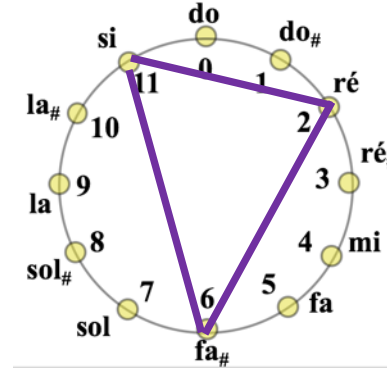
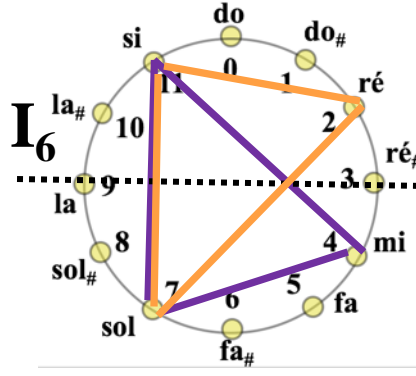
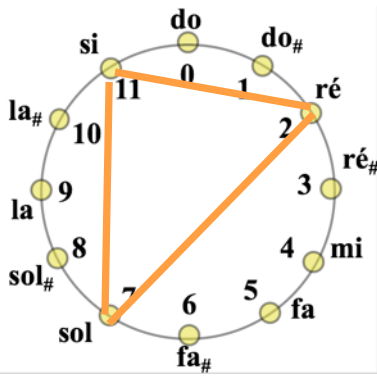
V → I → vi → iii

I → vi → iii → V

vi → iii → V → I



Quelques exemples analytiques : une Anatole...



G



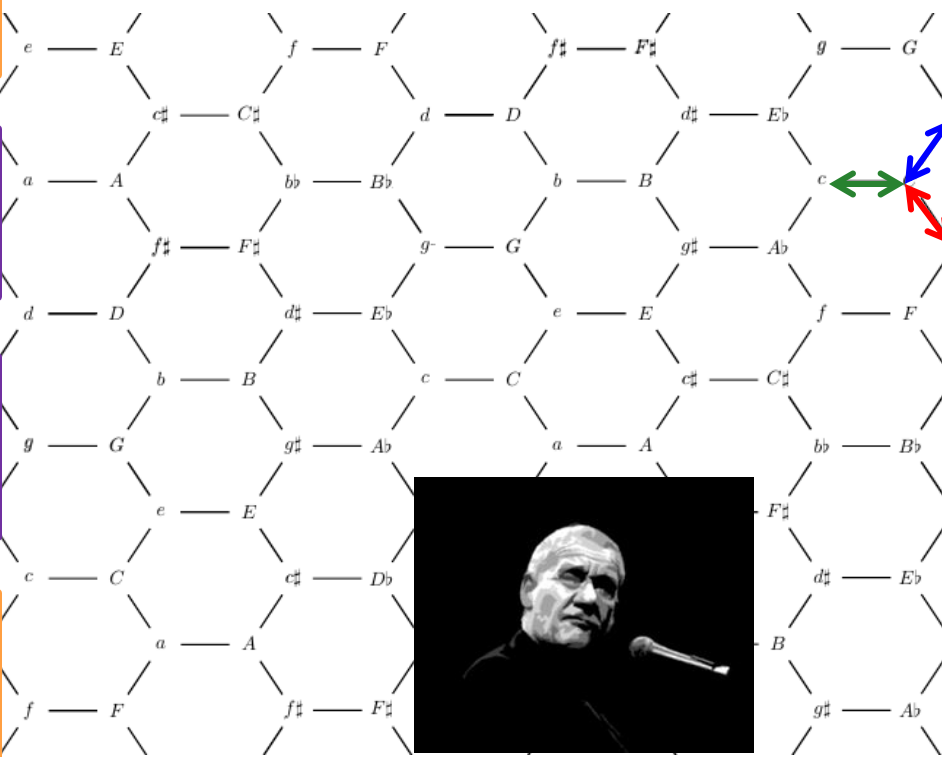
Em



Bm



D

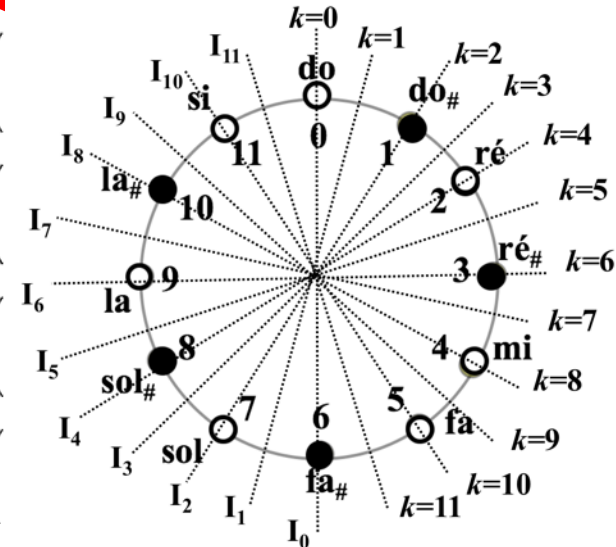


$iii \rightarrow V \rightarrow I \rightarrow vi$

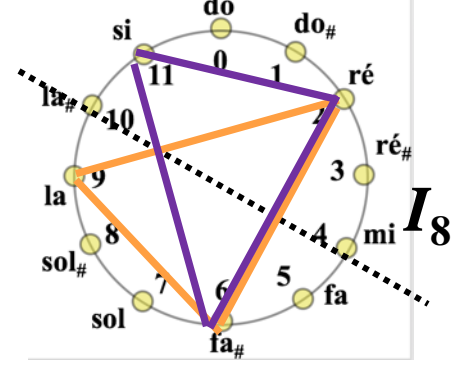
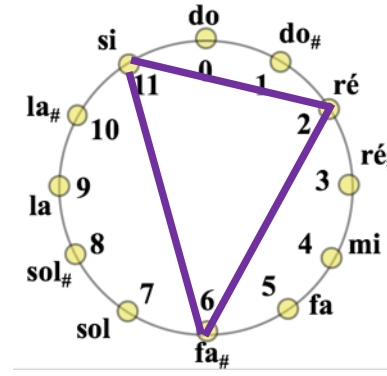
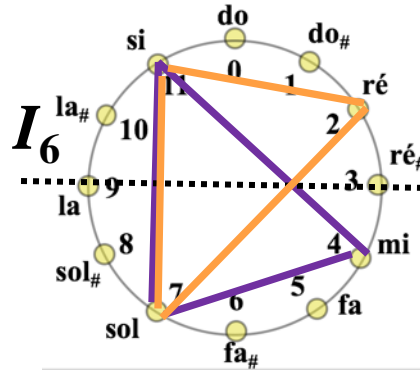
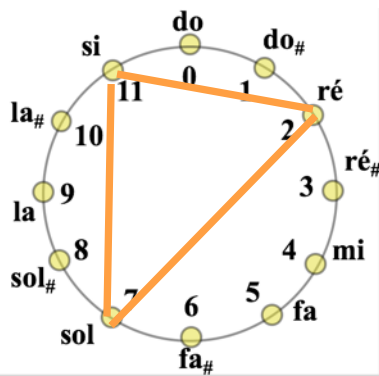
$V \rightarrow I \rightarrow vi \rightarrow iii$

$I \rightarrow vi \rightarrow iii \rightarrow V$

$vi \rightarrow iii \rightarrow V \rightarrow I$



Quelques exemples analytiques : une Anatole...



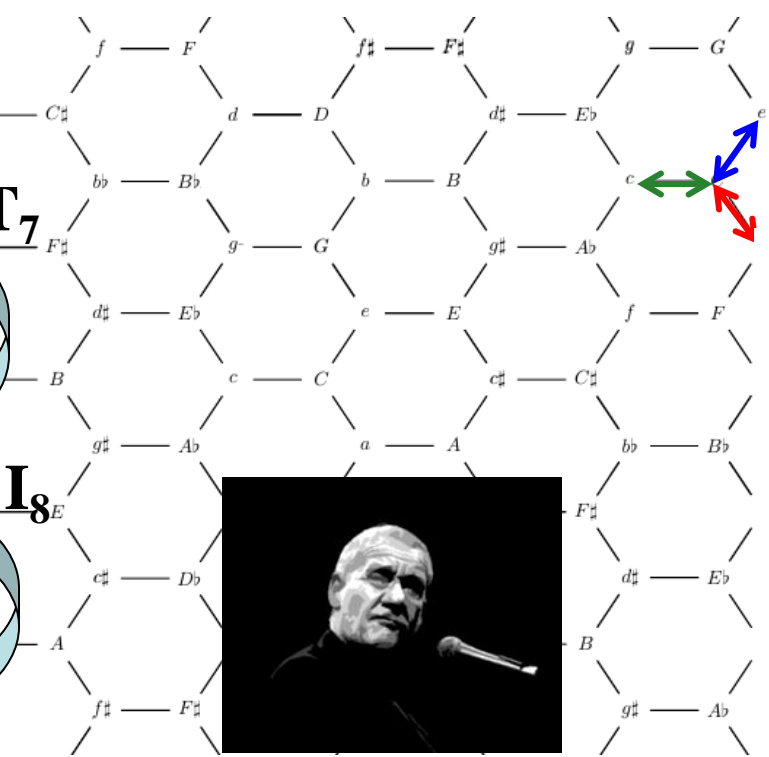
G

Em

Bm

D

Diagram showing curved arrows connecting G to Em, Em to Bm, Bm to D, and D to G, with interval labels I_6 , T_7 , and I_8 .

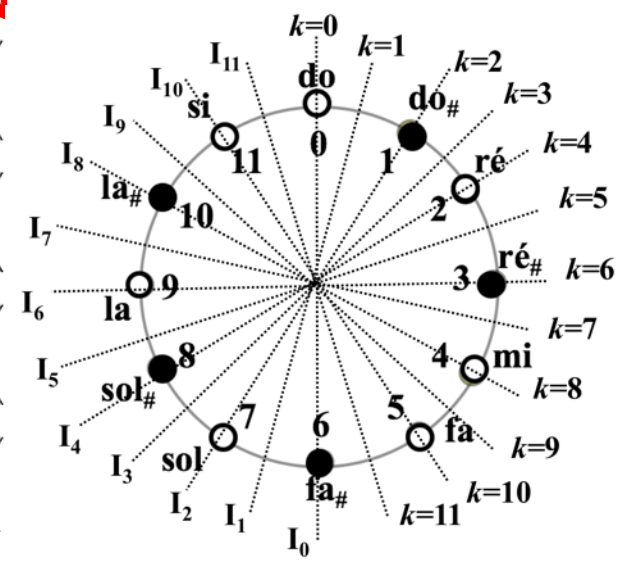


$iii \rightarrow V \rightarrow I \rightarrow vi$

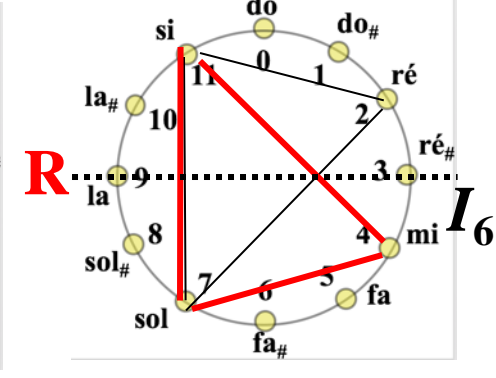
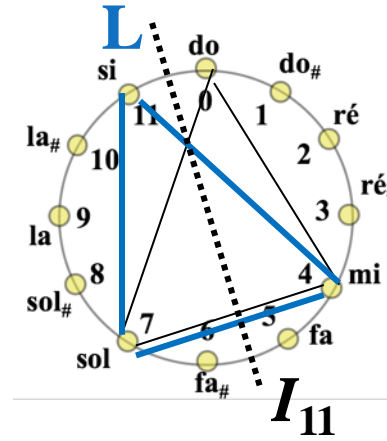
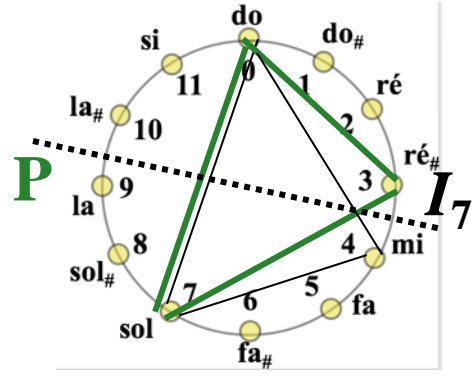
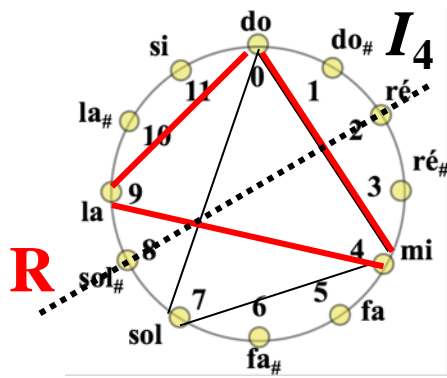
$V \rightarrow I \rightarrow vi \rightarrow iii$


$I \rightarrow vi \rightarrow iii \rightarrow V$


$vi \rightarrow iii \rightarrow V \rightarrow I$





Quelques exemples analytiques : ...chez Paolo Conte



G 

Em 

Bm 

D 

R \updownarrow **G**

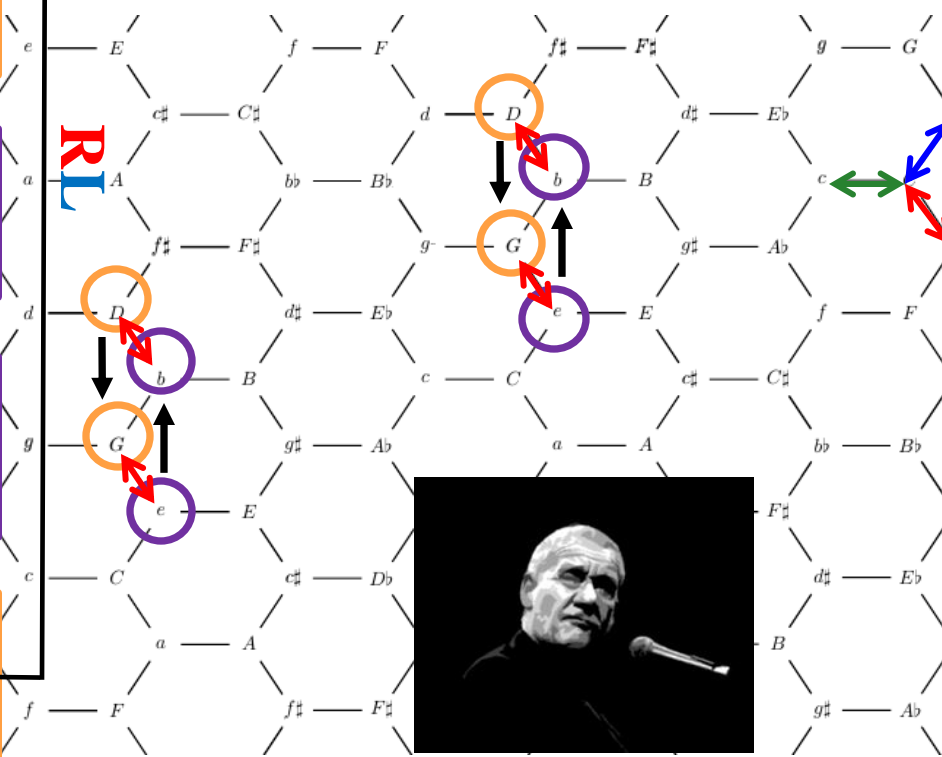
RL \updownarrow **Em**

R \updownarrow **D**

RT \updownarrow **Em**

RL \updownarrow **Bm**

R \updownarrow **D**

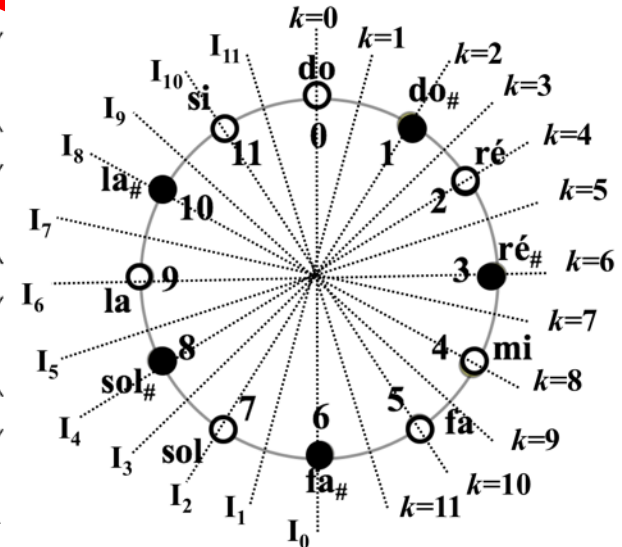


$iii \rightarrow V \rightarrow I \rightarrow vi$

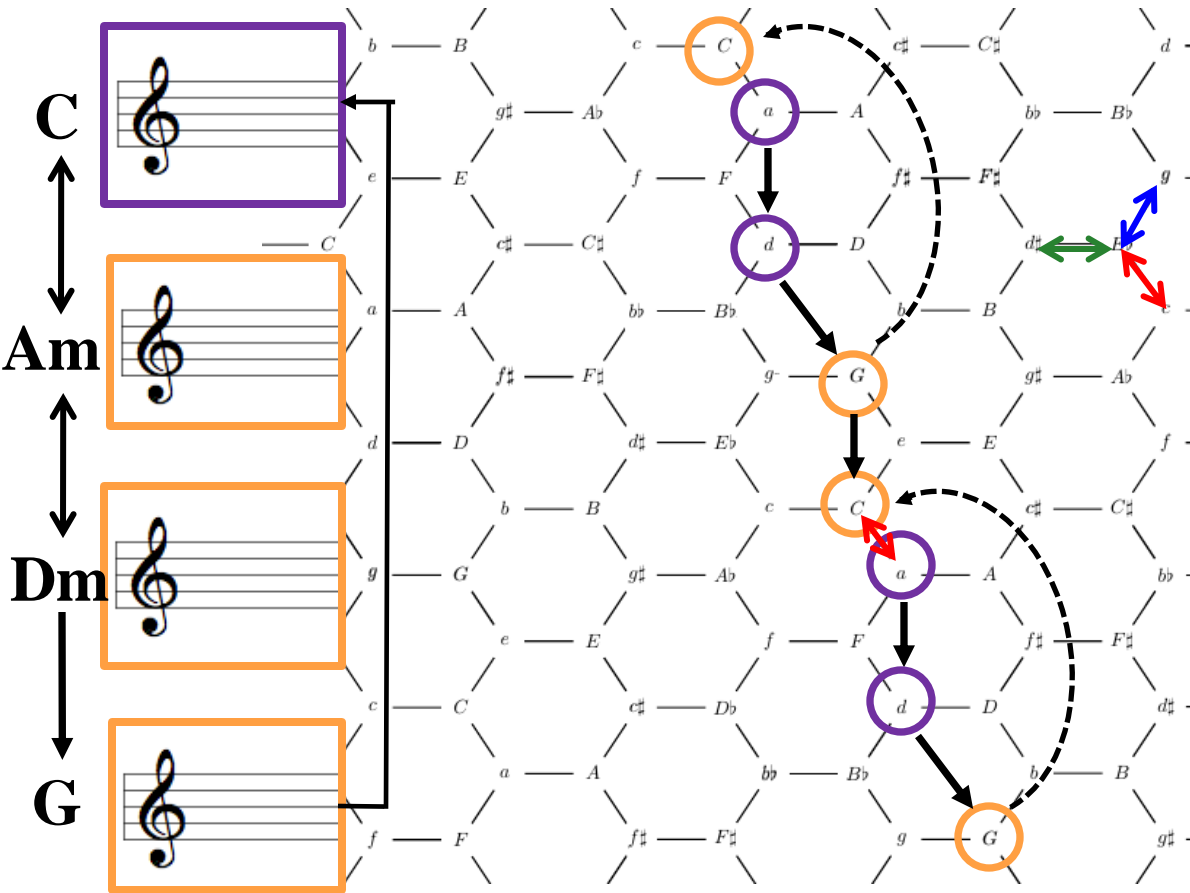
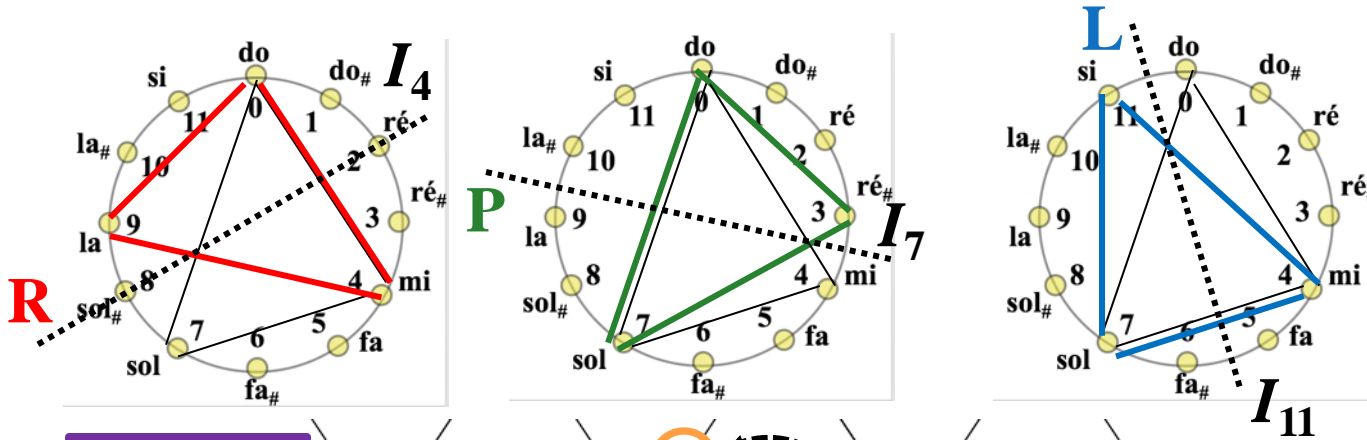
$V \rightarrow I \rightarrow vi \rightarrow iii$

$I \rightarrow vi \rightarrow iii \rightarrow V$

$vi \rightarrow iii \rightarrow V \rightarrow I$



Autres Anatoles et autres trajectoires

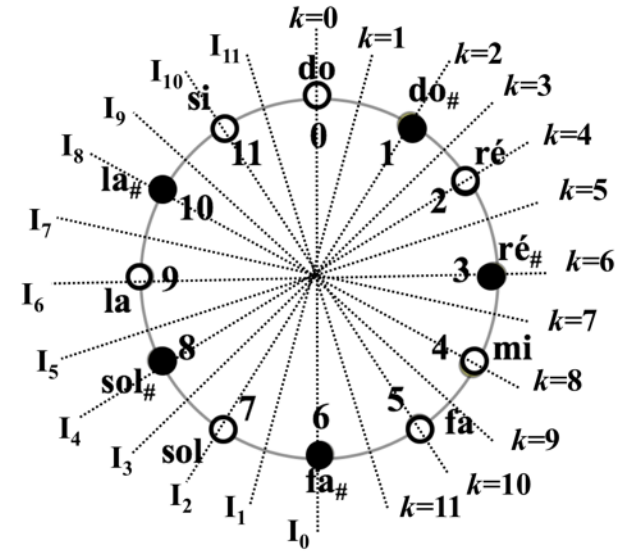


ii → V → I → vi

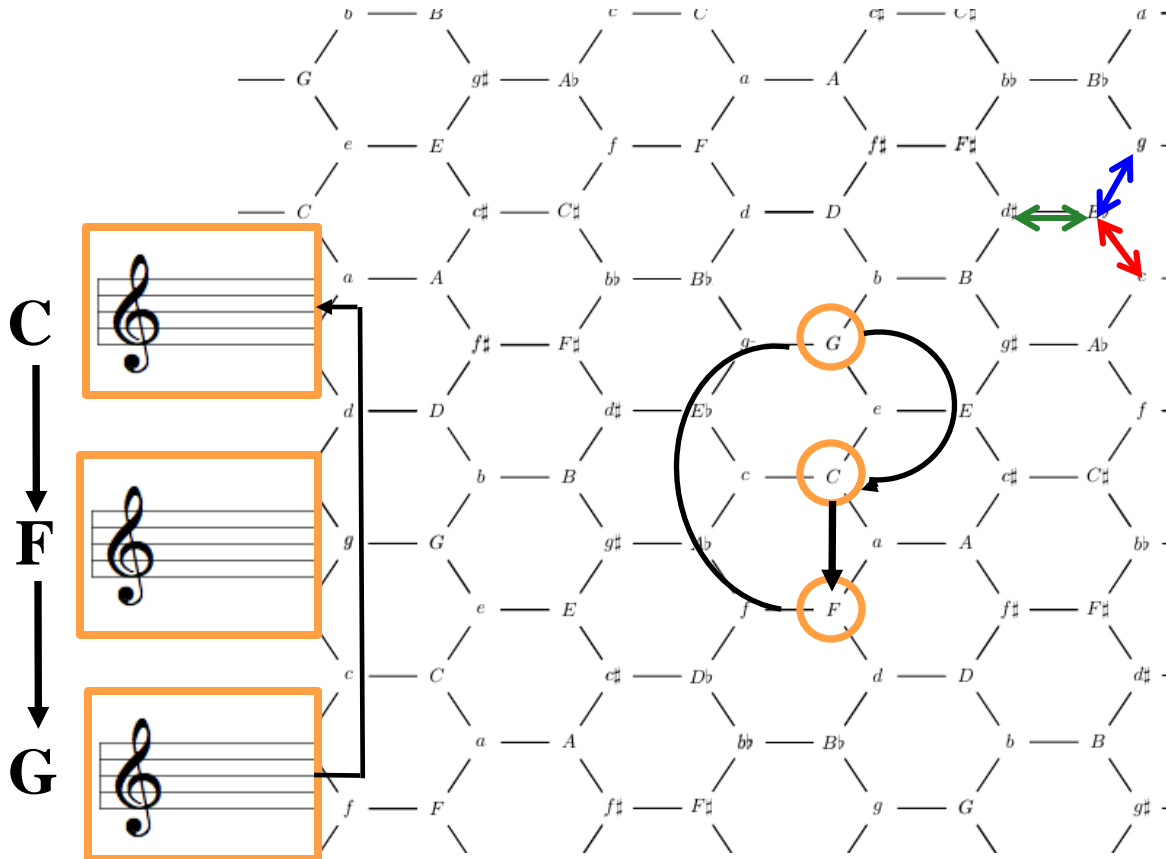
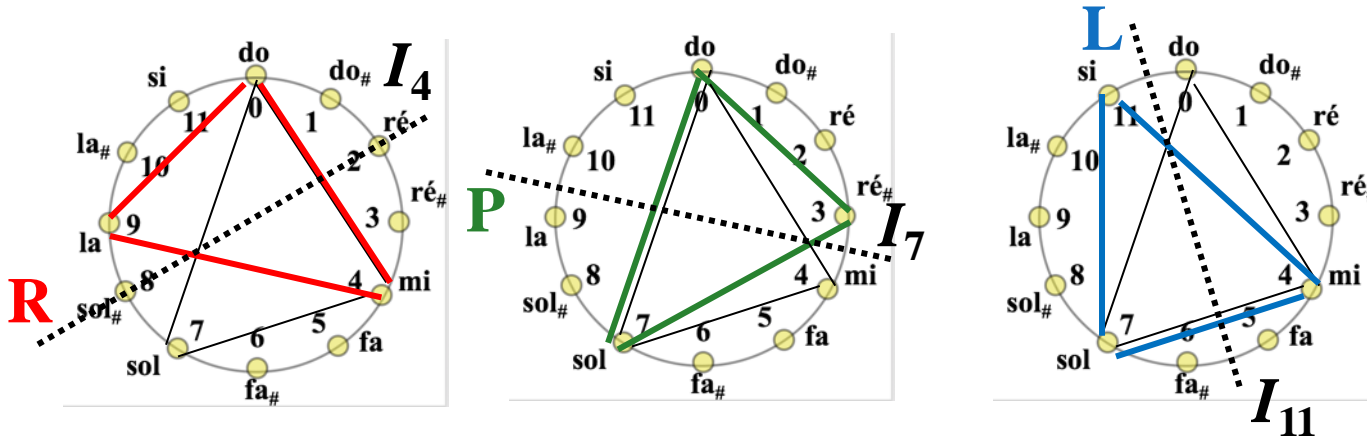
V → I → vi → ii

I → vi → ii → V

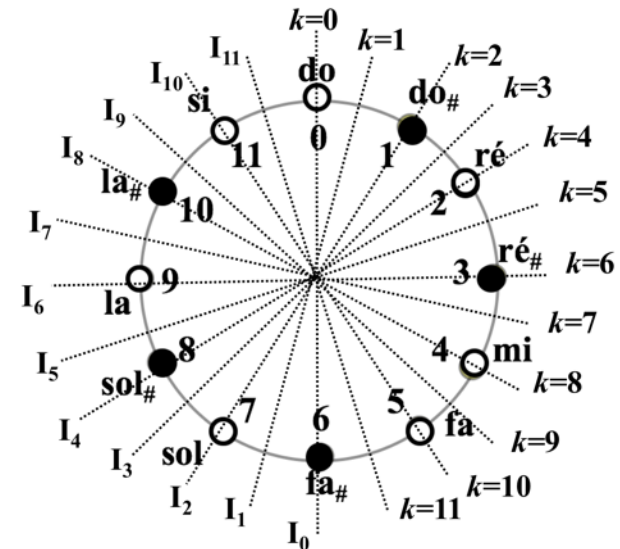
vi → ii → V → I



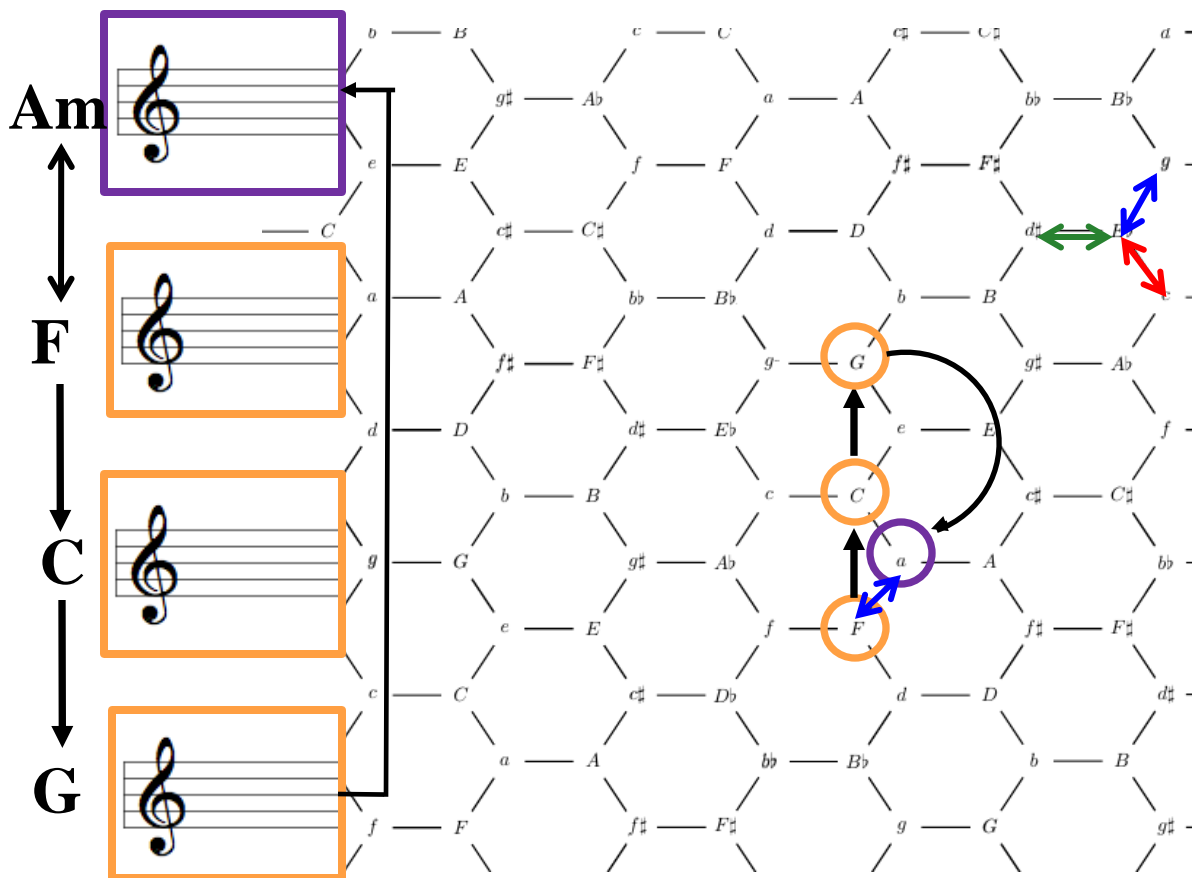
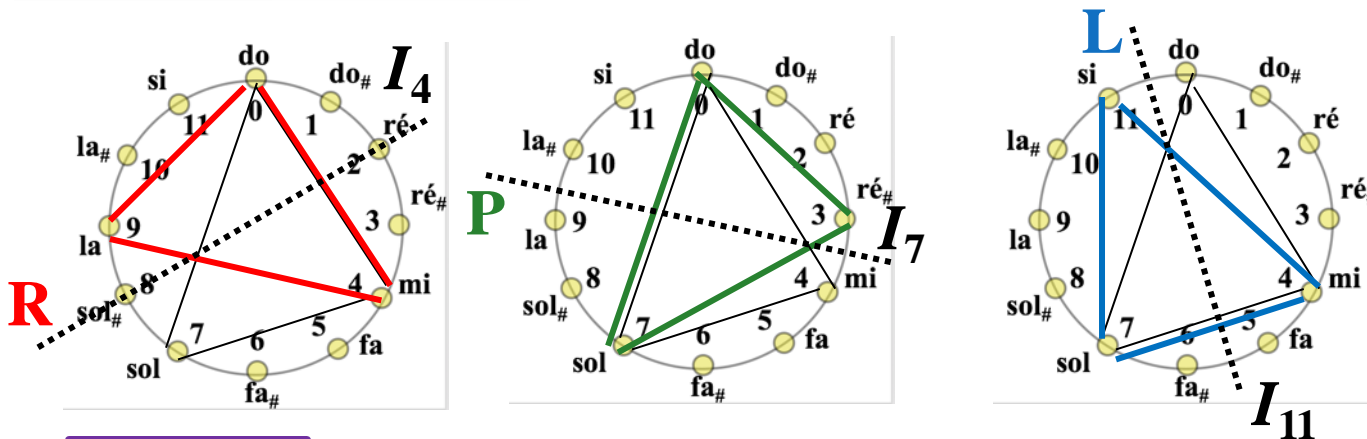
Boucles harmoniques dans la pop



$I \rightarrow IV \rightarrow V$
 $IV \rightarrow V \rightarrow I$
 $V \rightarrow I \rightarrow IV$



Boucles harmoniques dans la pop

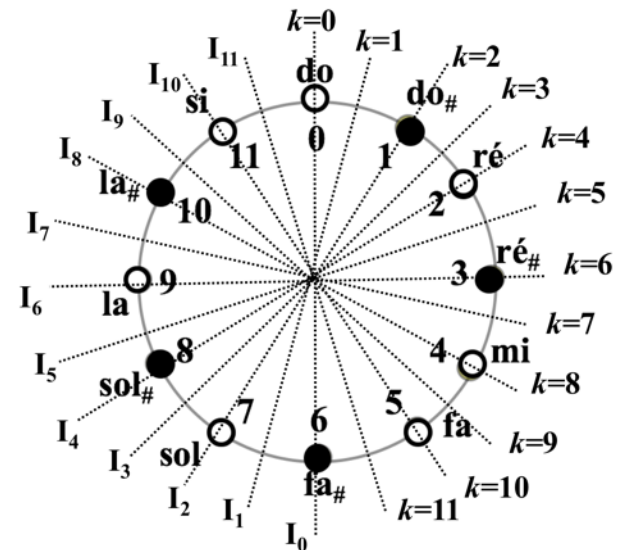


vi → IV → I → V

IV → I → V → vi

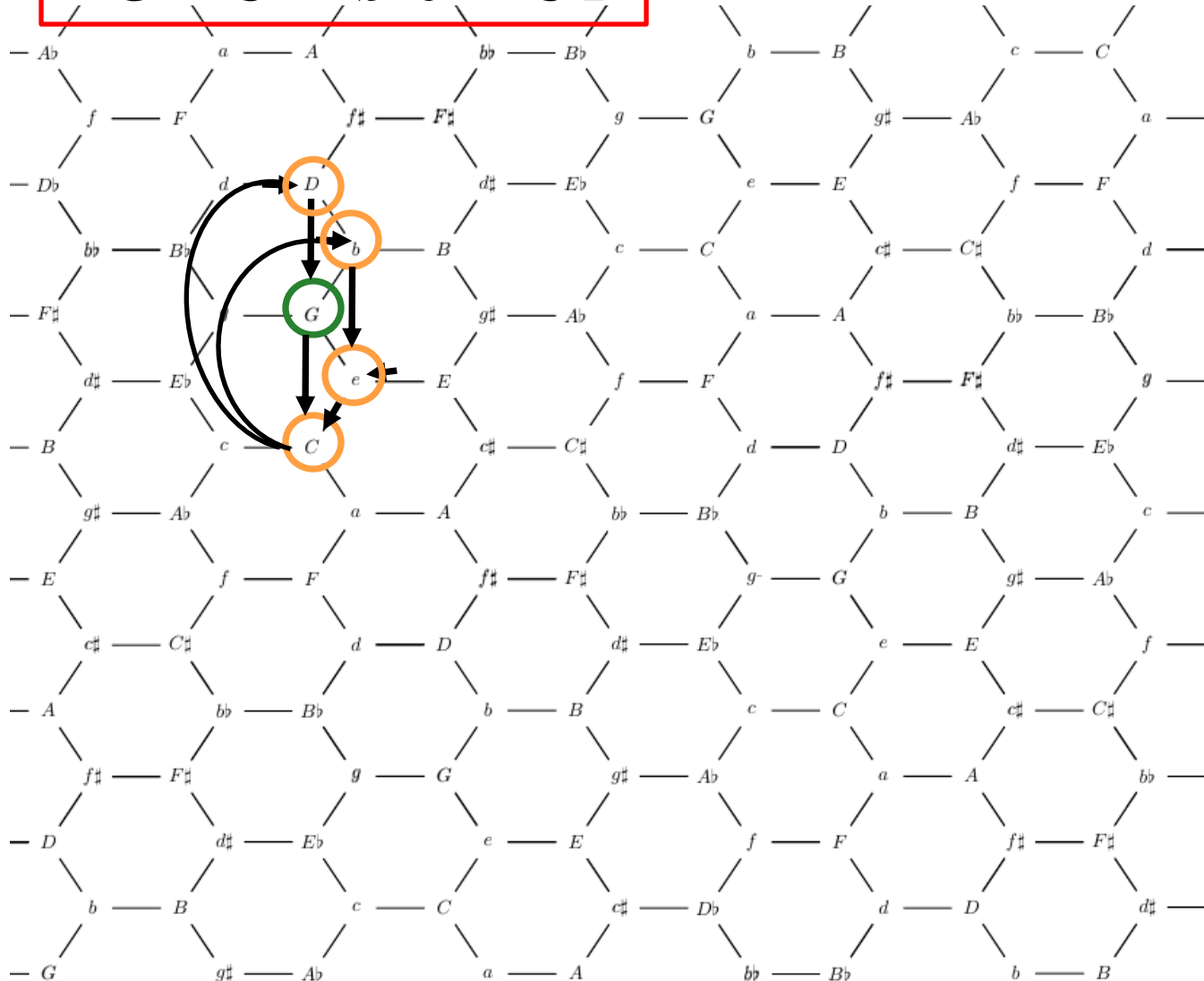
I → V → vi → IV

V → vi → IV → I



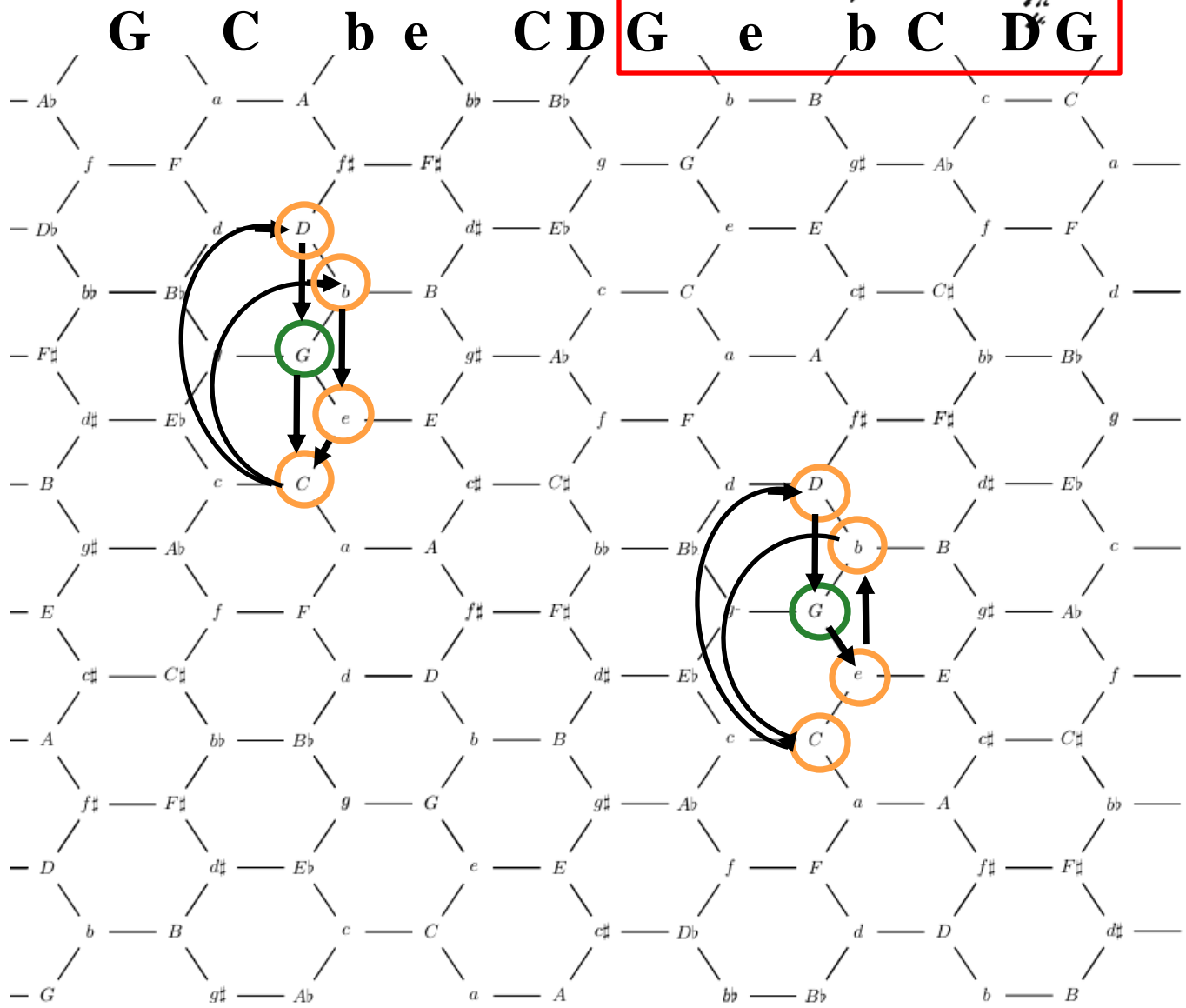
Retour sur un tube permutatif

Se telefonando, 1966
(Costanzo/Morricone/Mina)



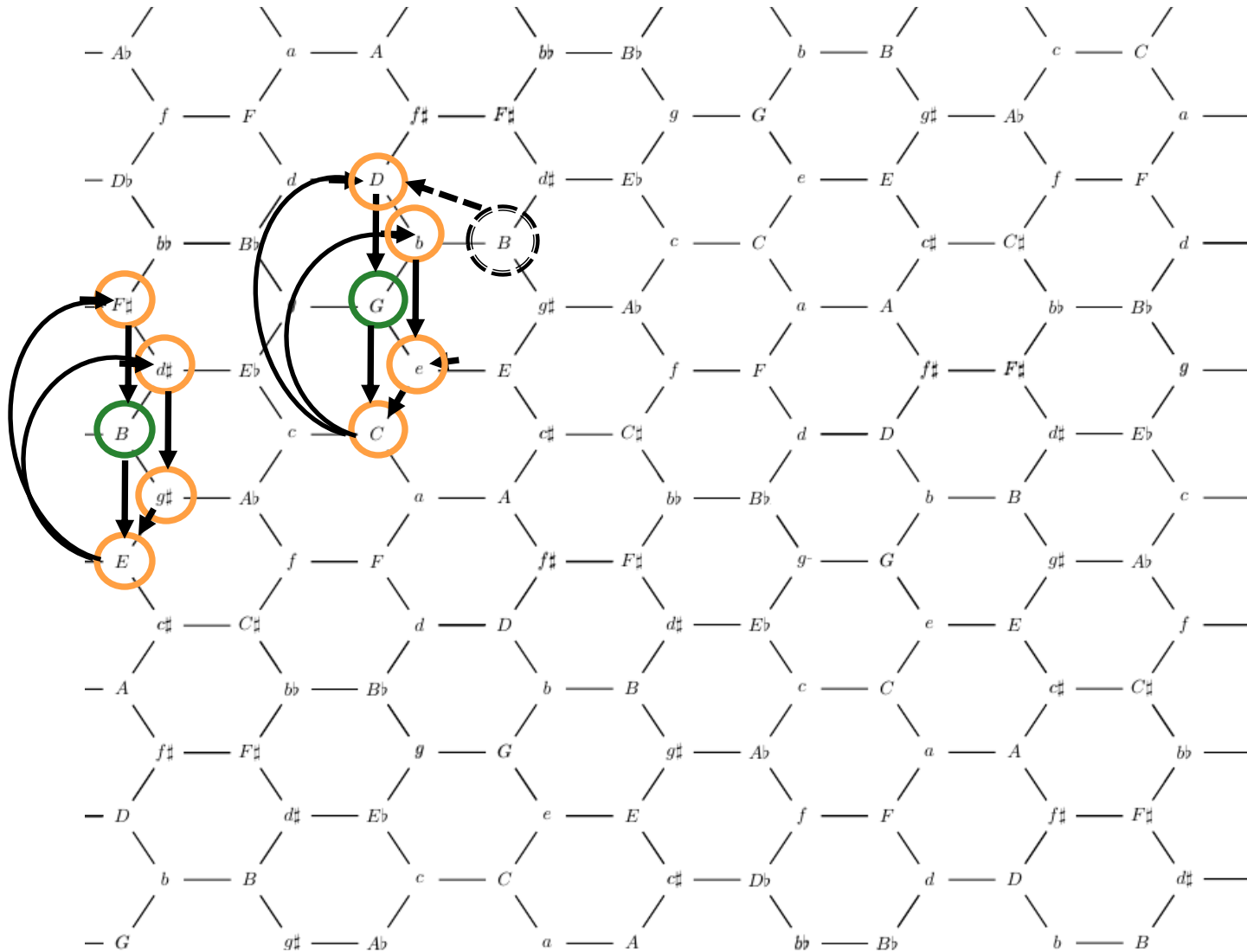
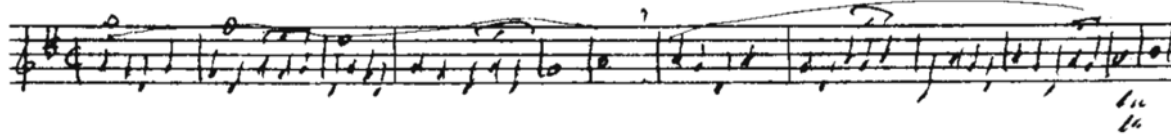
Retour sur un tube permutatif

Se telefonando, 1966
(Costanzo/Morricone/Mina)



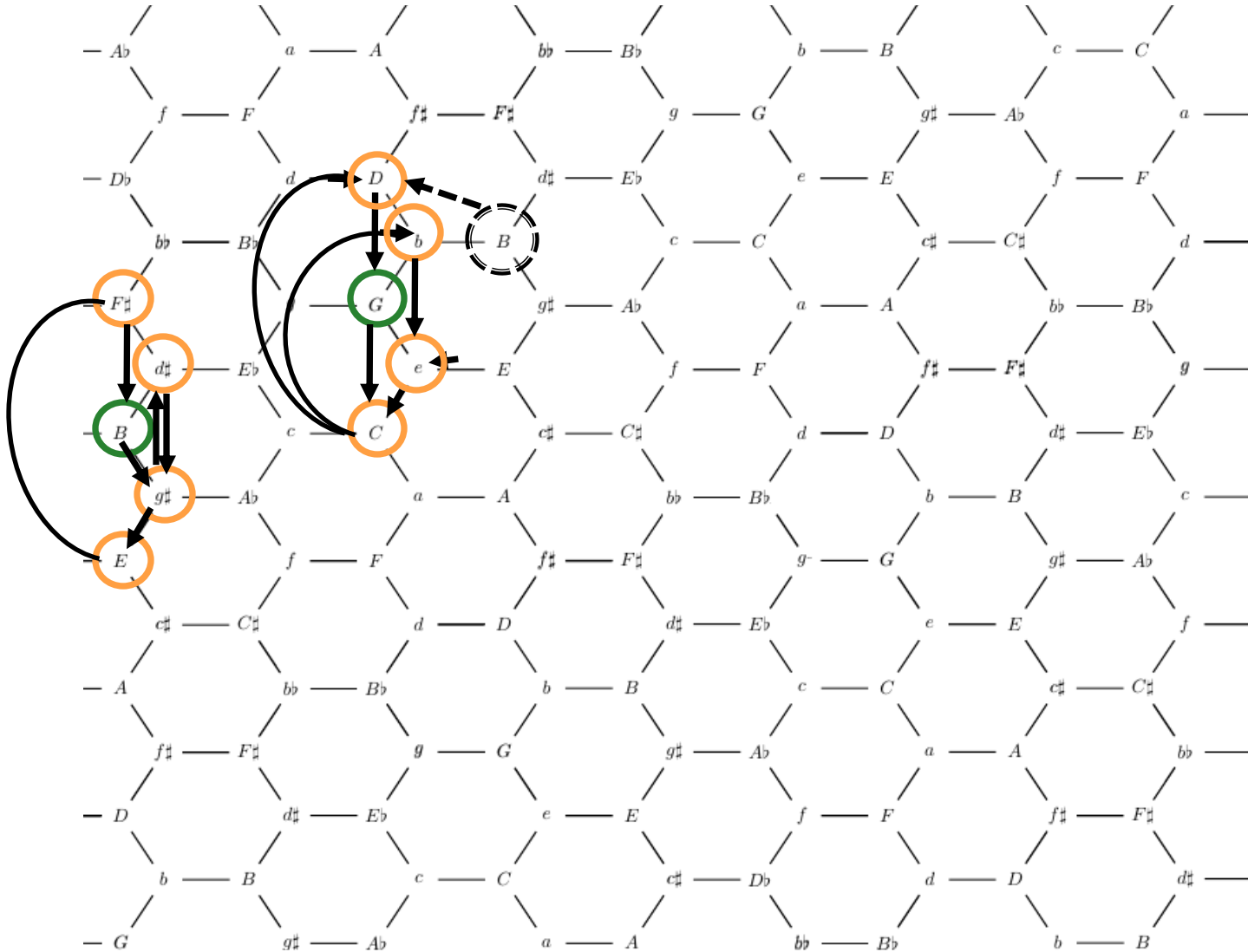
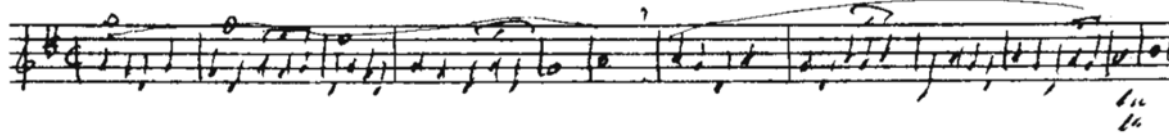
Retour sur un tube permutatif

Se telefonando, 1966
(Costanzo/Morricone/Mina)



Retour sur un tube permutatif

Se telefonando, 1966
(Costanzo/Morricone/Mina)



Mise en évidence des symétries dans la musica pop

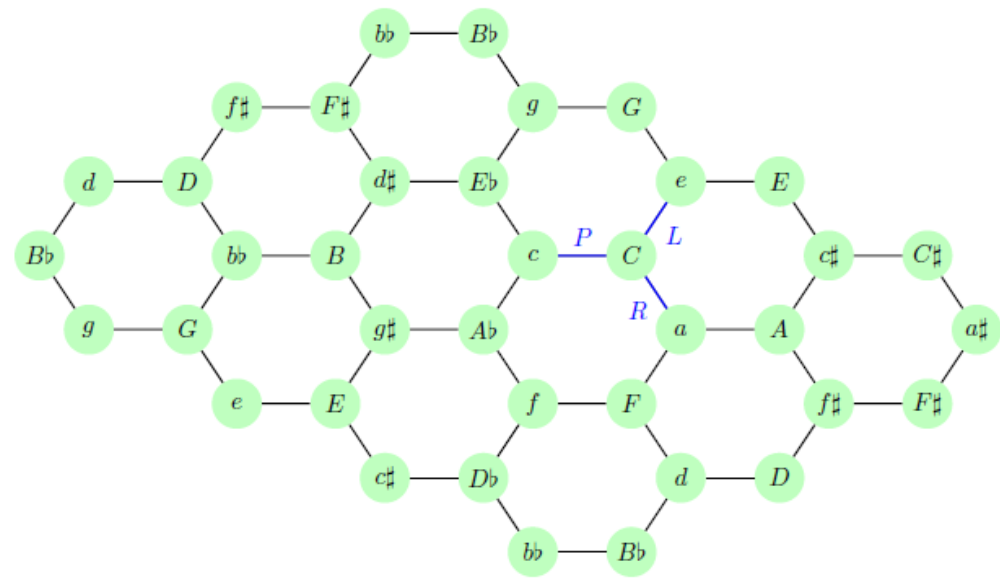
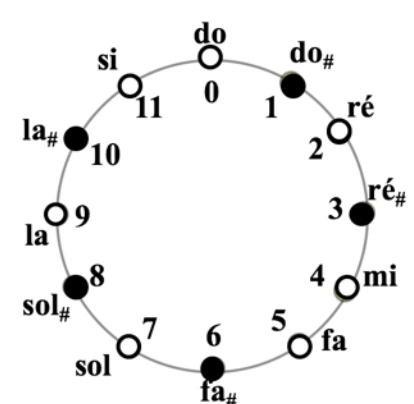
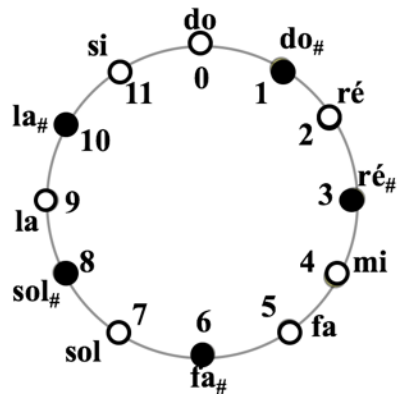
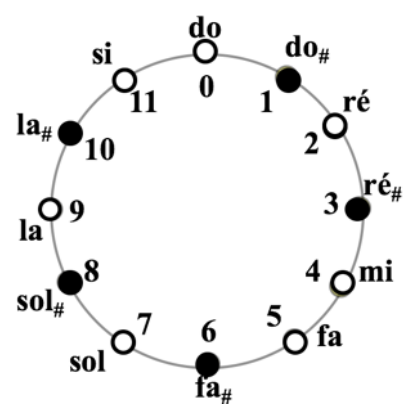
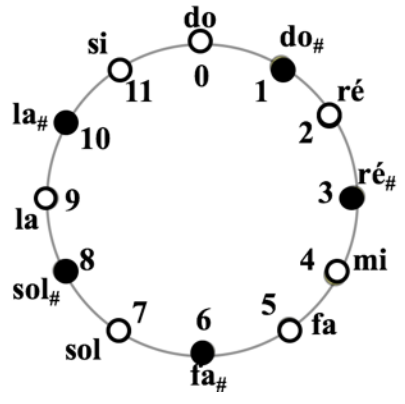
- Guy Capuzzo, "Neo-Riemannian Theory and the Analysis of Pop-Rock Music", Music Theory Spectrum 26(2), p. 177-199, 2004

Synthesizer

D- ↔ F- ↔ Db+ ↔ Bb+ ↔



Shake the disease - 1985
(Depeche Mode) – min. 2'17"



Mise en évidence des symétries dans la musica pop

- Guy Capuzzo, "Neo-Riemannian Theory and the Analysis of Pop-Rock Music", Music Theory Spectrum 26(2), p. 177-199, 2004

D- **RP** F- **L** Db+ **RP** Bb+ **L**

Séquence RPLRPL



Shake the disease - 1985
(Depeche Mode) – min. 2'17"

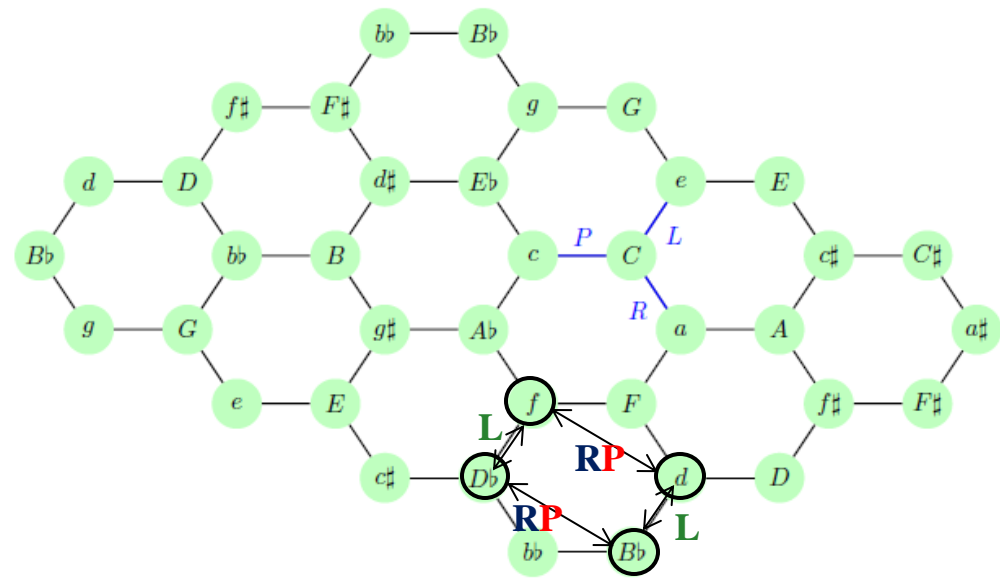


Dm

Fm

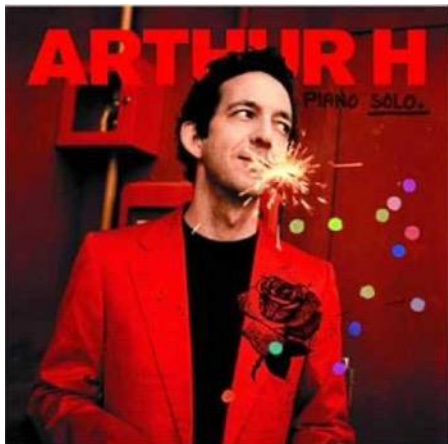
Bb

Db

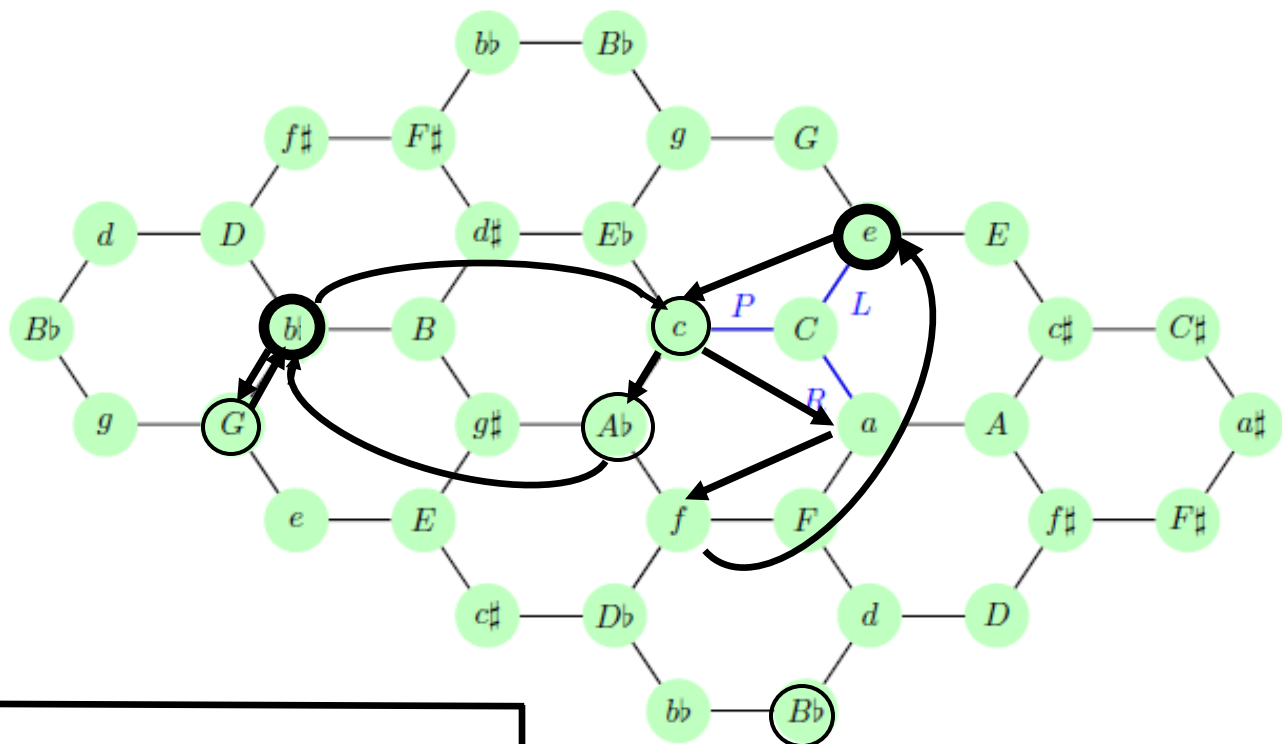


(Source <http://www.mathsintheair.org/>)

Parcours harmoniques chez Arthur H



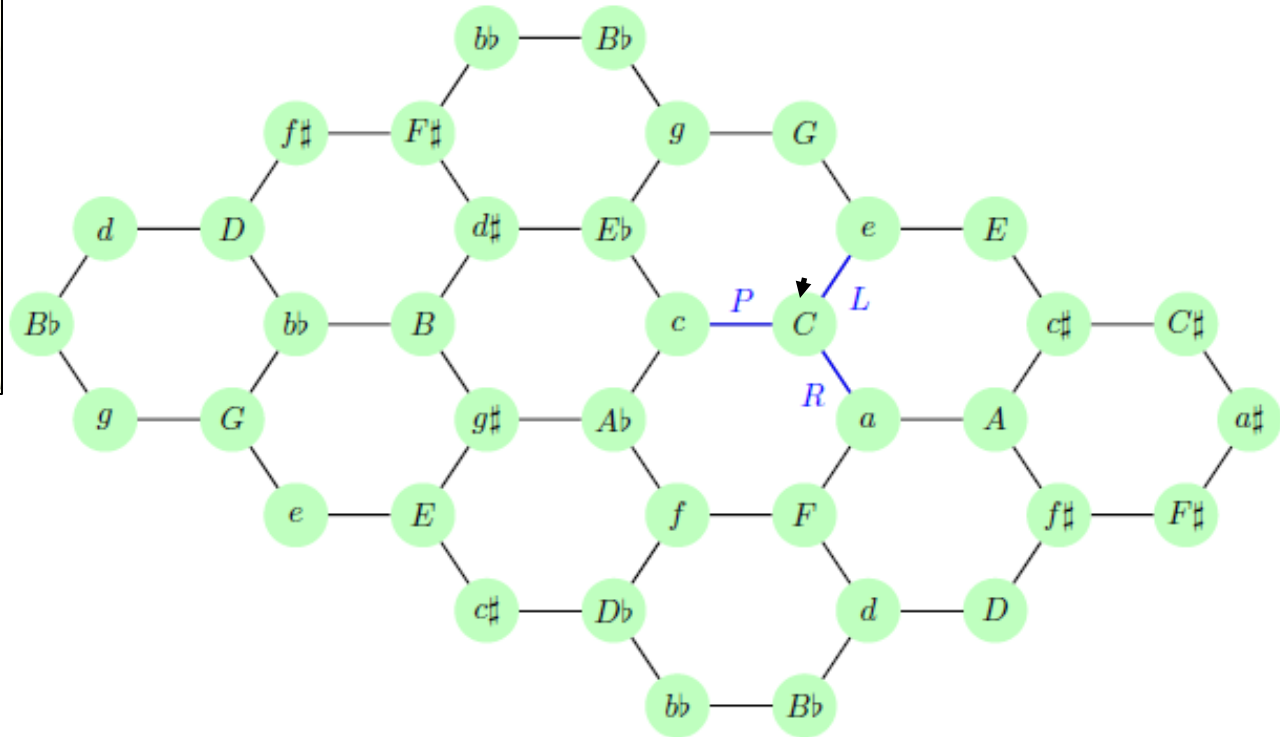
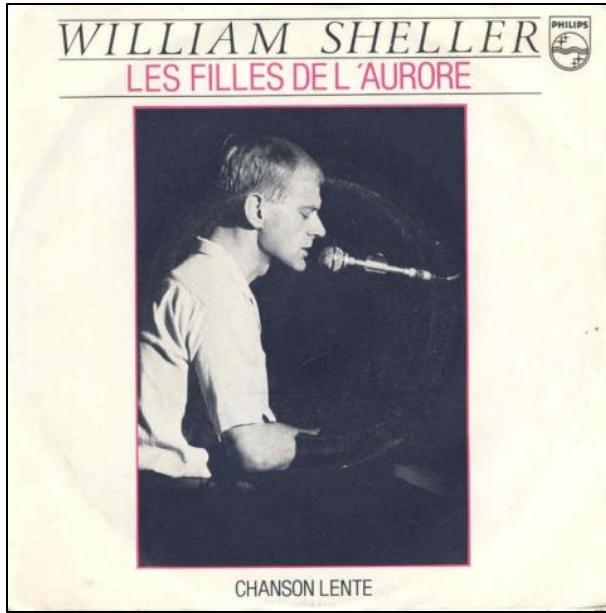
Le Baron noir
(album *Piano solo*, 2002)



Cycle 1 : $Bm \xrightarrow{PLPR} Cm \xrightarrow{L} Ab \xrightarrow{PRP} Bm \xrightarrow{L} G \xrightarrow{L} Bm \xrightarrow{L} G \xrightarrow{L} Bm$

Cycle 2 : $Em \xrightarrow{LP} Cm \xrightarrow{PL} Em \xrightarrow{LP} Cm \xrightarrow{PR} Am \xrightarrow{LP} Fm \xrightarrow{PLRL} Em$

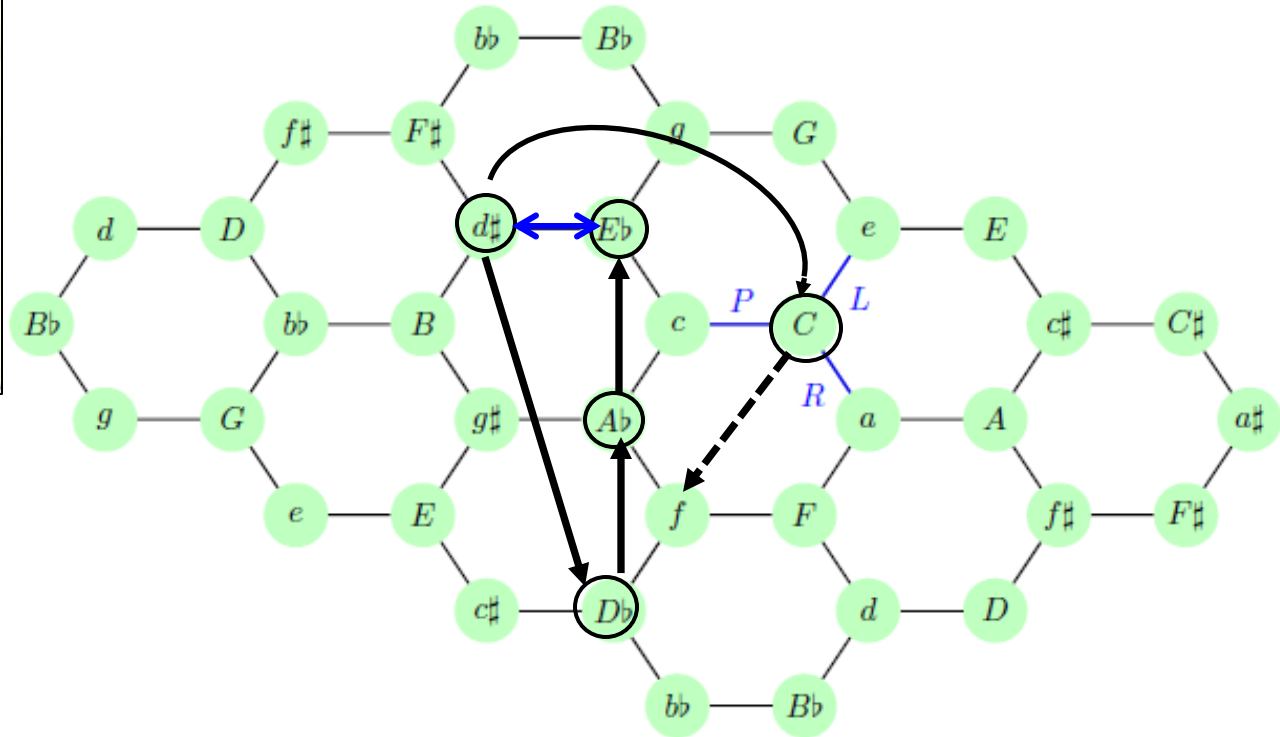
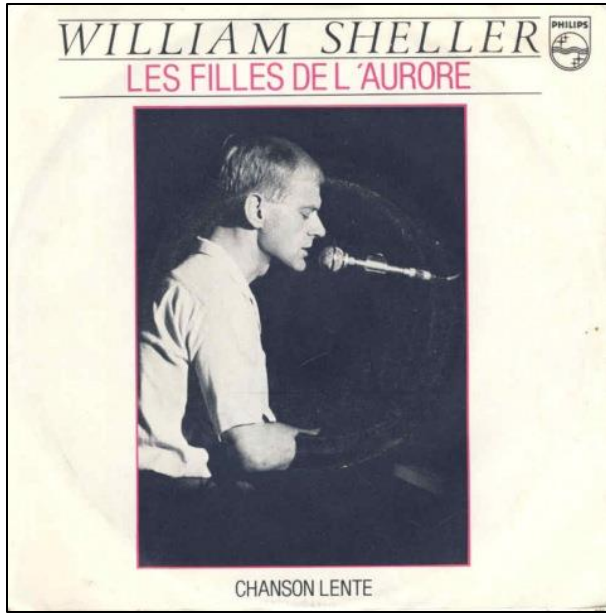
Parcours harmoniques chez William Sheller



min. 0'33''

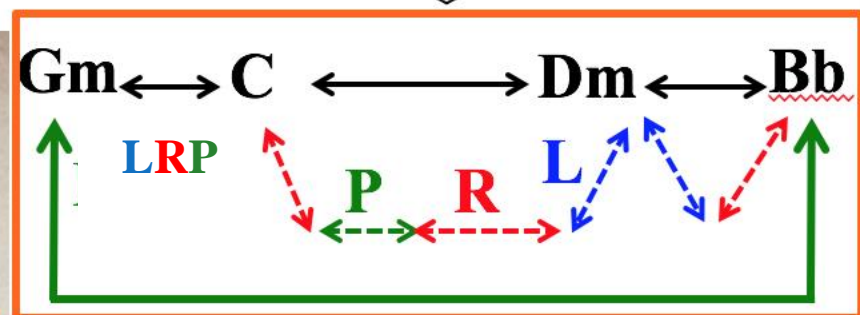
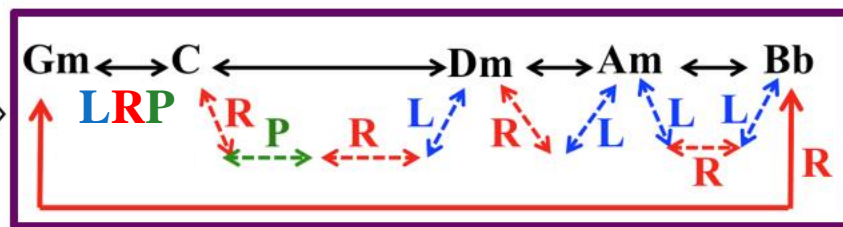
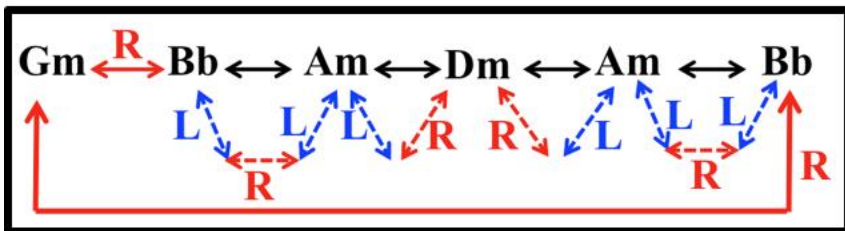


Parcours harmoniques chez William Sheller



min. 0'33''





MON APACHE

(Arman Méliès)

Cette promesse, c'est de l'or
que tu caches
en attendant les apaches
et leurs centaures

D'où vient la soie de ton ventre
et d'où vient
l'ardeur de ces beaux élans
que tu défends

les vaisseaux
logés au creux de ta peau
couleur d'encre

O mon inouïe amazone
tu nous quittes
et l'été se fait automne
black light, white heat

O mon inouïe antilope
dans tes flancs
et leurs reflets roux d'enfance
dort un cyclope

Où vont les flots noirs
de cendre

Une flèche en plein cœur
un ciel à la dérive
et je meurs
de nous survivre

Une flèche en plein cœur
un ciel à la dérive
et je meurs
de nous survivre

Un aiezan sur la grève
de nouveau enfin libre
et je crève
de nous survivre

Un aiezan sur la grève
de nouveau enfin libre
et je crève
de nous survivre

Cette lueur plus encore
tu la caches
en attendant les apaches
et leurs trésors

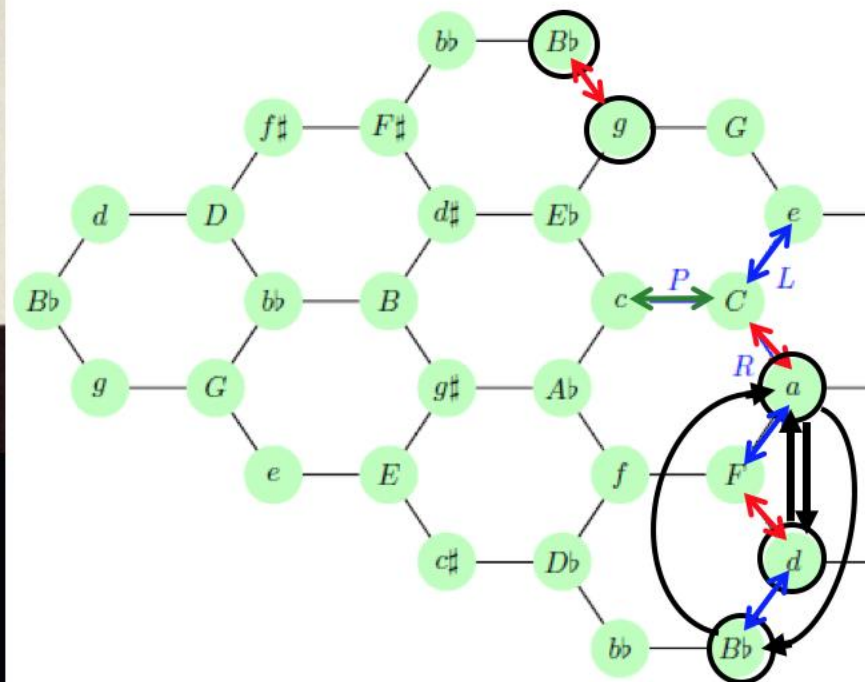
Cette promesse c'est de l'or
que tu caches
en attendant
les apaches

Cette promesse c'est de l'or
que tu caches
moi je t'attends

Mon apache

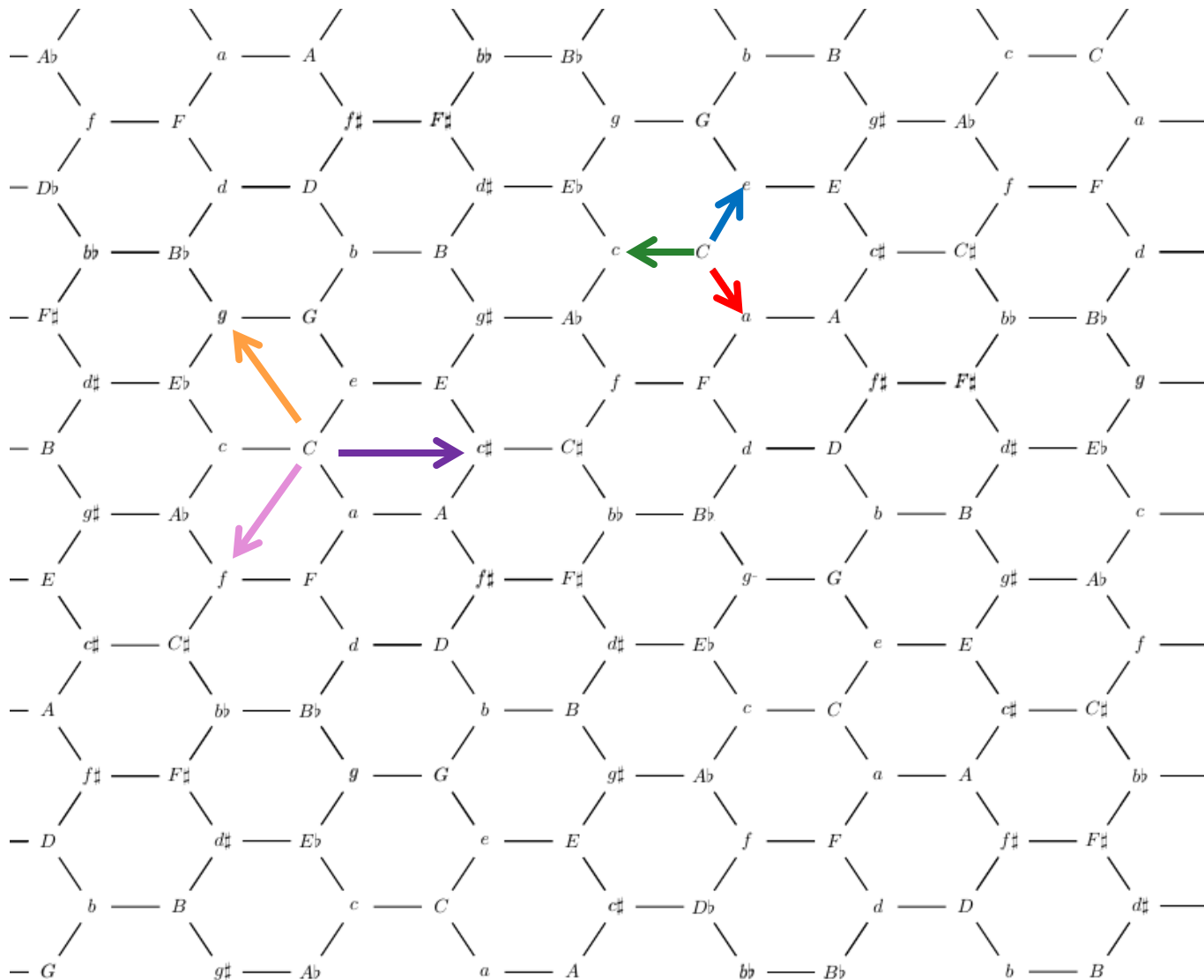


LØVE
Julien Doré



Une boucle harmonique et ses raccourcis :

SLIDE (S), NEBENVERWANDT (N) et FAR FIFTH (F)

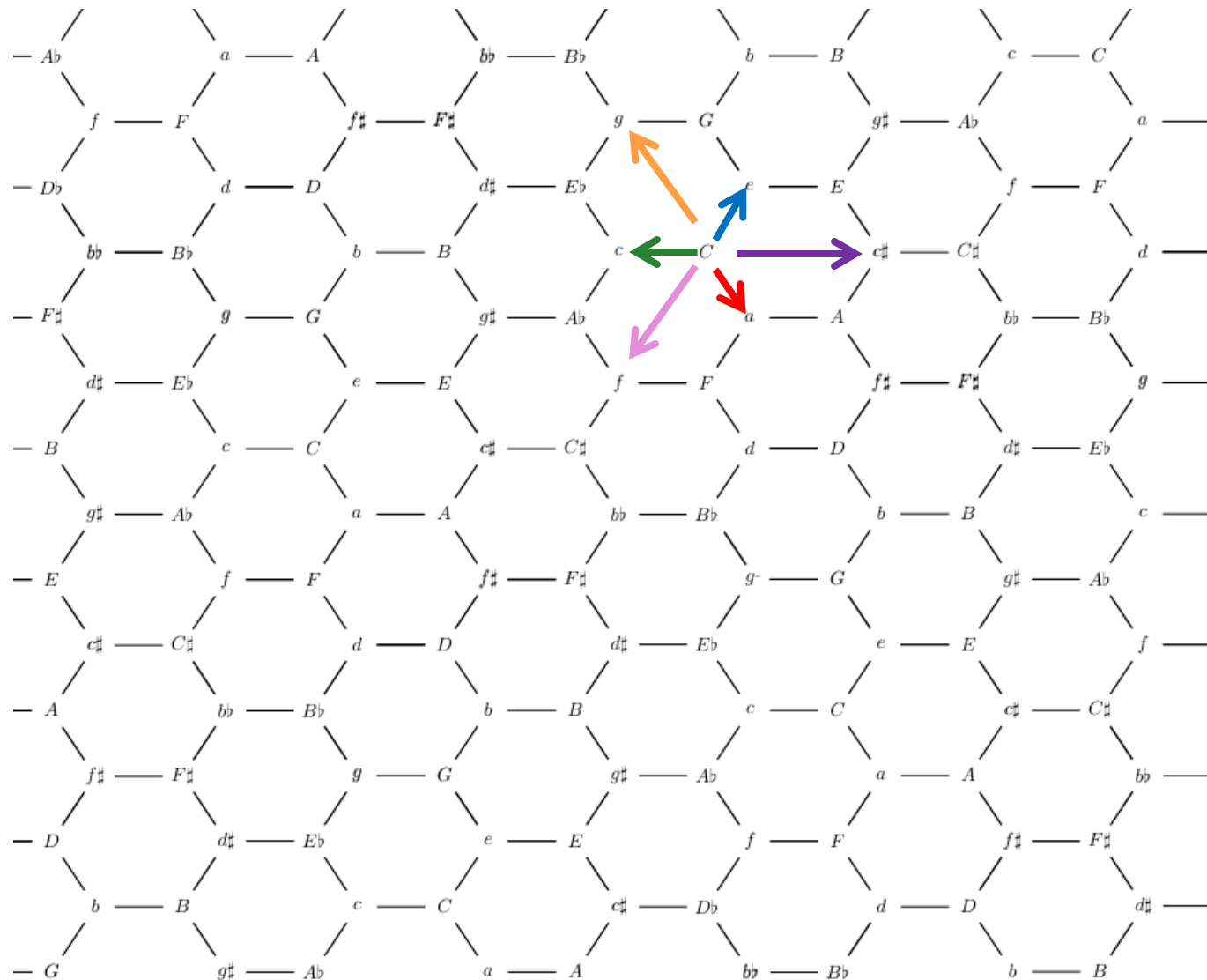


S = LPR

N = RLP

F = LRP

Boucles harmoniques simples (avec R, P et L) et complexes (avec R, P, L, S, N, F)

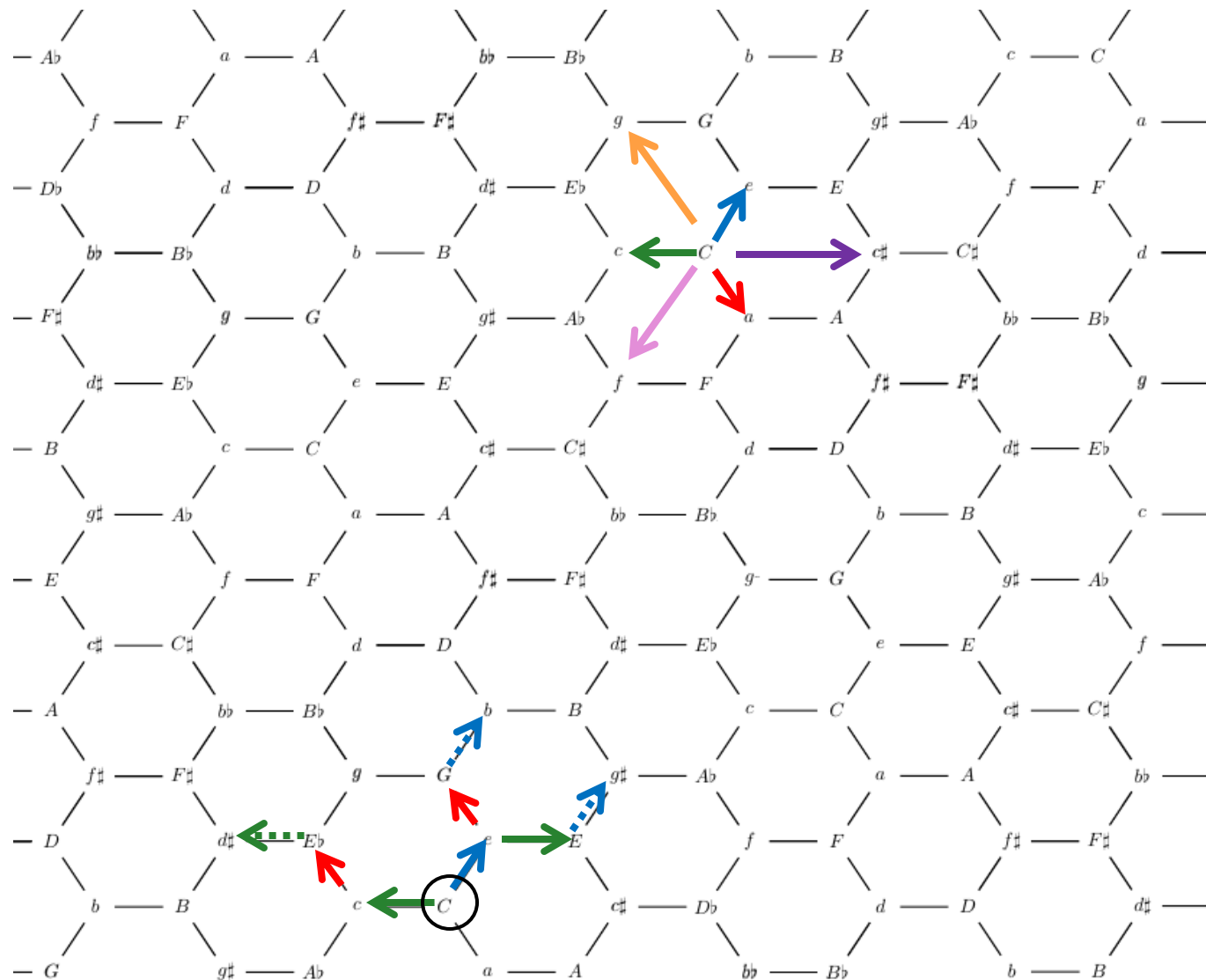


$$S = LPR$$

$$N = RLP$$

$$F = LRP$$

Boucles harmoniques simples (avec R, P et L) et complexes (avec R, P, L, S, N, F)



$$S = LPR$$

$$N = RLP$$

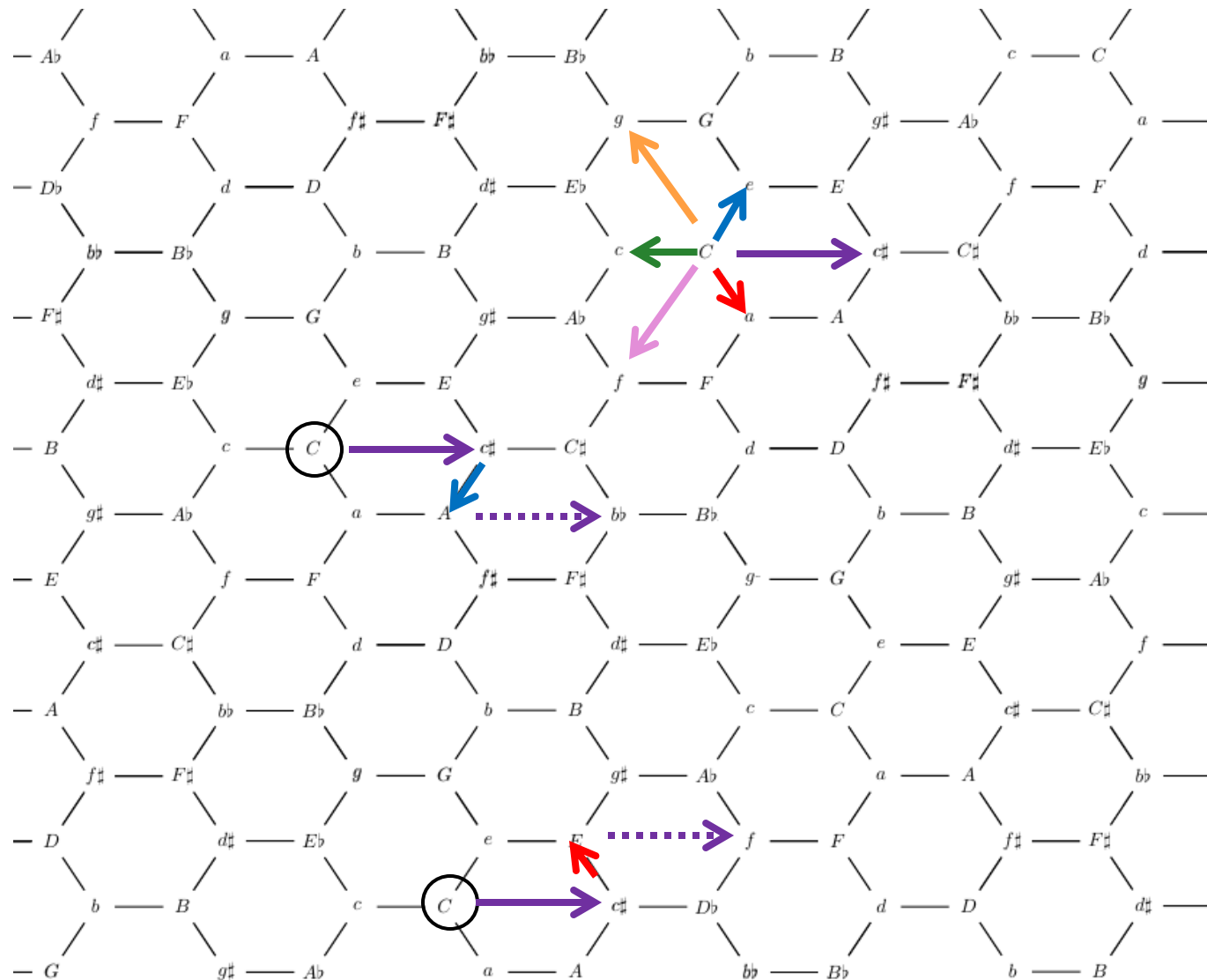
$$F = LRP$$

LPLP...

PRPR...

LRLR...

Boucles harmoniques simples (avec R, P et L) et complexes (avec R, P, L, S, N, F)



S = LRP

N = RLP

F = LRP

SRSR...

SLSL...

Retour sur l'analyse des Beatles

The BEATLES

The Beatles (White Album) - 1968

While My Guitar Gently Weeps The Beatles

intro: Am Am/G Am/F# Fmaj7 Am G D E7

Am Am/G
I look at you all
Am/F# Fmaj7
See the love there that's sleeping
Am G D E7
While my guitar gently weeps
Am Am/G
I look at the floor
Am/F# Fmaj7
And I see it needs sweeping
Am G C E7
Still my guitar gently weeps

A C#m F#m C#m
I don't know why nobody told you
Bm E7
How to unfold your love
A C#m F#m C#m
I don't know how someone controlled you
Bm E7
They bought and sold you

Am Am/G
I look at the world
Am/F# Fmaj7
And I notice, it's turning
Am G D E7
While my guitar gently weeps
Am Am/G
With every mistake
Am/F# Fmaj7
We must surely be learning
Am G C E7
Still my guitar gently weeps

solo :
Am Am/G Am/F# Fmaj7 Am G D E7
Am Am/G Am/F# Fmaj7 Am G C E7

A C#m F#m C#m
I don't know how you were diverted
Bm E7
You were perverted too
A C#m F#m C#m
I don't know how you were inverted
Bm E7
No one alerted you

Am Am/G Am/F# Fmaj7
I look at you all see the love there that's sleeping
Am G D E7
While my guitar gently weeps
Am Am/G Am/F# Fmaj7
Look at you all
Am G C E7
Still my guitar gently weeps

Source : Bert's Guitar Tutorials

Hexachord (Louis Bigo, 2013)

Retour sur l'analyse des Beatles

The Beatles (White Album) - 1968

The BEATLES

While My Guitar Gently Weeps The Beatles

intro: Am Am/G Am/F# Fmaj7 Am G D E7

Am Am/G
I look at you all
Am/F# Fmaj7
See the love there that's sleeping
Am G D E7
While my guitar gently weeps
Am Am/G
I look at the floor
Am/F# Fmaj7
And I see it needs sweeping
Am G C E7
Still my guitar gently weeps

A C#m F#m C#m
I don't know why nobody told you
Bm E7
How to unfold your love
A C#m F#m C#m
I don't know how someone controlled you
Bm E7
They bought and sold you

Am Am/G
I look at the world
Am/F# Fmaj7
And I notice, it's turning
Am G D E7
While my guitar gently weeps
Am Am/G
With every mistake
Am/F# Fmaj7
We must surely be learning
Am G C E7
Still my guitar gently weeps

solo :
Am Am/G Am/F# Fmaj7 Am G D E7
Am Am/G Am/F# Fmaj7 Am G C E7

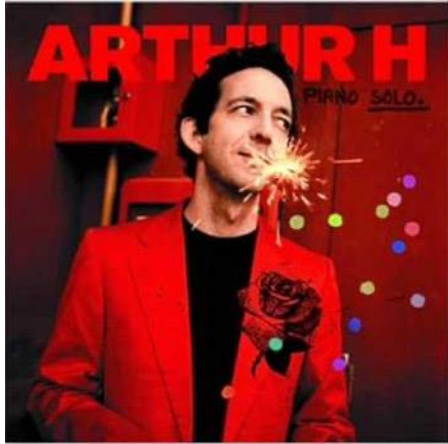
A C#m F#m C#m
I don't know how you were diverted
Bm E7
You were perverted too
A C#m F#m C#m
I don't know how you were inverted
Bm E7
No one alerted you

Am Am/G Am/F# Fmaj7
I look at you all see the love there that's sleeping
Am G D E7
While my guitar gently weeps
Am Am/G Am/F# Fmaj7
Look at you all
Am G C E7
Still my guitar gently weeps

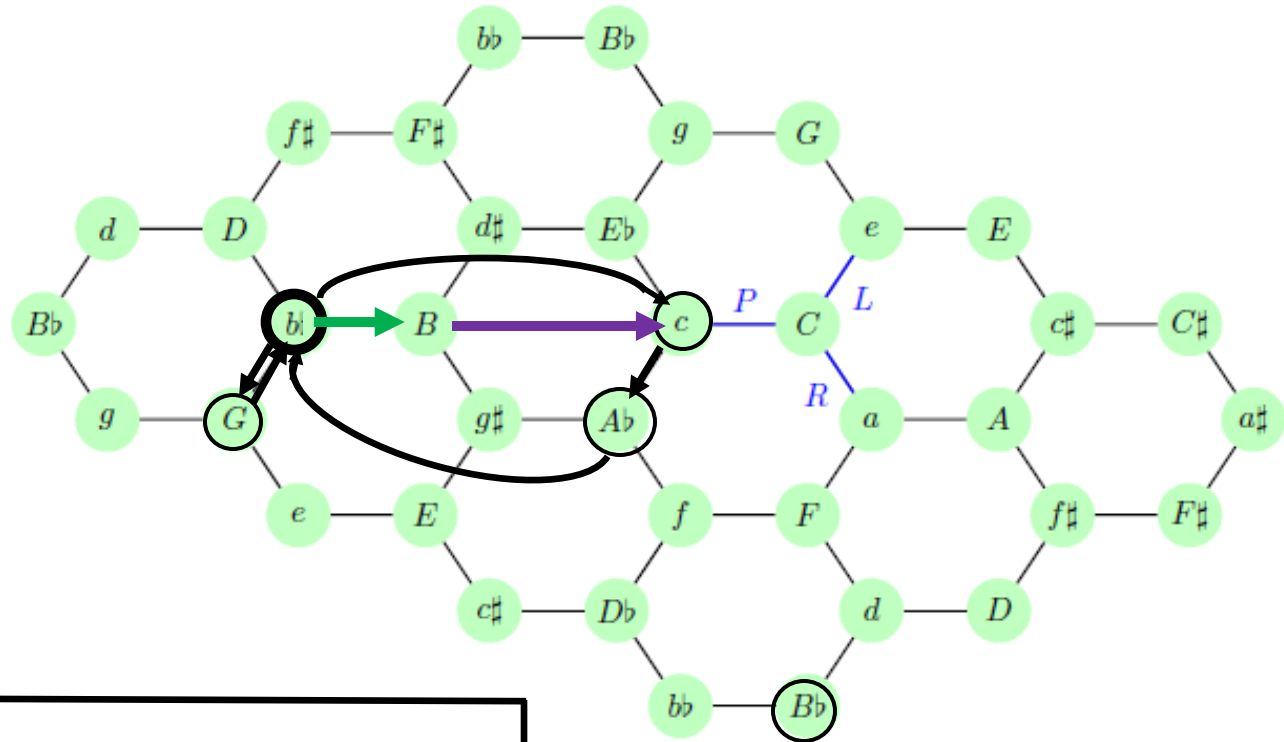
F = LRP

Source : Bert's Guitar Tutorials

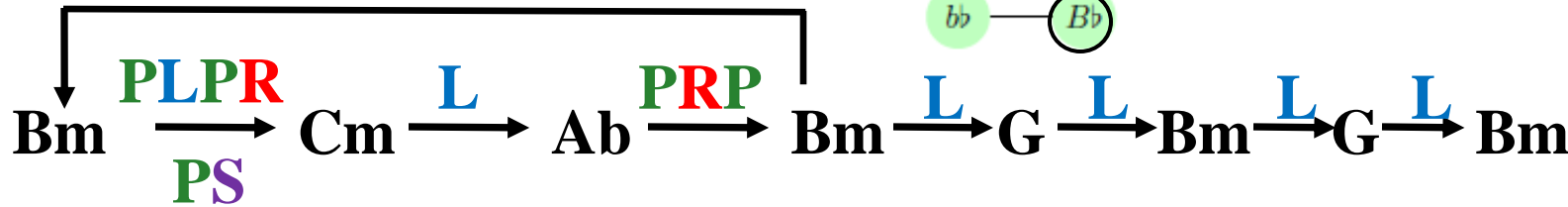
Parcours harmoniques chez Arthur H : le SLIDE



Le Baron noir
(album *Piano solo*, 2002)



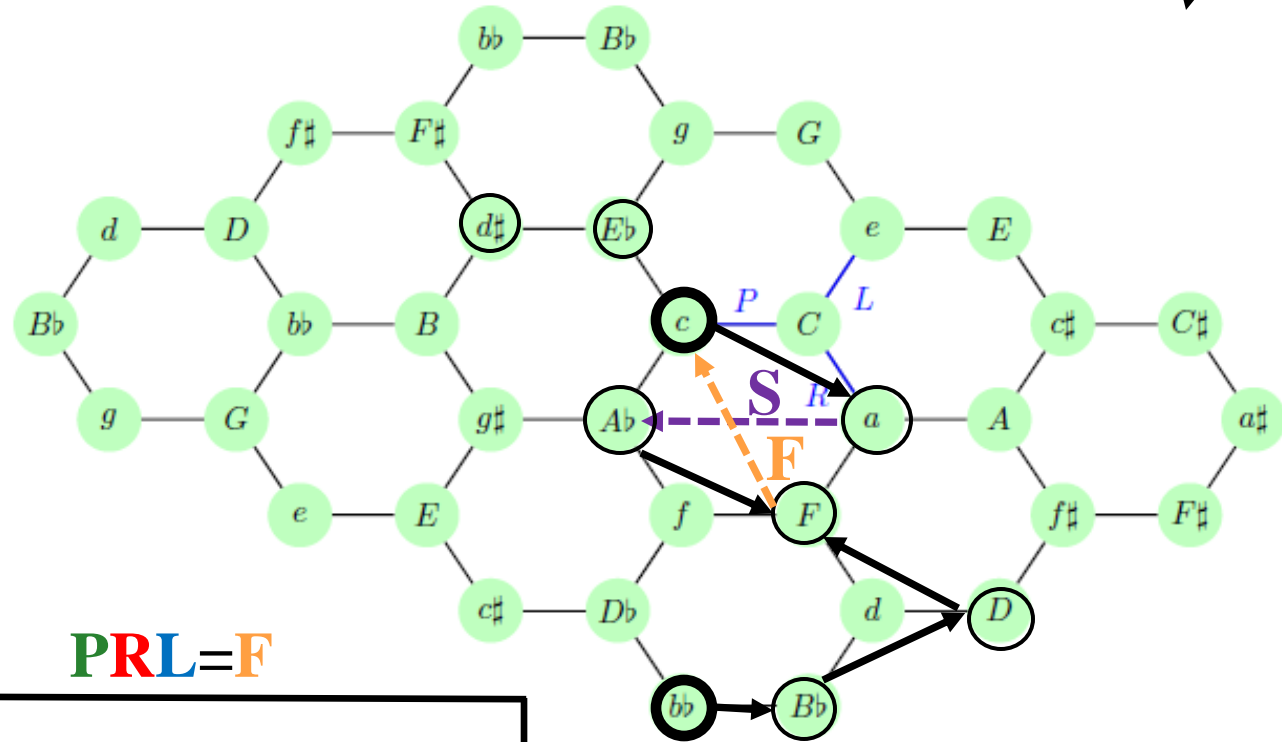
Cycle 1 :



Autres parcours harmoniques : le FAR FIFTH



Les Parures Secrètes
(album *Pour Madame X*, 2000)



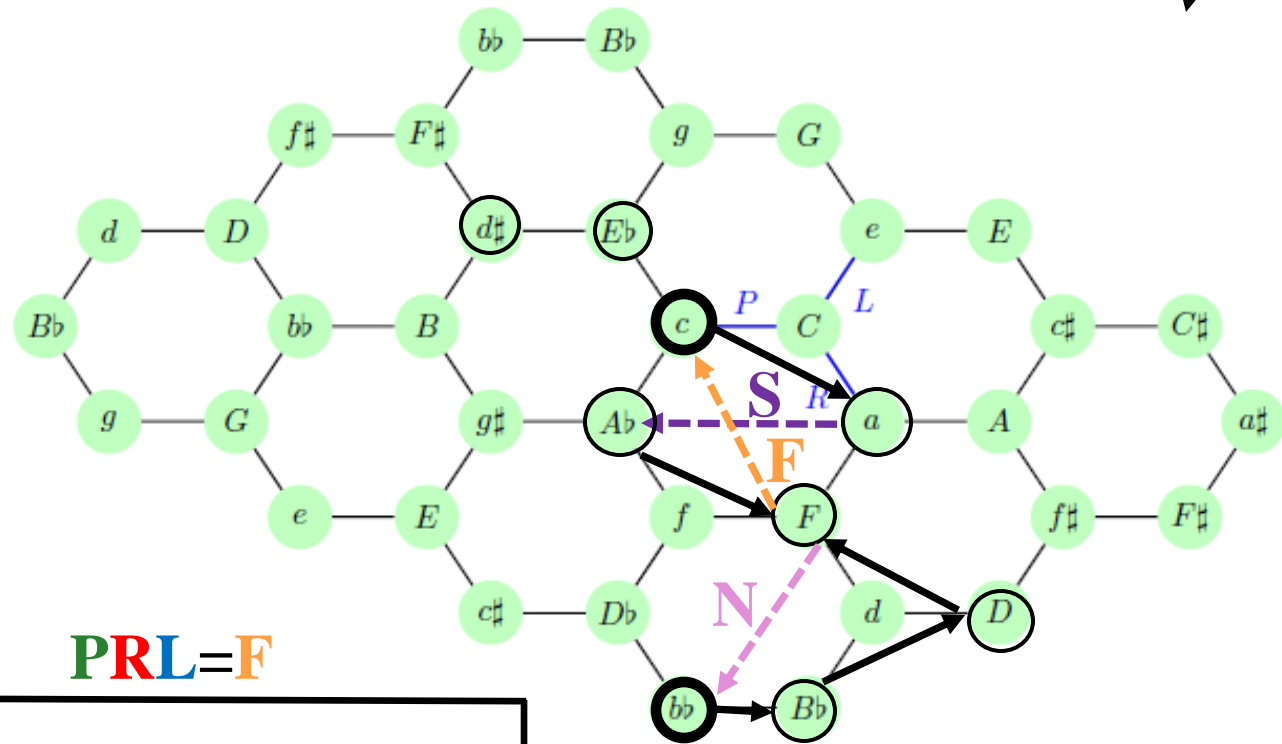
Cycle 1 :



Autres parcours harmoniques : le NEBENVERWANDT



Les Parures Secrètes
(album *Pour Madame X*, 2000)



PRL=F

Cycle 1 :

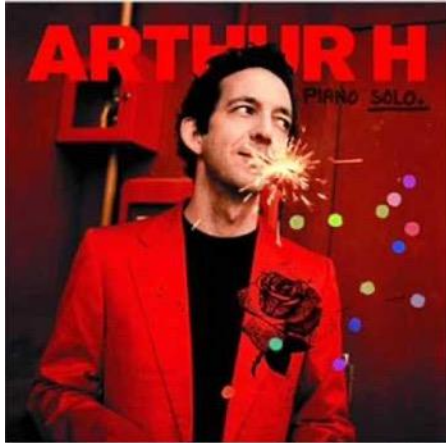


Cycle 2 :

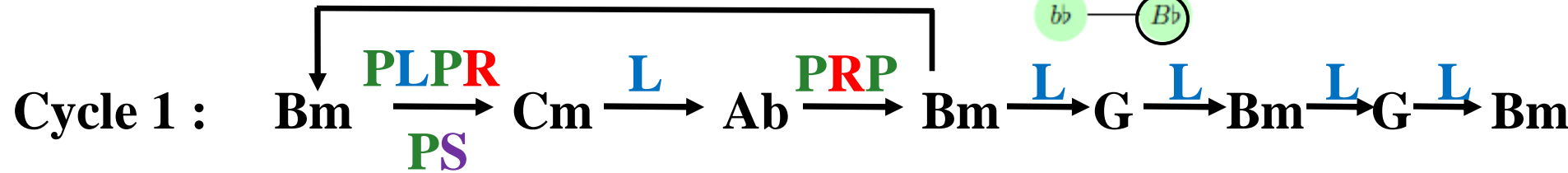
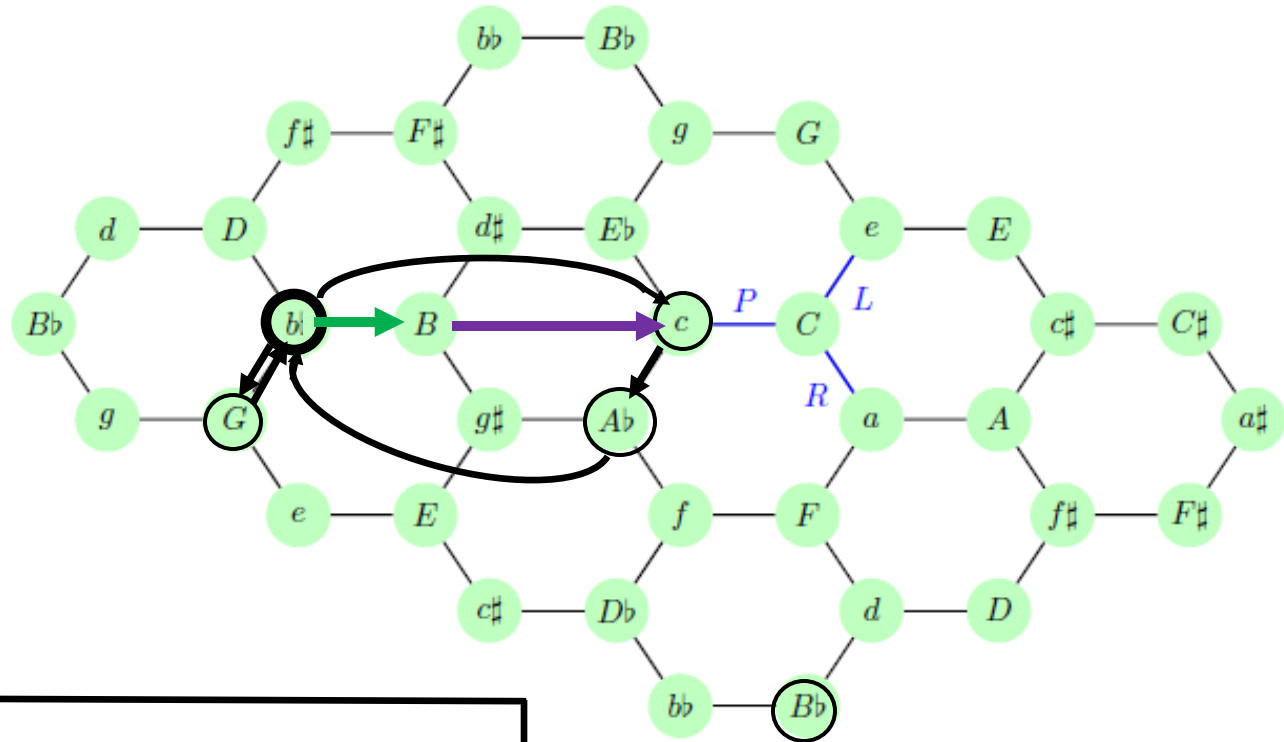


PLR=N

Le SLIDE chez Arthur H



Le Baron noir (album *Piano solo*, 2002)



Les zig-zag du *Nebenverwandt* chez Paolo Conte

IL REGNO DEL TANGO (Paolo Conte)



Non son neanche del paese

ho una valigia di carton

sono vestito, sì in borghese,

ma dentro c'è il bandoneon...

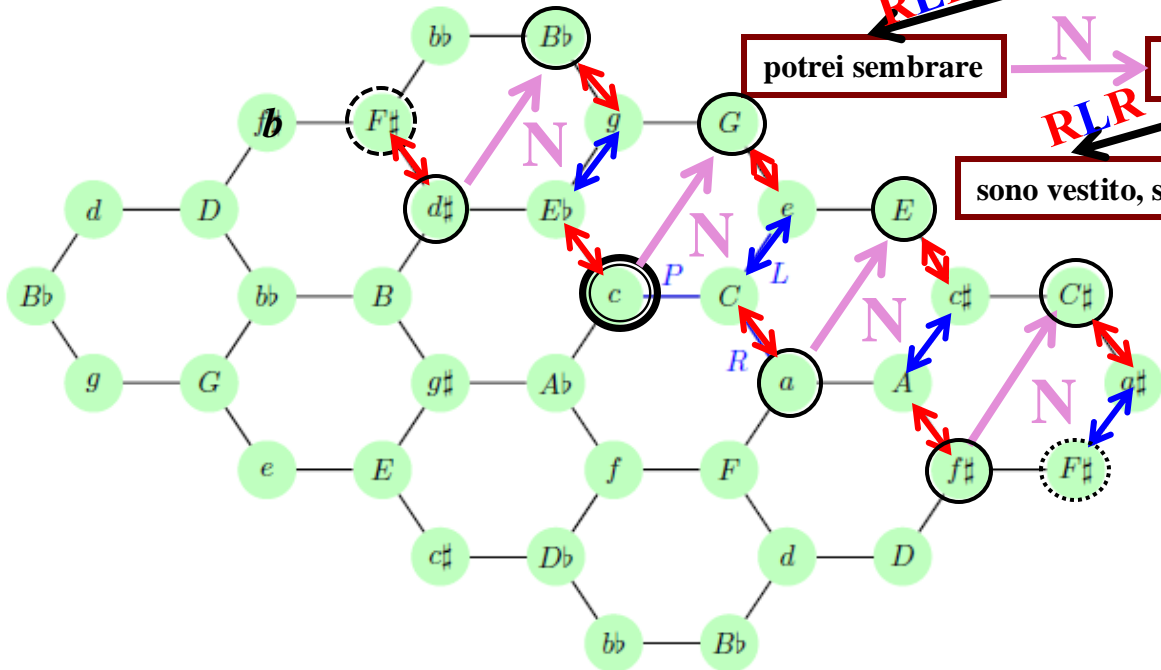
potrei sembrare in borghese,

sono vestito, sì un ragioniere,

anche un geometra potrei,

ma un tango sento io gridare

in fondo ai sentimenti miei



Harmonic Progressions

In Paolo Conte

Il Regno del Tango



M.Andreatta G.Baroin
www.MatheMusic.net 2016

Nebenverwandt comme principe modulante



Playlist Spotify
« Cours chanson »

GIURAMENTO (L. Mello / M. Andreatta)

01:29

non ci saranno stelle già sfinite
a raccontare stanche i nostri inizi
non ci saranno immagini sfuocate
dell'alba fatta dolce degli abbracci

non ci saranno frasi come lame
e baci di un raccolto più prezioso
non sagome di vetro a cancellare
la schiuma del tuo volto che compare

nel mio respiro fragile d'argilla
non ci sarà la notte a distanziare
la brace dei tuoi angoli di labbra
la luce che nel tuo danzare brilla

g
↓
e
↓
B
↓
d#
↓
Bb
↓
d

N

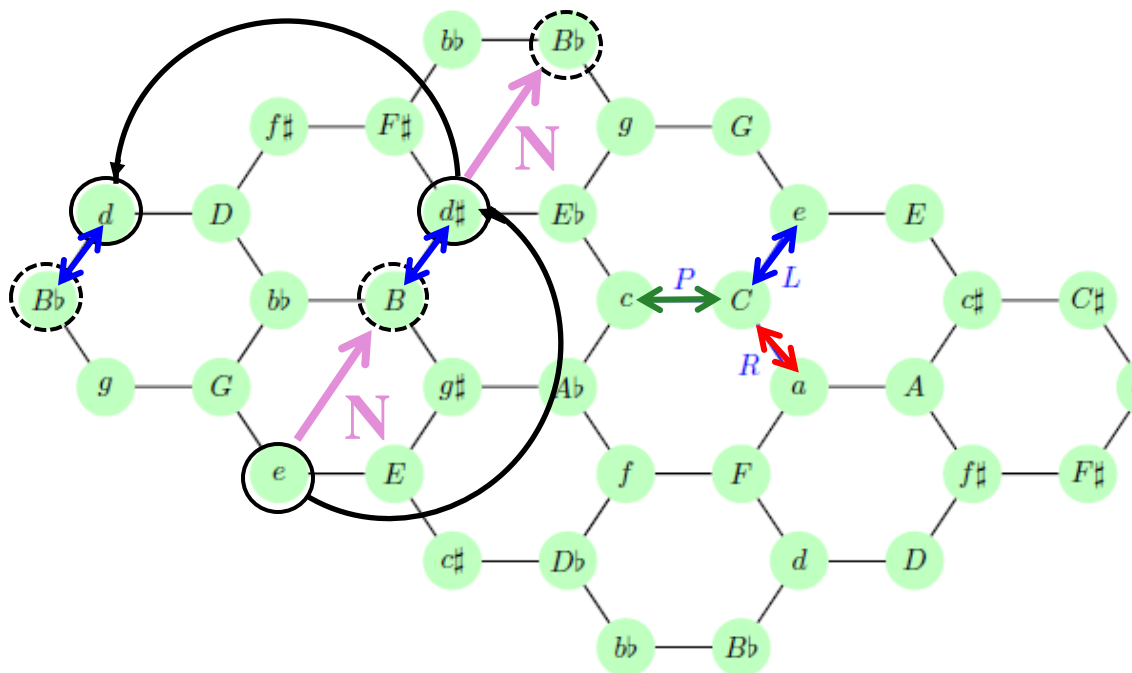
L

N

L

NL

NL



Nebenverwandt comme principe modulante



Playlist Spotify
 « Cours chanson »

FRANGIFLUTTI

(L. Mello / M. Andreatta)

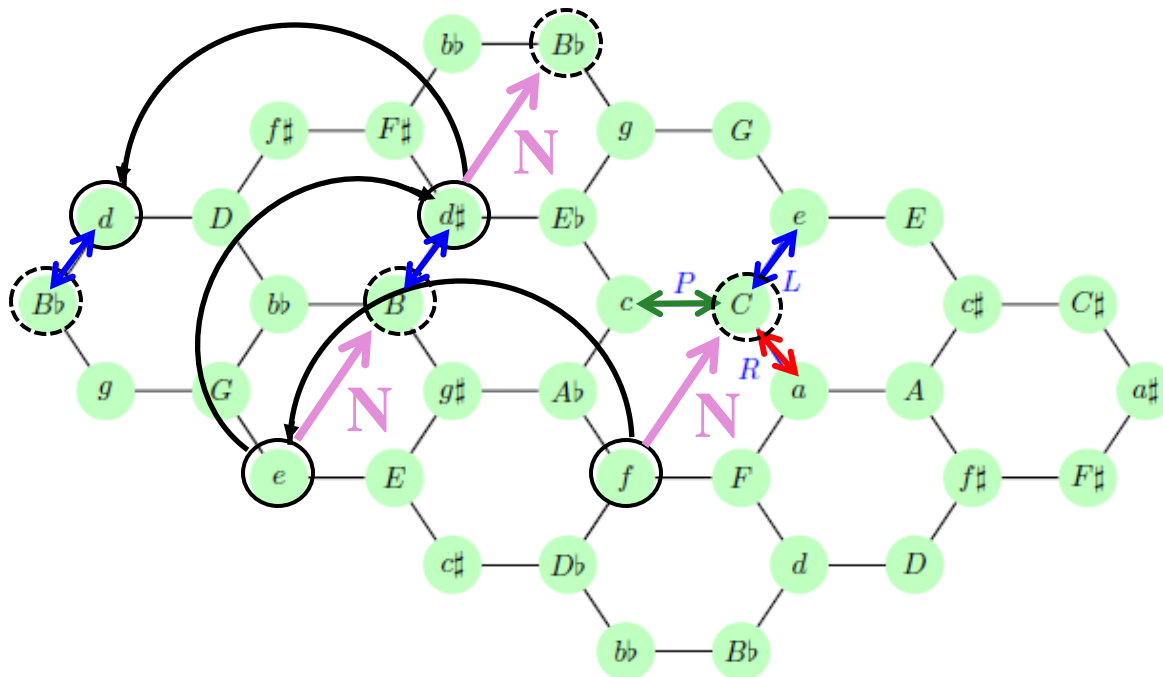
01:29

Nel rifrangere i nostri cuori,
 – gente nata che esige cura –
 sono stato tra i meno bravi
 nella tua favola insicura.

Ora è tardi lo so oramai
 venti freddi come una fiaba
 però tengo a cantare il canto
 Eva sola che resta maga.

Eva cenno di ribellione
 Eva fascio pronto all'addio
 Eva donna che sa parlare
 Al silenzio fatto d'oblio.

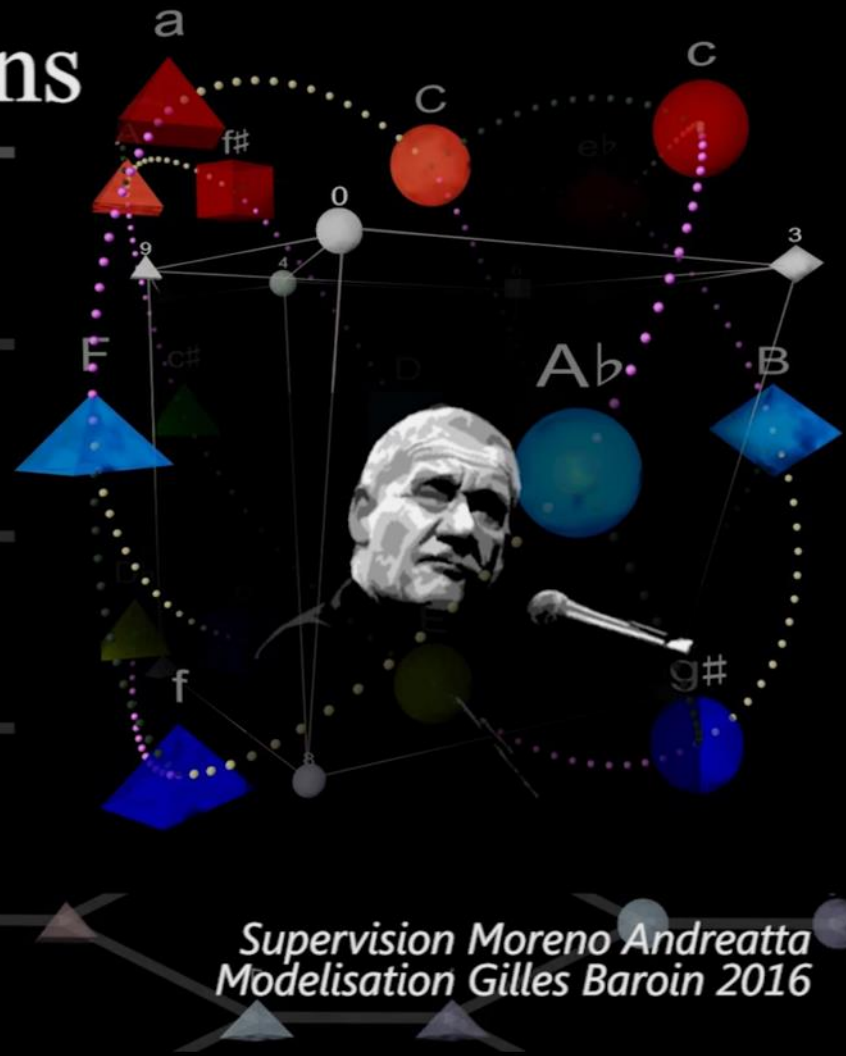
Sai parole da incatenare
 sai sorridere per piacere
 sai scappare senza tornare
 sai ferire e sai far l'amore.



Harmonic Progressions

In Paolo Conte

Madeleine



Supervision Moreno Andreatta
Modelisation Gilles Baroin 2016

Le jeu des modulations dans *Madeleine* de Paolo Conte

Preludio *Moderato* Lab → Réb/Fa → Sib⁷ → Mib⁷/Réb

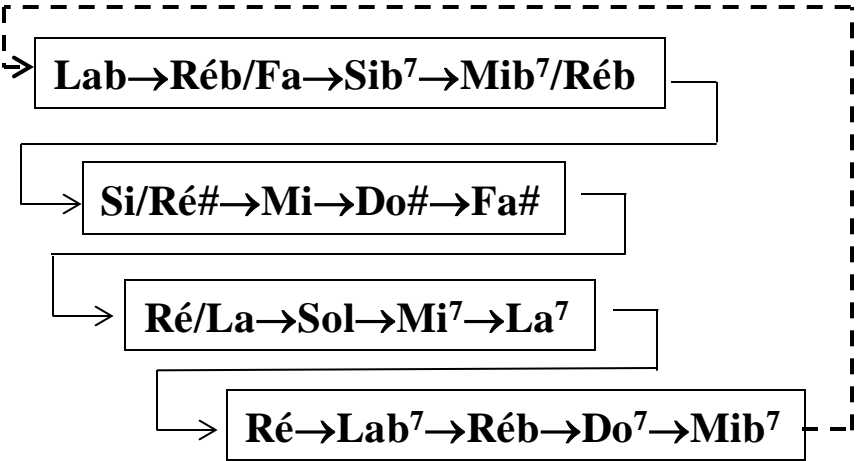
Chorus

Lab Réb/Fa Sib⁷ Mi⁷/Réb Si/Ré# Mi Do# Fa#

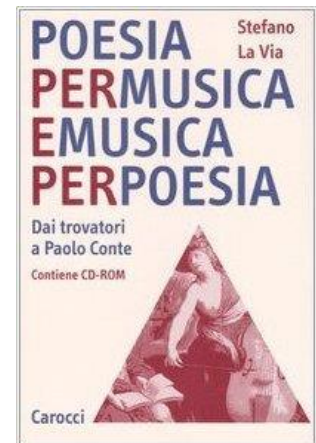
Qui, tut - to il meglio è già qui, non ci so - no pa
 Tan - to io ca - pi - sco sol - tan - to si il tat - to del - le tue
 [Ma] qual - che vol - ta è co - che qual - cu - no è tor

Re/La Sol Mi⁷ La⁷ Re Lab⁷ Réb Do⁷ Mi⁷

ro - le per spie ga re ed in - tui - re e ca - pi - re, Ma de - leine, e se mai ri - cor - da - re...
 ma - ni e la can - zo - ne per - du - ta e ri - tro - va - ta, come un' al - tra un' al - tra vi - ta...
 na - to sot - to cer - te ca - rez - ze...

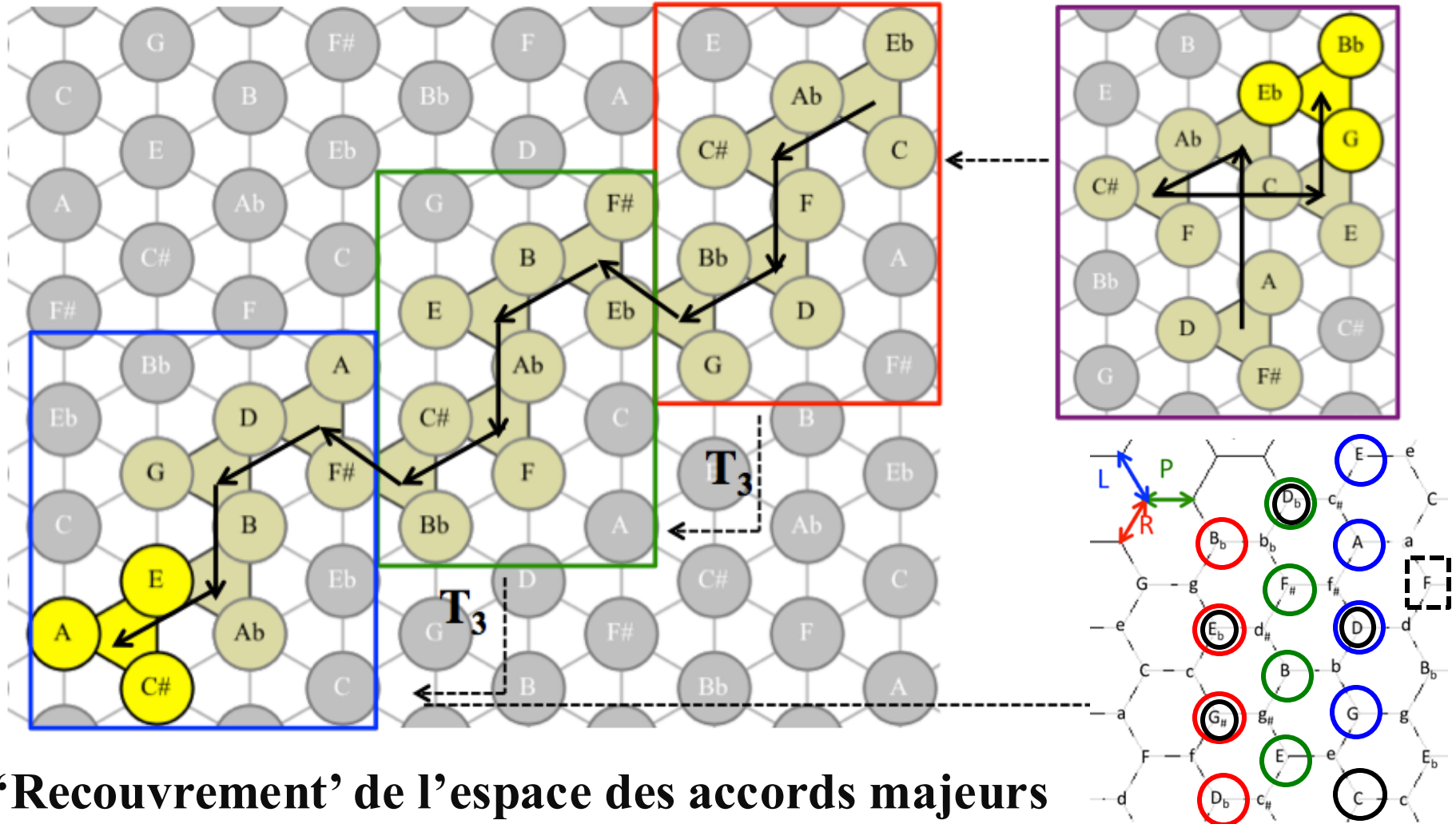


Stefano La Via, *Poesia per musica e musica per poesia. Dai trovatori a Paolo Conte*, Carocci, 2006



Le jeu des modulations dans *Madeleine* de Paolo Conte

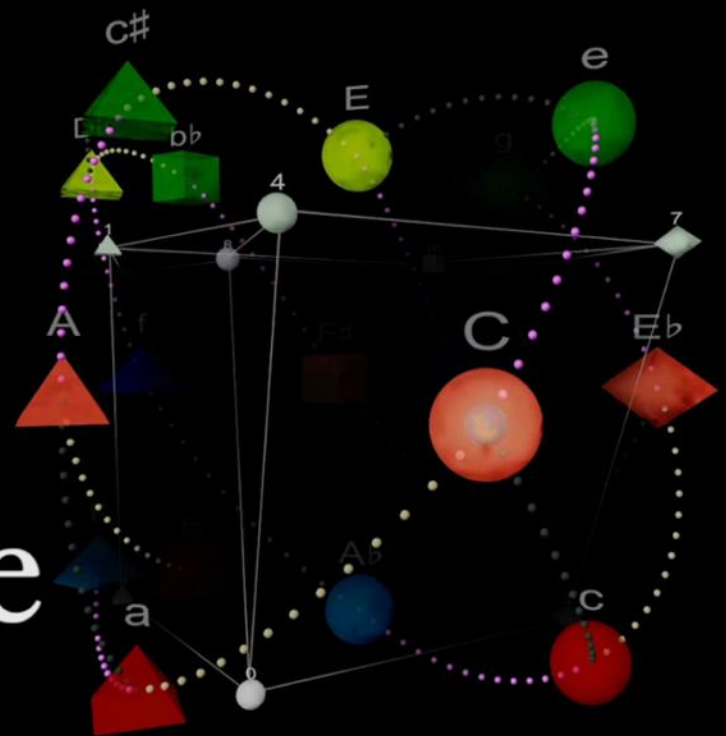
La_b Re_b Si_b Mi_b Si Mi Re_b Fa_{##} Re Sol Mi La Re La_b Re_b Do Mi_b



‘Recouvrement’ de l’espace des accords majeurs

Beethoven and the Hypersphere

(and the Tonnetz)



Gilles Baroin 2016
www.MatheMusic.net

➔ www.mathemusic.net

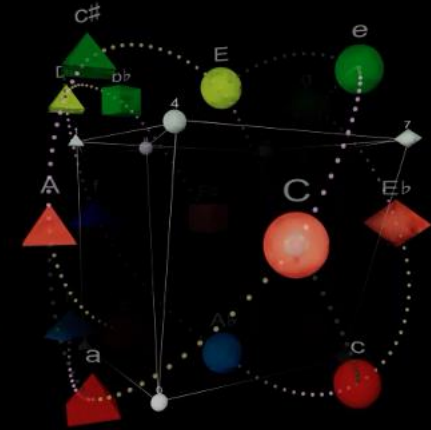


Gilles Baroin

Hamiltonian Song

www.MatheMusic.net

Le Blé en Herbe



Lyrics, music and performance by Polo
Mathemusical supervision by Moreno Andreatta
Hyperspheres and animation by Gilles Baroin, 2016



Polo Lamy



Gilles Baroin

La collection des 28 cycles hamiltoniens « redondants »

1. C-Cm-Ab-Abm-E-C#m-A-Am-F-Fm-C#-Bbm-F#-F#m-D-Dm-Bb-Gm-Eb-Ebm-B-Bm-G-Em--PLPLRL
2. C-Cm-Ab-Fm-C#-C#m-A-Am-F-Dm-Bb-Bbm-F#-F#m-D-Bm-G-Gm-Eb-Ebm-B-Abm-E-Em--PLRLPL
3. C-Cm-Eb-Ebm-F#-F#m-A-C#m-E-Em-G-Gm-Bb-Bbm-C#-Fm-Ab-Abm-B-Bm-D-Dm-F-Am--PRPRRLR
4. C-Cm-Eb-Ebm-F#-Bbm-C#-C#m-E-Em-G-Gm-Bb-Dm-F-Fm-Ab-Abm-B-Bm-D-F#m-A-Am--PRRLRPR
5. C-Cm-Eb-Ebm-F#-Bbm-C#-Fm-Ab-Abm-B-Bm-D-F#m-A-C#m-E-Em-G-Gm-Bb-Dm-F-Am--PRPRLRLR
6. C-Cm-Eb-Gm-Bb-Bbm-C#-C#m-E-Em-G-Bm-D-Dm-F-Fm-Ab-Abm-B-Ebm-F#-F#m-A-Am--PRLRPRPR
7. C-Cm-Eb-Gm-Bb-Bbm-C#-Fm-Ab-Abm-B-Ebm-F#-F#m-A-C#m-E-Em-G-Bm-D-Dm-F-Am--PRLR
8. C-Cm-Eb-Gm-Bb-Dm-F-Fm-Ab-Abm-B-Ebm-F#-Bbm-C#-C#m-E-Em-G-Bm-D-F#m-A-Am--PRLRLRPR
9. C-Em-E-Abm-Ab-Cm-Eb-Gm-G-Bm-B-Ebm-F#-Bbm-Bb-Dm-D-F#m-A-C#m-C#-Fm-F-Am--LPLPLR
10. C-Em-E-Abm-B-Ebm-Eb-Gm-G-Bm-D-F#m-F#-Bbm-Bb-Dm-F-Am-A-C#m-C#-Fm-Ab-Cm--LPLRLP
11. C-Em-G-Gm-Bb-Bbm-C#-C#m-E-Abm-B-Bm-D-Dm-F-Fm-Ab-Cm-Eb-Ebm-F#-F#m-A-Am--LRPRPRPR
12. C-Em-G-Gm-Bb-Bbm-C#-Fm-Ab-Cm-Eb-Ebm-F#-F#m-A-C#m-E-Abm-B-Bm-D-Dm-F-Am--LRPRPRLR
13. C-Em-G-Gm-Bb-Dm-F-Fm-Ab-Cm-Eb-Ebm-F#-Bbm-C#-C#m-E-Abm-B-Bm-D-F#m-A-Am--LRPR
14. C-Em-G-Bm-B-Ebm-Eb-Gm-Bb-Dm-D-F#m-F#-Bbm-C#-Fm-F-Am-A-C#m-E-Abm-Ab-Cm--LRLPLP
15. C-Em-G-Bm-D-Dm-F-Fm-Ab-Cm-Eb-Gm-Bb-Bbm-C#-C#m-E-Abm-B-Ebm-F#-F#m-A-Am--LRLRPRPR
16. C-Em-G-Bm-D-F#m-A-C#m-E-Abm-B-Ebm-F#-Bbm-C#-Fm-Ab-Cm-Eb-Gm-Bb-Dm-F-Am--LR
17. C-Am-A-F#m-F#-Ebm-Eb-Cm-Ab-Fm-F-Dm-D-Bm-B-Abm-E-C#m-C#-Bbm-Bb-Gm-G-Em--RPRPRPRL
18. C-Am-A-F#m-F#-Ebm-B-Abm-Ab-Fm-F-Dm-D-Bm-G-Em-E-C#m-C#-Bbm-Bb-Gm-Eb-Cm--RPRPRLRP
19. C-Am-A-F#m-F#-Ebm-B-Abm-E-C#m-C#-Bbm-Bb-Gm-Eb-Cm-Ab-Fm-F-Dm-D-Bm-G-Em--RPRPRLRL
20. C-Am-A-F#m-D-Bm-B-Abm-Ab-Fm-F-Dm-Bb-Gm-G-Em-E-C#m-C#-Bbm-F#-Ebm-Eb-Cm--RPRLRPRP
21. C-Am-A-F#m-D-Bm-B-Abm-E-C#m-C#-Bbm-F#-Ebm-Eb-Cm-Ab-Fm-F-Dm-Bb-Gm-G-Em--RPRL
22. C-Am-A-F#m-D-Bm-G-Em-E-C#m-C#-Bbm-F#-Ebm-B-Abm-Ab-Fm-F-Dm-Bb-Gm-Eb-Cm--RPRLRLRP
23. C-Am-F-Fm-C#-C#m-A-F#m-D-Dm-Bb-Bbm-F#-Ebm-B-Bm-G-Gm-Eb-Cm-Ab-Abm-E-Em--RLPLPL
24. C-Am-F-Dm-D-Bm-B-Abm-Ab-Fm-C#-Bbm-Bb-Gm-G-Em-E-C#m-A-F#m-F#-Ebm-Eb-Cm--RLRPRPRP
25. C-Am-F-Dm-D-Bm-B-Abm-E-C#m-A-F#m-F#-Ebm-Eb-Cm-Ab-Fm-C#-Bbm-Bb-Gm-G-Em--RLRPRPRL
26. C-Am-F-Dm-D-Bm-G-Em-E-C#m-A-F#m-F#-Ebm-B-Abm-Ab-Fm-C#-Bbm-Bb-Gm-Eb-Cm--RLRP
27. C-Am-F-Dm-Bb-Gm-G-Em-E-C#m-A-F#m-D-Bm-B-Abm-Ab-Fm-C#-Bbm-F#-Ebm-Eb-Cm--RLRLRPRP
28. C-Am-F-Dm-Bb-Gm-Eb-Cm-Ab-Fm-C#-Bbm-F#-Ebm-B-Abm-E-C#m-A-F#m-D-Bm-G-Em--RL



Le Blé en Herbe



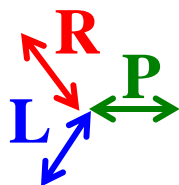
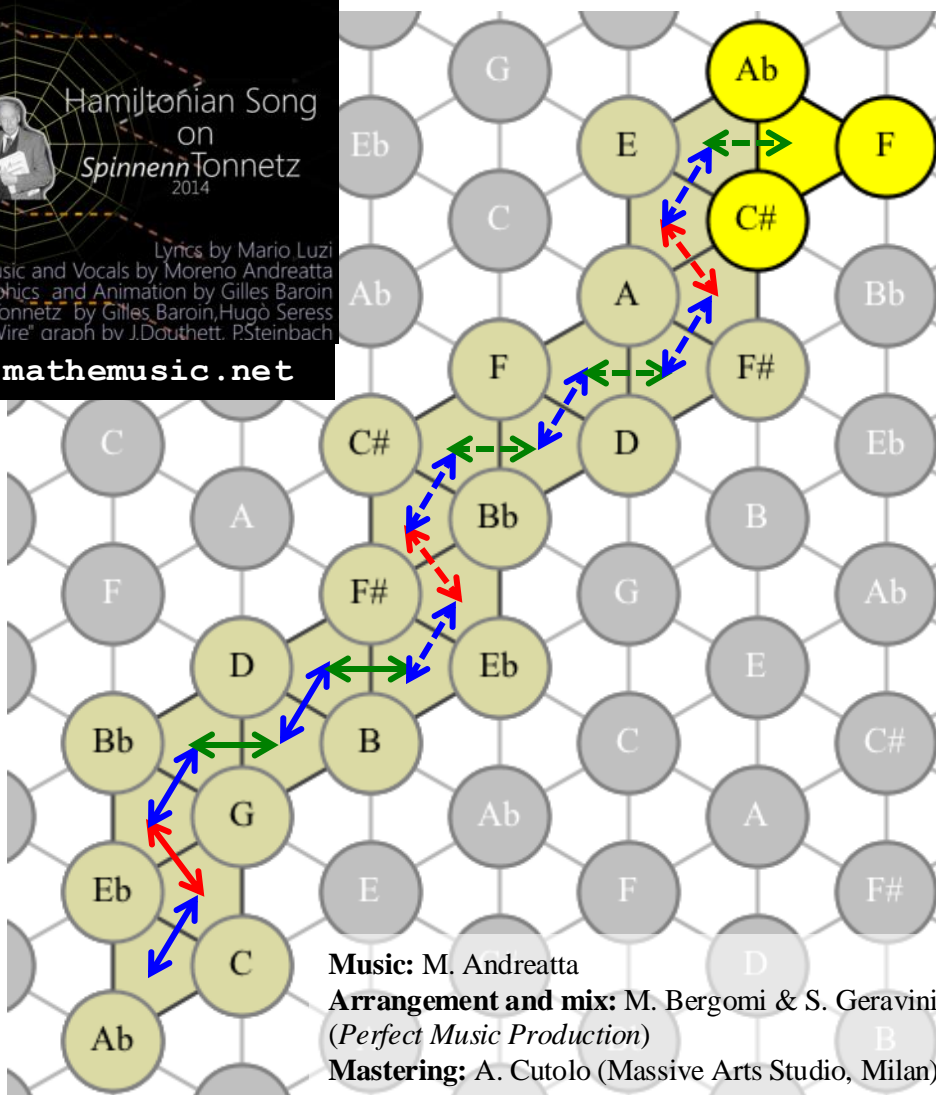
Cycles hamiltoniens avec périodicité interne

8. C-Cm-Eb-Gm-Bb-Dm-F-Fm-Ab-Abm-B-Ebm-F#-Bbm-C#-C#m-E-Em-G-Bm-D-F#m-A-Am--PRLRLRPR
9. C-Em-E-Abm-Ab-Cm-Eb-Gm-G-Bm-B-Ebm-F#-Bbm-Bb-Dm-D-F#m-A-C#m-C#-Fm-F-Am--LPLPLR
10. C-Em-E-Abm-B-Ebm-Eb-Gm-G-Bm-D-F#m-F#-Bbm-Bb-Dm-F-Am-A-C#m-C#-Fm-Ab-Cm--LPLRLP
11. C-Em-G-Gm-Bb-Bbm-C#-C#m-E-Abm-B-Bm-D-Dm-F-Fm-Ab-Cm-Eb-Ebm-F#-F#m-A-Am--LRPRRPR
12. C-Em-G-Gm-Bb-Bbm-C#-Fm-Ab-Cm-Eb-Ebm-F#-F#m-A-C#m-E-Abm-B-Bm-D-Dm-F-Am--LRPRRLR

LPLPLR ...
 PLPLRL ...
 LPLRLP ...
 PLRLPL ...
LRLPLP ...
 RLPLPL ...



min. 1'02"



Music: M. Andreatta
 Arrangement and mix: M. Bergomi & S. Geravini
 (Perfect Music Production)
 Mastering: A. Cutolo (Massive Arts Studio, Milan)

La sera non è più la tua canzone
 (Mario Luzi, 1945, in *Poesie sparse*)

La sera non è più la tua canzone,
 è questa roccia d'ombra traforata
 dai lumi e dalle voci senza fine,
 la quiete d'una cosa già pensata.

Ah questa luce viva e chiara viene
 solo da te, sei tu così vicina
 al vero d'una cosa conosciuta,
 per nome hai una parola ch'è passata
 nell'intimo del cuore e s'è perduta.

Caduto è più che un segno della vita,
 riposi, dal viaggio sei tornata
 dentro di te, sei scesa in questa pura
 sostanza così tua, così romita
 nel silenzio dell'essere, (compiuta).

L'aria tace ed il tempo dietro a te
 si leva come un'arida montagna
 dove vaga il tuo spirito e si perde,
 un vento raro scivola e ristagna.

Luzi



Hamiltonian Song
on
Spinnennetz
2014

Lyrics by Mario Luzi
Music and Vocals by Moreno Andreatta
Graphics and Animation by Gilles Baroin
SpinnenNetz by Gilles Baroin, Hugò Seress
Original "Chicken Wire" graph by J.Douthett, P.Steinbach

La collection des 28 cycles hamiltoniens « redondants »

1. C-Cm-Ab-Abm-E-C#m-A-Am-F-Fm-C#-Bbm-F#-F#m-D-Dm-Bb-Gm-Eb-Ebm-B-Bm-G-Em--PLPLRL
2. C-Cm-Ab-Fm-C#-C#m-A-Am-F-Dm-Bb-Bbm-F#-F#m-D-Bm-G-Gm-Eb-Ebm-B-Abm-E-Em--PLRLPL
3. C-Cm-Eb-Ebm-F#-F#m-A-C#m-E-Em-G-Gm-Bb-Bbm-C#-Fm-Ab-Abm-B-Bm-D-Dm-F-Am--PRPRRLR
4. C-Cm-Eb-Ebm-F#-Bbm-C#-C#m-E-Em-G-Gm-Bb-Dm-F-Fm-Ab-Abm-B-Bm-D-F#m-A-Am--PRRLRPR
5. C-Cm-Eb-Ebm-F#-Bbm-C#-Fm-Ab-Abm-B-Bm-D-F#m-A-C#m-E-Em-G-Gm-Bb-Dm-F-Am--PRPRLRLR
6. C-Cm-Eb-Gm-Bb-Bbm-C#-C#m-E-Em-G-Bm-D-Dm-F-Fm-Ab-Abm-B-Ebm-F#-F#m-A-Am--PRLRPRPR
7. C-Cm-Eb-Gm-Bb-Bbm-C#-Fm-Ab-Abm-B-Ebm-F#-F#m-A-C#m-E-Em-G-Bm-D-Dm-F-Am--PRLR
8. C-Cm-Eb-Gm-Bb-Dm-F-Fm-Ab-Abm-B-Ebm-F#-Bbm-C#-C#m-E-Em-G-Bm-D-F#m-A-Am--PRLRLRPR
9. C-Em-E-Abm-Ab-Cm-Eb-Gm-G-Bm-B-Ebm-F#-Bbm-Bb-Dm-D-F#m-A-C#m-C#-Fm-F-Am--LPLPLR
10. C-Em-E-Abm-B-Ebm-Eb-Gm-G-Bm-D-F#m-F#-Bbm-Bb-Dm-F-Am-A-C#m-C#-Fm-Ab-Cm--LPLRLP
11. C-Em-G-Gm-Bb-Bbm-C#-C#m-E-Abm-B-Bm-D-Dm-F-Fm-Ab-Cm-Eb-Ebm-F#-F#m-A-Am--LRPRPRPR
12. C-Em-G-Gm-Bb-Bbm-C#-Fm-Ab-Cm-Eb-Ebm-F#-F#m-A-C#m-E-Abm-B-Bm-D-Dm-F-Am--LRPRRLR
13. C-Em-G-Gm-Bb-Dm-F-Fm-Ab-Cm-Eb-Ebm-F#-Bbm-C#-C#m-E-Abm-B-Bm-D-F#m-A-Am--LRPR
14. C-Em-G-Bm-B-Ebm-Eb-Gm-Bb-Dm-D-F#m-F#-Bbm-C#-Fm-F-Am-A-C#m-E-Abm-Ab-Cm--LRLPLP
15. C-Em-G-Bm-D-Dm-F-Fm-Ab-Cm-Eb-Gm-Bb-Bbm-C#-C#m-E-Abm-B-Ebm-F#-F#m-A-Am--LRLRPRPR
16. C-Em-G-Bm-D-F#m-A-C#m-E-Abm-B-Ebm-F#-Bbm-C#-Fm-Ab-Cm-Eb-Gm-Bb-Dm-F-Am--LR
17. C-Am-A-F#m-F#-Ebm-Eb-Cm-Ab-Fm-F-Dm-D-Bm-B-Abm-E-C#m-C#-Bbm-Bb-Gm-G-Em--RPRPRPRL
18. C-Am-A-F#m-F#-Ebm-B-Abm-Ab-Fm-F-Dm-D-Bm-G-Em-E-C#m-C#-Bbm-Bb-Gm-Eb-Cm--RPRPRLRP
19. C-Am-A-F#m-F#-Ebm-B-Abm-E-C#m-C#-Bbm-Bb-Gm-Eb-Cm-Ab-Fm-F-Dm-D-Bm-G-Em--RPRPRLRL
20. C-Am-A-F#m-D-Bm-B-Abm-Ab-Fm-F-Dm-Bb-Gm-G-Em-E-C#m-C#-Bbm-F#-Ebm-Eb-Cm--RPRLRPRP
21. C-Am-A-F#m-D-Bm-B-Abm-E-C#m-C#-Bbm-F#-Ebm-Eb-Cm-Ab-Fm-F-Dm-Bb-Gm-G-Em--RPRL
22. C-Am-A-F#m-D-Bm-G-Em-E-C#m-C#-Bbm-F#-Ebm-B-Abm-Ab-Fm-F-Dm-Bb-Gm-Eb-Cm--RPRLRLRP
23. C-Am-F-Fm-C#-C#m-A-F#m-D-Dm-Bb-Bbm-F#-Ebm-B-Bm-G-Gm-Eb-Cm-Ab-Abm-E-Em--RLPLPL
24. C-Am-F-Dm-D-Bm-B-Abm-Ab-Fm-C#-Bbm-Bb-Gm-G-Em-E-C#m-A-F#m-F#-Ebm-Eb-Cm--RLRPRPRP
25. C-Am-F-Dm-D-Bm-B-Abm-E-C#m-A-F#m-F#-Ebm-Eb-Cm-Ab-Fm-C#-Bbm-Bb-Gm-G-Em--RLRPRPRL
26. C-Am-F-Dm-D-Bm-G-Em-E-C#m-A-F#m-F#-Ebm-B-Abm-Ab-Fm-C#-Bbm-Bb-Gm-Eb-Cm--RLRP
27. C-Am-F-Dm-Bb-Gm-G-Em-E-C#m-A-F#m-D-Bm-B-Abm-Ab-Fm-C#-Bbm-F#-Ebm-Eb-Cm--RLRLRPRP
28. C-Am-F-Dm-Bb-Gm-Eb-Cm-Ab-Fm-C#-Bbm-F#-Ebm-B-Abm-E-C#m-A-F#m-D-Bm-G-Em--RL



Le Blé en Herbe



Le catalogue complet des 124 cycles hamiltoniens

List of 124 Hamiltonian Cycles (Bigo/Andreatta, February 2016)

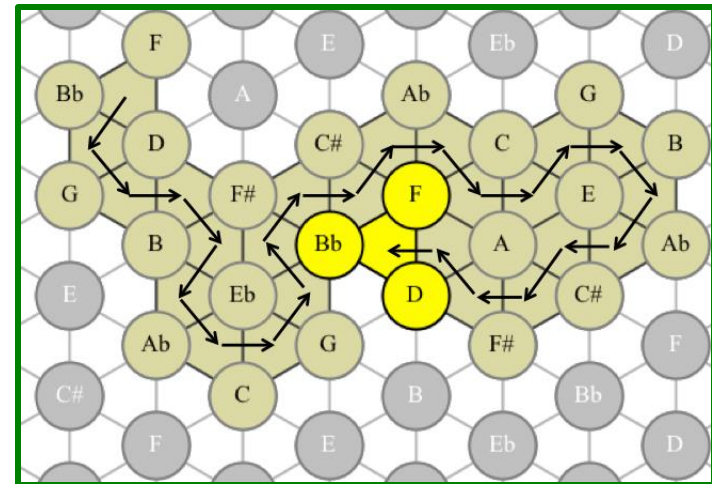
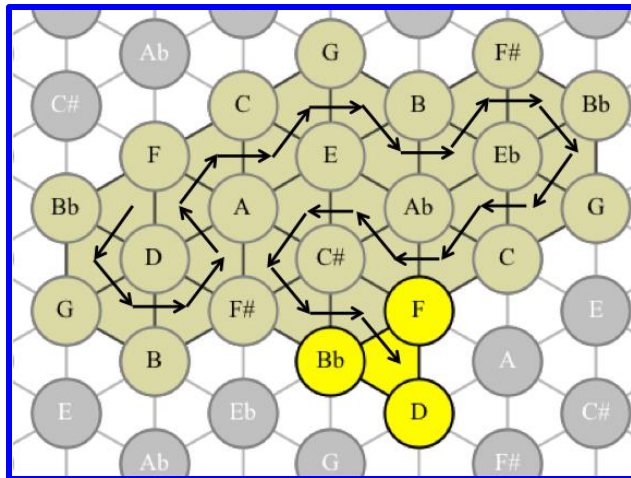
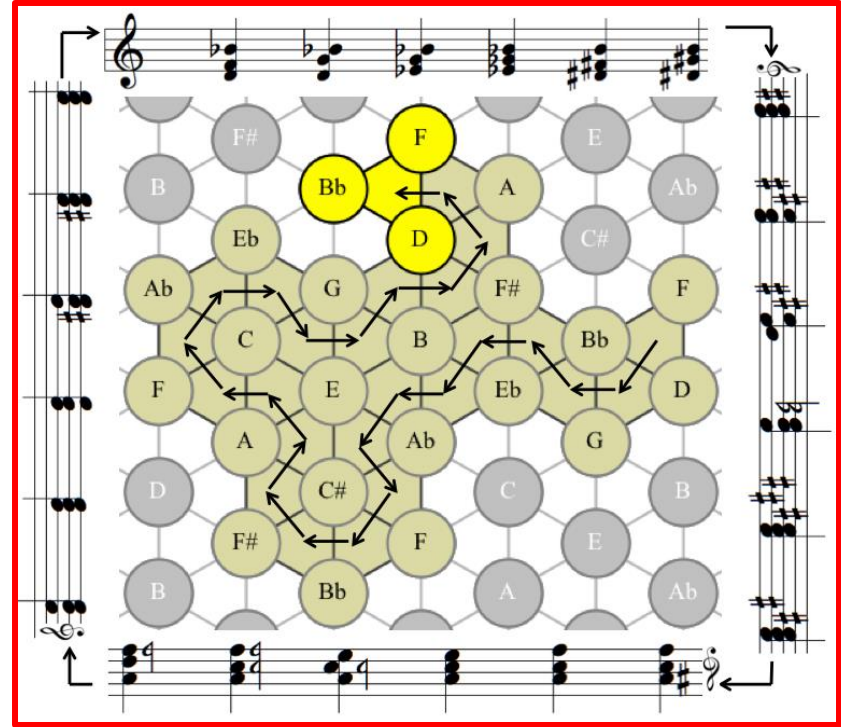
1. C-Cm-Ab-Abm-E-Em-G-Gm-Eb-Ebm-B-Bm-D-Dm-Bb-Bbm-F-F#m-A-C#m-C#-Fm-F-Am-PLPLPRPLPLRPLRPLRPLRPLRPLR
2. C-Cm-Ab-Abm-E-Em-G-Gm-Eb-Ebm-B-Bm-D-F#m-F#-Bbm-Bb-Dm-F-Fm-C#-C#m-A-Am-PLPLPRPLPLRPLRPLRPLRPLRPLR
3. C-Cm-Ab-Abm-E-Em-G-Gm-B-Bm-Eb-Ebm-Bb-Bbm-F-F#m-D-Dm-F-Fm-C#-C#m-A-Am-PLRPLRPLRPLRPLRPLRPLRPLRPLR
4. C-Cm-Ab-Abm-E-C#m-C#-Fm-F-Am-A-F#m-F#-Bbm-Bb-Dm-D-Bm-B-Ebm-Eb-Gm-G-Em-PLPLRPLRPLRPLRPLRPLRPLRPLR
5. C-Cm-Ab-Abm-E-C#m-A-Am-F-Fm-C#-Bbm-F-F#m-D-Dm-Bb-Gm-Eb-Ebm-B-Bm-G-Em-PLPLRPLRPLRPLRPLRPLRPLRPLR
6. C-Cm-Ab-Abm-B-Bm-G-Gm-Eb-Ebm-F-F#m-D-Dm-Bb-Bbm-C#-Fm-F-Am-A-C#m-E-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
7. C-Cm-Ab-Abm-B-Bm-G-Gm-Eb-Ebm-F#-Bbm-Bb-Dm-D-F#m-A-Am-F-Fm-C#-C#m-E-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
8. C-Cm-Ab-Abm-B-Bm-G-Em-E-C#m-A-F#m-D-Dm-Bb-Gm-Eb-Ebm-F#-Bbm-C#-Fm-F-Am-PLRPLRPLRPLRPLRPLRPLRPLRPLR
9. C-Cm-Ab-Abm-B-Ebm-Eb-Gm-G-Bm-D-Dm-Bb-Bbm-F-F#m-A-Am-F-Fm-C#-C#m-E-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
10. C-Cm-Ab-Abm-B-Ebm-Eb-Gm-Bb-Dm-D-Bm-G-Em-E-C#m-A-F#m-F#-Bbm-C#-Fm-F-Am-PLRPLRPLRPLRPLRPLRPLRPLRPLR
11. C-Cm-Ab-Abm-B-Ebm-Eb-Gm-Bb-Dm-F-Fm-C#-Bbm-F#-F#m-D-Bm-G-Em-E-C#m-A-Am-PLRPLRPLRPLRPLRPLRPLRPLRPLR
12. C-Cm-Ab-Fm-F-Am-A-C#m-C#-Bbm-Bb-Dm-D-F#m-F#-Ebm-Eb-Gm-G-Bm-B-Abm-E-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
13. C-Cm-Ab-Fm-F-Am-A-F#m-F#-Bbm-C#-C#m-E-Abm-B-Ebm-Eb-Gm-Bb-Dm-D-Bm-G-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
14. C-Cm-Ab-Fm-F-Am-A-F#m-D-Dm-Bb-Gm-Eb-Ebm-F#-Bbm-C#-C#m-E-Abm-B-Bm-G-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
15. C-Cm-Ab-Fm-F-Dm-Bb-Gm-Eb-Ebm-B-Abm-E-Em-G-Bm-D-F#m-F#-Bbm-C#-C#m-A-Am-PLRPLRPLRPLRPLRPLRPLRPLRPLR
16. C-Cm-Ab-Fm-C#-C#m-A-Am-F-Dm-Bb-Bbm-F#-F#m-D-Bm-G-Gm-Eb-Ebm-B-Abm-E-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
17. C-Cm-Ab-Fm-C#-C#m-A-F#m-F#-Bbm-Bb-Gm-Eb-Ebm-B-Abm-E-Em-G-Bm-D-Dm-F-Am-PLRPLRPLRPLRPLRPLRPLRPLRPLR
18. C-Cm-Ab-Fm-C#-C#m-A-F#m-D-Bm-B-Abm-E-Em-G-Gm-Eb-Ebm-F#-Bbm-Bb-Dm-F-Am-PLRPLRPLRPLRPLRPLRPLRPLRPLR
19. C-Cm-Ab-Fm-C#-C#m-E-Abm-B-Bm-D-F#m-A-Am-F-Dm-Bb-Bbm-F#-Ebm-Eb-Gm-G-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
20. C-Cm-Ab-Fm-C#-C#m-E-Abm-B-Ebm-Eb-Gm-Bb-Bbm-F#-F#m-A-Am-F-Dm-D-Bm-G-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
21. C-Cm-Ab-Fm-C#-Bbm-Bb-Dm-F-Am-A-C#m-E-Abm-B-Bm-D-F#m-F#-Ebm-Eb-Gm-G-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
22. C-Cm-Ab-Fm-C#-Bbm-Bb-Gm-Eb-Ebm-F#-F#m-D-Dm-F-Am-A-C#m-E-Abm-B-Bm-G-Em-PLRPLRPLRPLRPLRPLRPLRPLRPLR
23. C-Cm-Eb-Ebm-B-Bm-G-Gm-Bb-Bbm-F#-F#m-D-Dm-F-Am-A-C#m-C#-Fm-Ab-Abm-E-Em-PRPLPLRPLRPLRPLRPLRPLRPLRPLR
24. C-Cm-Eb-Ebm-B-Bm-G-Gm-Bb-Dm-D-F#m-F#-Bbm-C#-C#m-A-Am-F-Fm-Ab-Abm-E-Em-PRPLPLRPLRPLRPLRPLRPLRPLRPLR
25. C-Cm-Eb-Ebm-B-Bm-D-F#m-F#-Bbm-C#-Fm-Ab-Abm-E-C#m-A-Am-F-Dm-Bb-Gm-G-Em-PRPLPLRPLRPLRPLRPLRPLRPLRPLR
26. C-Cm-Eb-Ebm-B-Abm-Ab-Fm-C#-Bbm-F#-F#m-D-Bm-G-Gm-Bb-Dm-F-Am-A-C#m-E-Em-PRPLRPLRPLRPLRPLRPLRPLRPLRPLR
27. C-Cm-Eb-Ebm-F#-F#m-A-C#m-E-Em-G-Gm-Bb-Bbm-C#-Fm-Ab-Abm-B-Bm-D-Dm-F-Am-PRPRRPLRPLRPLRPLRPLRPLRPLRPLR
28. C-Cm-Eb-Ebm-F#-Bbm-C#-C#m-E-Em-G-Gm-Bb-Dm-F-Fm-Ab-Abm-B-Bm-D-F#m-A-Am-PRRPLRPLRPLRPLRPLRPLRPLRPLR
29. C-Cm-Eb-Ebm-F#-Bbm-C#-Fm-Ab-Abm-B-Bm-D-F#m-A-C#m-E-Em-G-Gm-Bb-Dm-F-Am-PRRPLRPLRPLRPLRPLRPLRPLRPLR
30. C-Cm-Eb-Gm-G-Bm-B-Ebm-F#-F#m-D-Dm-Bb-Bbm-C#-C#m-A-Am-F-Fm-Ab-Abm-E-Em-PRLPLRPLRPLRPLRPLRPLRPLRPLRPLR
31. C-Cm-Eb-Gm-G-Bm-D-F#m-F#-Ebm-B-Abm-Ab-Fm-C#-Bbm-Bb-Dm-F-Am-A-C#m-E-Em-PRLPLRPLRPLRPLRPLRPLRPLRPLRPLR
32. C-Cm-Eb-Gm-G-Bm-D-F#m-A-Am-F-Dm-Bb-Bbm-F#-Ebm-B-Abm-Ab-Fm-C#-C#m-E-Em-PRLPLRPLRPLRPLRPLRPLRPLRPLRPLR
33. C-Cm-Eb-Gm-G-Em-E-Abm-Ab-Fm-C#-C#m-A-F#m-D-Bm-B-Ebm-F#-Bbm-Bb-Dm-F-Am-PRLRPLRPLRPLRPLRPLRPLRPLRPLR
34. C-Cm-Eb-Gm-Bb-Bbm-F#-Ebm-B-Bm-G-Em-E-Abm-Ab-Fm-C#-C#m-A-F#m-D-Dm-F-Am-PRLRPLRPLRPLRPLRPLRPLRPLRPLR
35. C-Cm-Eb-Gm-Bb-Bbm-C#-C#m-E-Em-G-Bm-D-Dm-F-Fm-Ab-Abm-B-Ebm-F#-F#m-A-Am-PRLRPRRPLRPLRPLRPLRPLRPLRPLR
36. C-Cm-Eb-Gm-Bb-Bbm-C#-Fm-Ab-Abm-E-C#m-A-Am-F-Dm-D-F#m-F#-Ebm-B-Bm-G-Em-PRLRPRRPLRPLRPLRPLRPLRPLRPLR
37. C-Cm-Eb-Gm-Bb-Bbm-C#-Fm-Ab-Abm-B-Ebm-F#-F#m-A-C#m-E-Em-G-Bm-D-Dm-F-Am-PRLRPLRPLRPLRPLRPLRPLRPLRPLR
38. C-Cm-Eb-Gm-Bb-Dm-D-F#m-A-Am-F-Fm-Ab-Abm-E-C#m-C#-Bbm-F#-Ebm-B-Bm-G-Em-PRLRPLRPLRPLRPLRPLRPLRPLRPLR
39. C-Cm-Eb-Gm-Bb-Dm-D-F#m-A-C#m-C#-Bbm-F#-Ebm-B-Bm-G-Em-E-Abm-Ab-Fm-F-Am-PRLRPLRPLRPLRPLRPLRPLRPLRPLR
40. C-Cm-Eb-Gm-Bb-Dm-F-Fm-Ab-Abm-B-Ebm-F#-Bbm-C#-C#m-E-Em-G-Bm-D-F#m-A-Am-PRLRPLRPLRPLRPLRPLRPLRPLRPLR
41. C-Em-E-Abm-Ab-Cm-Eb-Ebm-B-Bm-G-Gm-Bb-Bbm-F#-F#m-D-Dm-F-Fm-C#-C#m-A-Am-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
42. C-Em-E-Abm-Ab-Cm-Eb-Gm-G-Bm-B-Ebm-F#-Bbm-Bb-Dm-D-F#m-A-C#m-C#-Fm-F-Am-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
43. C-Em-E-Abm-Ab-Fm-F-Am-A-C#m-C#-Bbm-Bb-Dm-D-F#m-F#-Ebm-B-Bm-G-Gm-Eb-Cm-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
44. C-Em-E-Abm-Ab-Fm-F-Am-A-C#m-C#-Bbm-F#-F#m-D-Dm-Bb-Gm-G-Bm-B-Ebm-Eb-Cm-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
45. C-Em-E-Abm-Ab-Fm-C#-C#m-A-Am-F-Dm-D-F#m-F#-Bbm-Bb-Gm-G-Bm-B-Ebm-Eb-Cm-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
46. C-Em-E-Abm-B-Bm-G-Gm-Eb-Ebm-F#-F#m-D-Dm-Bb-Bbm-C#-C#m-A-Am-F-Fm-Ab-Cm-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
47. C-Em-E-Abm-B-Bm-G-Gm-Bb-Bbm-F#-Ebm-Eb-Cm-Ab-Fm-C#-C#m-A-F#m-D-Dm-F-Am-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
48. C-Em-E-Abm-B-Bm-G-Gm-Bb-Dm-D-F#m-A-C#m-C#-Bbm-F#-Ebm-Eb-Cm-Ab-Fm-F-Am-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
49. C-Em-E-Abm-B-Ebm-Eb-Gm-G-Bm-D-F#m-F#-Bbm-Bb-Dm-F-Am-A-C#m-C#-Fm-Ab-Cm-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
50. C-Em-E-Abm-B-Ebm-Eb-Cm-Ab-Fm-F-Dm-Bb-Gm-G-Bm-D-F#m-F#-Bbm-C#-C#m-A-Am-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
51. C-Em-E-Abm-B-Ebm-Eb-Cm-Ab-Fm-C#-C#m-A-F#m-F#-Bbm-Bb-Gm-G-Bm-D-Dm-F-Am-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
52. C-Em-E-Abm-B-Ebm-F#-F#m-D-Bm-G-Gm-Eb-Cm-Ab-Fm-F-Dm-Bb-Bbm-C#-C#m-A-Am-LPLRPLRPLRPLRPLRPLRPLRPLRPLR
53. C-Em-E-Abm-B-Ebm-F#-F#m-A-C#m-C#-Bbm-Bb-Dm-D-Bm-G-Gm-Eb-Cm-Ab-Fm-F-Am-LPLRPLRPLRPLRPLRPLRPLRPLRPLR

Le catalogue complet des 124 cycles hamiltoniens

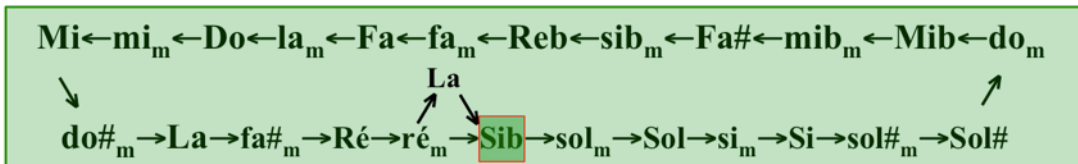
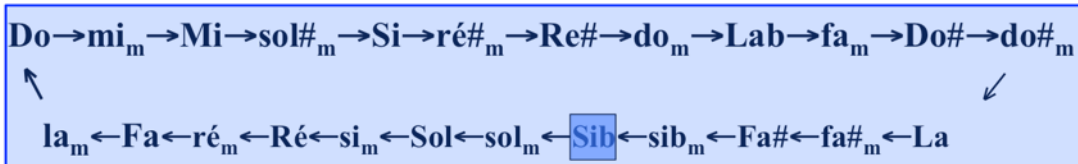
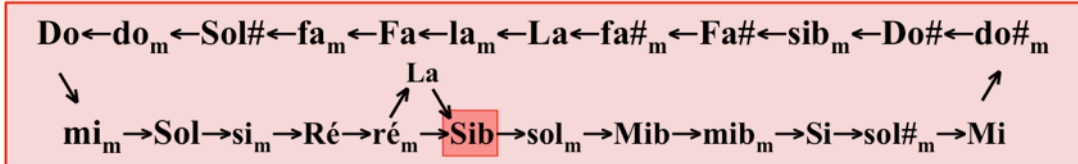
54. C-Em-E-C#m-C#-Fm-F-Am-A-F#m-F#-Bbm-Bb-Dm-D-Bm-G-Gm-Eb-Ebm-B-Abm-Ab-Cm--LPRPLPRPLPRPLPRPLPRPLP
55. C-Em-E-C#m-C#-Fm-F-Am-A-F#m-D-Dm-Bb-Bbm-F#-Ebm-Eb-Gm-G-Bm-B-Abm-Ab-Cm--LPRPLPRPLPRPLPRPLPRPLP
56. C-Em-E-C#m-C#-Fm-F-Dm-Bb-Bbm-F#-Ebm-B-Abm-Ab-Cm-Eb-Gm-G-Bm-D-F#m-A-Am--LPRPLPRPLRRLRPLRPLRRLRPR
57. C-Em-E-C#m-C#-Fm-Ab-Abm-B-Ebm-F#-Bbm-Bb-Dm-F-Am-A-F#m-D-Bm-G-Gm-Eb-Cm--LPRPLPRPLRRLRPLRPLRRLRPR
58. C-Em-E-C#m-A-Am-F-Fm-C#-Bbm-Bb-Dm-D-F#m-F#-Ebm-Eb-Gm-G-Bm-B-Abm-Ab-Cm--LPRPLPRPLPRPLPRPLPRPLP
59. C-Em-E-C#m-A-Am-F-Dm-Bb-Bbm-C#-Fm-Ab-Abm-B-Ebm-F#-F#m-D-Bm-G-Gm-Eb-Cm--LPRPLRRLRPLRPLRPLRPLRPLR
60. C-Em-E-C#m-A-Am-F-Dm-Bb-Gm-G-Bm-D-F#m-F#-Bbm-C#-Fm-Ab-Abm-B-Ebm-Eb-Cm--LPRPLRRLRPLRPLRPLRPLRPR
61. C-Em-E-C#m-A-F#m-F#-Ebm-B-Abm-Ab-Cm-Eb-Gm-G-Bm-D-Dm-Bb-Bbm-C#-Fm-F-Am--LPRPLRPLRPLRPLRPLRPLRPLR
62. C-Em-E-C#m-A-F#m-D-Dm-Bb-Gm-G-Bm-B-Abm-Ab-Cm-Eb-Ebm-F#-Bbm-C#-Fm-F-Am--LPRPLRPLRPLRPLRPLRPLRPLR
63. C-Em-G-Gm-Eb-Ebm-B-Bm-D-Dm-Bb-Bbm-F#-F#m-A-Am-F-Fm-C#-C#m-E-Abm-Ab-Cm--LRPLPLPRPLPRPLRPLRPLP
64. C-Em-G-Gm-Eb-Ebm-F#-F#m-D-Bm-B-Abm-E-C#m-A-Am-F-Dm-Bb-Bbm-C#-Fm-Ab-Cm--LRPLPRPLRPLRPLRPLRPLRPL
65. C-Em-G-Gm-Eb-Ebm-F#-Bbm-Bb-Dm-F-Am-A-F#m-D-Bm-B-Abm-E-C#m-C#-Fm-Ab-Cm--LRPLRPLRPLRPLRPLRPLRPLR
66. C-Em-G-Gm-Eb-Cm-Ab-Abm-E-C#m-C#-Fm-F-Dm-Bb-Bbm-F#-Ebm-B-Bm-D-F#m-A-Am--LRPLRPLRPLRPLRPLRPLRPLR
67. C-Em-G-Gm-Eb-Cm-Ab-Abm-E-C#m-A-F#m-F#-Ebm-B-Bm-D-Dm-Bb-Bbm-C#-Fm-F-Am--LRPLRPLRPLRPLRPLRPLRPLR
68. C-Em-G-Gm-Bb-Bbm-C#-C#m-E-Abm-B-Bm-D-Dm-F-Fm-Ab-Cm-Eb-Ebm-F#-F#m-A-Am--LRPRPRPR
69. C-Em-G-Gm-Bb-Bbm-C#-Fm-Ab-Cm-Eb-Ebm-F#-F#m-A-C#m-E-Abm-B-Bm-D-Dm-F-Am--LRPRPRLR
70. C-Em-G-Gm-Bb-Dm-D-Bm-B-Ebm-Eb-Cm-Ab-Abm-E-C#m-A-F#m-F#-Bbm-C#-Fm-F-Am--LRPRLRPLRPLRPLRPLRPLRPLR
71. C-Em-G-Gm-Bb-Dm-F-Fm-C#-Bbm-F#-F#m-D-Bm-B-Ebm-Eb-Cm-Ab-Abm-E-C#m-A-Am--LRPRLRPLRPLRPLRPLRPLRPLR
72. C-Em-G-Gm-Bb-Dm-F-Fm-Ab-Cm-Eb-Ebm-F#-Bbm-C#-C#m-E-Abm-B-Bm-D-F#m-A-Am--LRPR
73. C-Em-G-Gm-Bb-Dm-F-Am-A-C#m-E-Abm-Ab-Fm-C#-Bbm-F#-F#m-D-Bm-B-Ebm-Eb-Cm--LRPRLRPLRPLRPLRPLRPLRPR
74. C-Em-G-Gm-B-Ebm-Eb-Gm-Bb-Dm-D-F#m-F#-Bbm-C#-Fm-F-Am-A-C#m-E-Abm-Ab-Cm--LRLPLP
75. C-Em-G-Gm-B-Ebm-F#-F#m-D-Dm-F-Fm-C#-Bbm-Bb-Gm-Eb-Cm-Ab-Abm-E-C#m-A-Am--LRLPLRPLRPLRPLRPLRPLRPLR
76. C-Em-G-Gm-B-Ebm-F#-F#m-D-Dm-F-Am-A-C#m-E-Abm-Ab-Fm-C#-Bbm-Bb-Gm-Eb-Cm--LRLPLRPLRPLRPLRPLRPLRPLR
77. C-Em-G-Gm-B-Ebm-F#-Bbm-Bb-Gm-Eb-Cm-Ab-Abm-E-C#m-C#-Fm-F-Dm-D-F#m-A-Am--LRLPLRPLRPLRPLRPLRPLRPR
78. C-Em-G-Gm-B-Ebm-F#-Bbm-C#-C#m-E-Abm-Ab-Fm-F-Am-A-F#m-D-Dm-Bb-Gm-Eb-Cm--LRLPLRPLRPLRPLRPLRPLRPLR
79. C-Em-G-Gm-B-Abm-E-C#m-C#-Bbm-F#-Ebm-Eb-Gm-Bb-Dm-D-F#m-A-Am-F-Fm-Ab-Cm--LRLPRLRPLRPLRPLRPLRPLRPL
80. C-Em-G-Gm-B-Abm-E-C#m-A-Am-F-Dm-D-F#m-F#-Ebm-Eb-Gm-Bb-Bbm-C#-Fm-Ab-Cm--LRLPLRPLRPLRPLRPLRPLRPL
81. C-Em-G-Gm-D-Dm-Bb-Gm-Eb-Ebm-B-Abm-E-C#m-C#-Bbm-F#-F#m-A-Am-F-Fm-Ab-Cm--LRLRPLRPLRPLRPLRPLRPLRPL
82. C-Em-G-Gm-D-Dm-F-Fm-Ab-Cm-Eb-Gm-Bb-Bbm-C#-C#m-E-Abm-B-Ebm-F#-F#m-A-Am--LRLRPRPR
83. C-Em-G-Gm-D-Dm-F-Fm-A-F#m-F#-Bbm-Bb-Gm-Eb-Ebm-B-Abm-E-C#m-C#-Fm-Ab-Cm--LRLRPLRPLRPLRPLRPLRPLRPL
84. C-Em-G-Gm-D-F#m-A-C#m-E-Abm-B-Ebm-F#-Bbm-C#-Fm-Ab-Cm-Eb-Gm-Bb-Dm-F-Am--LR
85. C-Am-A-C#m-C#-Fm-F-Dm-D-F#m-F#-Bbm-Bb-Gm-G-Bm-B-Ebm-Eb-Cm-Ab-Abm-E-Em--RPLPLPRPLPRPLRPLRPLRPLP
86. C-Am-A-C#m-C#-Fm-F-Dm-D-F#m-F#-Bbm-Bb-Gm-Eb-Ebm-B-Bm-G-Em-E-Abm-Ab-Cm--RPLPLPRPLRPLRPLRPLRPLP
87. C-Am-A-C#m-C#-Fm-F-Dm-Bb-Bbm-F#-F#m-D-Bm-B-Ebm-Eb-Gm-G-Em-E-Abm-Ab-Cm--RPLPLRPLRPLRPLRPLRPLP
88. C-Am-A-C#m-C#-Bbm-Bb-Dm-F-Fm-Ab-Cm-Eb-Gm-G-Bm-D-F#m-F#-Ebm-B-Abm-E-Em--RPLRPLRPLRPLRPLRPLRPL
89. C-Am-A-C#m-C#-Bbm-F#-F#m-D-Bm-G-Gm-Bb-Dm-F-Fm-Ab-Cm-Eb-Ebm-B-Abm-E-Em--RPLRPLRPLRPLRPLRPLRPL
90. C-Am-A-C#m-C#-Bbm-F#-F#m-D-Bm-G-Em-E-Abm-B-Ebm-Eb-Gm-Bb-Dm-F-Fm-Ab-Cm--RPLRPLRPLRPLRPLRPLRPL
91. C-Am-A-C#m-E-Em-G-Bm-D-F#m-F#-Bbm-C#-Fm-F-Dm-Bb-Gm-Eb-Ebm-B-Abm-Ab-Cm--RPLRPLRPLRPLRPLRPLRPL
92. C-Am-A-C#m-E-Abm-Ab-Cm-Eb-Ebm-B-Bm-D-F#m-F#-Bbm-C#-Fm-F-Dm-Bb-Gm-G-Em--RPLRPLRPLRPLRPLRPLRPL
93. C-Am-A-C#m-E-Abm-Ab-Cm-Eb-Gm-Bb-Bbm-C#-Fm-F-Dm-D-F#m-F#-Ebm-B-Bm-G-Em--RPLRPLRPLRPLRPLRPLRPL
94. C-Am-A-F#m-F#-Ebm-Eb-Cm-Ab-Fm-F-Dm-D-Bm-B-Abm-E-C#m-C#-Bbm-Bb-Gm-G-Em--RPRPRPR
95. C-Am-A-F#m-F#-Ebm-B-Abm-Ab-Fm-F-Dm-D-Bm-G-Em-E-C#m-C#-Bbm-Bb-Gm-Eb-Cm--RPRPRLR
96. C-Am-A-F#m-F#-Ebm-B-Abm-E-C#m-C#-Bbm-Bb-Gm-Eb-Cm-Ab-Fm-F-Dm-D-Bm-G-Em--RPRPRLR
97. C-Am-A-F#m-D-Dm-F-Fm-C#-C#m-E-Abm-Ab-Cm-Eb-Gm-Bb-Bbm-F#-Ebm-B-Bm-G-Em--RPLRPLRPLRPLRPLRPLRPL
98. C-Am-A-F#m-D-Bm-B-Ebm-F#-Bbm-Bb-Dm-F-Fm-C#-C#m-E-Abm-Ab-Cm-Eb-Gm-G-Em--RPLRPLRPLRPLRPLRPLRPL
99. C-Am-A-F#m-D-Bm-B-Abm-Ab-Fm-F-Dm-Bb-Gm-G-Em-E-C#m-C#-Bbm-F#-Ebm-Eb-Cm--RPLRPRPR
100. C-Am-A-F#m-D-Bm-B-Abm-E-C#m-C#-Bbm-F#-Ebm-Eb-Cm-Ab-Fm-F-Dm-Bb-Gm-G-Em--RPLR
101. C-Am-A-F#m-D-Bm-G-Gm-Eb-Cm-Ab-Abm-B-Ebm-F#-Bbm-Bb-Dm-F-Fm-C#-C#m-E-Em--RPLRPLRPLRPLRPLRPLRPL
102. C-Am-A-F#m-D-Bm-G-Em-E-C#m-C#-Bbm-F#-Ebm-B-Abm-Ab-Fm-F-Dm-Bb-Gm-Eb-Cm--RPLRPLRPLRPLRPLRPLRPL
103. C-Am-F-Fm-C#-C#m-A-F#m-F#-Bbm-Bb-Dm-D-Bm-B-Ebm-Eb-Gm-G-Em-E-Abm-Ab-Cm--RLPLRPLRPLRPLRPLRPLRPLP
104. C-Am-F-Fm-C#-C#m-A-F#m-D-Dm-Bb-Bbm-F#-Ebm-B-Bm-G-Gm-Eb-Cm-Ab-Abm-E-Em--RLPLP
105. C-Am-F-Fm-C#-Bbm-Bb-Dm-D-Bm-B-Ebm-F#-F#m-A-C#m-E-Abm-Ab-Cm-Eb-Gm-G-Em--RLPLRPLRPLRPLRPLRPLRPL
106. C-Am-F-Fm-C#-Bbm-Bb-Dm-D-Bm-G-Gm-Eb-Cm-Ab-Abm-B-Ebm-F#-F#m-A-C#m-E-Em--RLPLRPLRPLRPLRPLRPLRPL
107. C-Am-F-Fm-C#-Bbm-F#-F#m-A-C#m-E-Em-G-Bm-D-Dm-Bb-Gm-Eb-Ebm-B-Abm-Ab-Cm--RLPLRPLRPLRPLRPLRPLRPL

Le catalogue complet des 124 cycles hamiltoniens

108. C-Am-F-Fm-C#-Bbm-F#-F#m-A-C#m-E-Abm-Ab-Cm-Eb-Ebm-B-Bm-D-Dm-Bb-Gm-G-Em-RLPLRLRPLRLPLRPLRPLRPL
109. C-Am-F-Fm-C#-Bbm-F#-Ebm-Eb-Gm-Bb-Dm-D-F#m-A-C#m-E-Em-G-Bm-B-Abm-Ab-Cm-RLPLRLRPLRLPLRPLRPLRPL
110. C-Am-F-Fm-C#-Bbm-F#-Ebm-Eb-Cm-Ab-Abm-B-Bm-G-Gm-Bb-Dm-D-F#m-A-C#m-E-Em-RLPLRLRPLRPLRPLRPLRPL
111. C-Am-F-Fm-Ab-Abm-E-Em-G-Bm-B-Ebm-F#-Bbm-C#-C#m-A-F#m-D-Dm-Bb-Gm-Eb-Cm-RLRPLRPLRPLRPLRPLRPLRPL
112. C-Am-F-Fm-Ab-Cm-Eb-Ebm-F#-Bbm-C#-C#m-A-F#m-D-Dm-Bb-Gm-G-Bm-B-Abm-E-Em-RLRPLRPLRPLRPLRPLRPLRPL
113. C-Am-F-Fm-Ab-Cm-Eb-Gm-G-Bm-D-Dm-Bb-Bbm-C#-C#m-A-F#m-F#-Ebm-B-Abm-E-Em-RLRPLRPLRPLRPLRPLRPLRPL
114. C-Am-F-Dm-D-F#m-A-C#m-C#-Fm-Ab-Abm-E-Em-G-Bm-B-Ebm-F#-Bbm-Bb-Gm-Eb-Cm-RLRPLRPLRPLRPLRPLRPLRPL
115. C-Am-F-Dm-D-F#m-A-C#m-C#-Fm-Ab-Cm-Eb-Ebm-F#-Bbm-Bb-Gm-G-Bm-B-Abm-E-Em-RLRPLRPLRPLRPLRPLRPLRPL
116. C-Am-F-Dm-D-Bm-B-Abm-Ab-Fm-C#-Bbm-Bb-Gm-G-Em-E-C#m-A-F#m-F#-Ebm-Eb-Cm-RLRPRPRP
117. C-Am-F-Dm-D-Bm-B-Abm-E-C#m-A-F#m-F#-Ebm-Eb-Cm-Ab-Fm-C#-Bbm-Bb-Gm-G-Em-RLRPRPRP
118. C-Am-F-Dm-D-Bm-G-Gm-Bb-Bbm-F#-F#m-A-C#m-C#-Fm-Ab-Cm-Eb-Ebm-B-Abm-E-Em-RLRPLRPLRPLRPLRPLRPLRPL
119. C-Am-F-Dm-D-Bm-G-Em-E-Abm-B-Ebm-Eb-Gm-Bb-Bbm-F#-F#m-A-C#m-C#-Fm-Ab-Cm-RLRPLRPLRPLRPLRPLRPLRPL
120. C-Am-F-Dm-D-Bm-G-Em-E-C#m-A-F#m-F#-Ebm-B-Abm-Ab-Fm-C#-Bbm-Bb-Gm-Eb-Cm-RLRP
121. C-Am-F-Dm-Bb-Bbm-F#-Ebm-Eb-Gm-G-Em-E-Abm-B-Bm-D-F#m-A-C#m-C#-Fm-Ab-Cm-RLRPLRPLRPLRPLRPLRPLRPL
122. C-Am-F-Dm-Bb-Bbm-F#-Ebm-B-Bm-D-F#m-A-C#m-C#-Fm-Ab-Abm-E-Em-G-Gm-Eb-Cm-RLRPLRPLRPLRPLRPLRPLRPL
123. C-Am-F-Dm-Bb-Gm-G-Em-E-C#m-A-F#m-D-Bm-B-Abm-Ab-Fm-C#-Bbm-F#-Ebm-Eb-Cm-RLRPRPRP
124. C-Am-F-Dm-Bb-Gm-Eb-Cm-Ab-Fm-C#-Bbm-F#-Ebm-B-Abm-E-C#m-A-F#m-D-Bm-G-Em-RL



Aprile (d'après Gabriele D'Annunzio)



La fenêtre est entr'ouverte, sur le jardin.
 Une heure passe, lente, somnolente.
 Et elle, d'abord attentive, finit par s'endormir.
 À cette voix qui là-bas se lamente,
 Qui se lamente au fond de ce jardin.

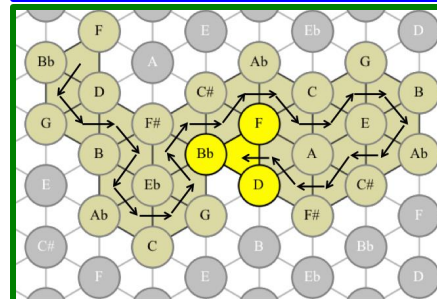
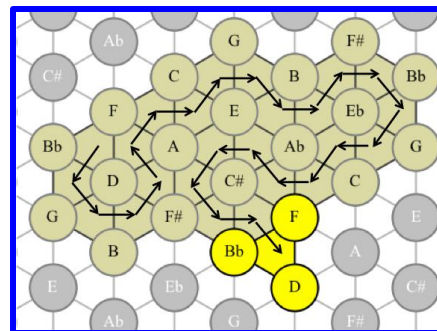
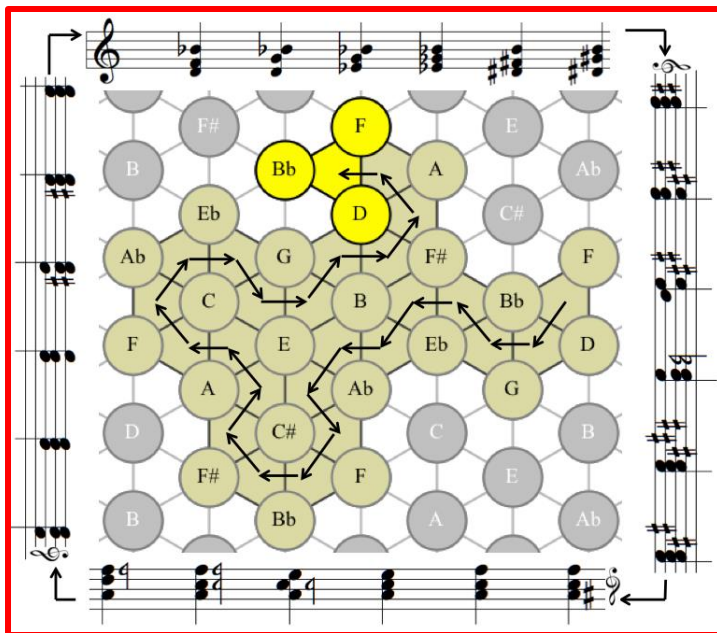
Cycle hamiltonien #1

Ce n'est qu'une voix d'eau sur la pierre,
 Et combien de fois, combien de fois entendue !
 Cet amour et cette heure s'abîment dans cette vie
 Comme s'abîment dans l'onde sans fin
 Le cadavre et la pierre liés ensemble.

Cycle hamiltonien #2

Elle détend son angoisse dans le sommeil.
 Mais l'angoisse est forte, et le sommeil est si léger !
 (La lumière d'avril ressemble presque à une neige
 qui serait tiède.)
 Et certes elle doit souffrir,
 Vaguement souffrir, aussi dans le sommeil.

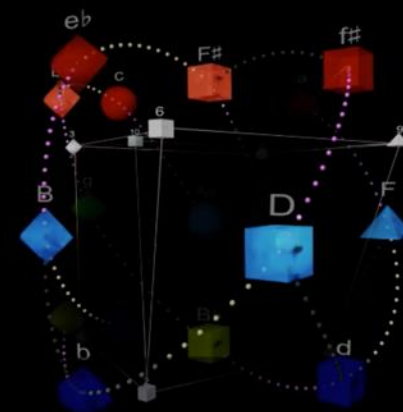
Cycle hamiltonien #3



Aprile

Hamiltonian Song

Mathemusical
2D & 4D Visualizations



Composition, Performance: Moreno Andreatta
Hyperspheres & Animations: Gilles Baroin
Spinnen-Tonnetz: Hugò Seress & G.B
Lyrics by Gabriele D'Annunzio
www.MatheMusic.net



« Ah ! » : une ballade semi-hamiltonienne en compagnie de Jacques Roubaud

4/4 C |

2/4 C | 4/4 Em E | C#m |
Ah ! quel silence Dans la rue de Valence !

A F#m | D |
Mais quel vacarme Dans la rue de Parme !

2/4 Dm Bb | 4/4Gm G | Bm |
Calme ah ! quel calme Dans la rue des Palmes

B Abm | Ab |
Quelle agitation Dans la rue Bran-cion

Cm | Eb |
Ah ! l'heure sereine Dans la rue de Seine !

Gm G | Bm |
Mais quelle inquiétude Boulevard de Dix-mude !

D Dm Bb Bbm | Db |
Ah ! quel trouble interne Avenue des ternes

Fm F | Am |
Quel repos intérieur Rue Gît-le-Cœur.

C Em | E | C#m A | F#m | D Dm | Bb | Gm G | Bm | B Abm Ab Cm
Ah ! etc.

| Eb | Gm G Bm D | Dm | Bb Bbm | Db | Fm F | Am |

2/4 C | 4/4 Em E | C#m |
Ah ! quel silence Dans la rue de Valence !

A F#m | D |
Mais quel vacarme Dans la rue de Parme !

2/4 Dm Bb | 4/4Gm G | Bm |
Calme ah ! quel calme Dans la rue des Palmes

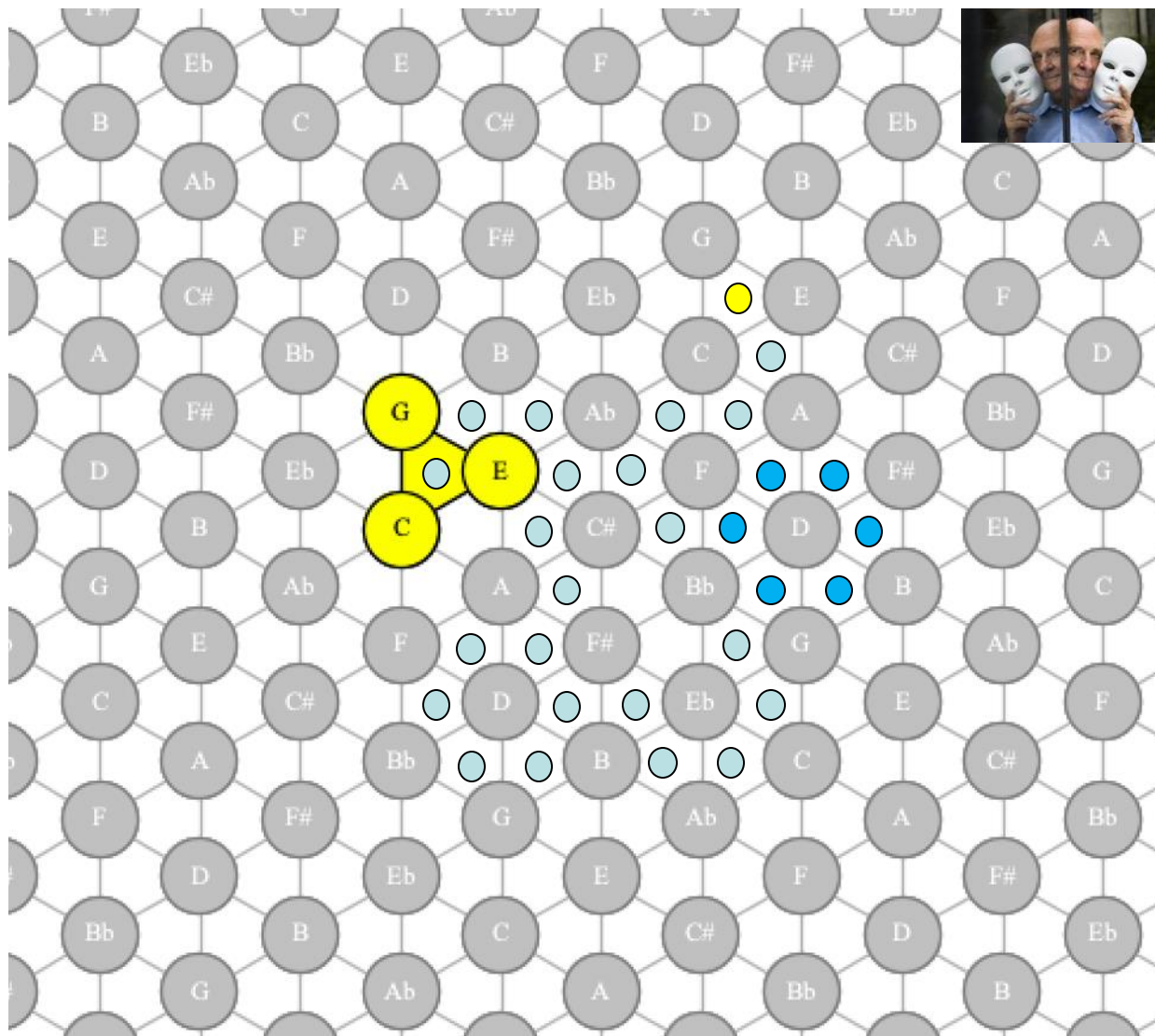
B Abm | Ab |
Quelle agitation Dans la rue Bran-cion

Cm | Eb |
Ah ! l'heure sereine Dans la rue de Seine !

Gm G | Bm |
Mais quelle inquiétude Boulevard de Dix-mude !

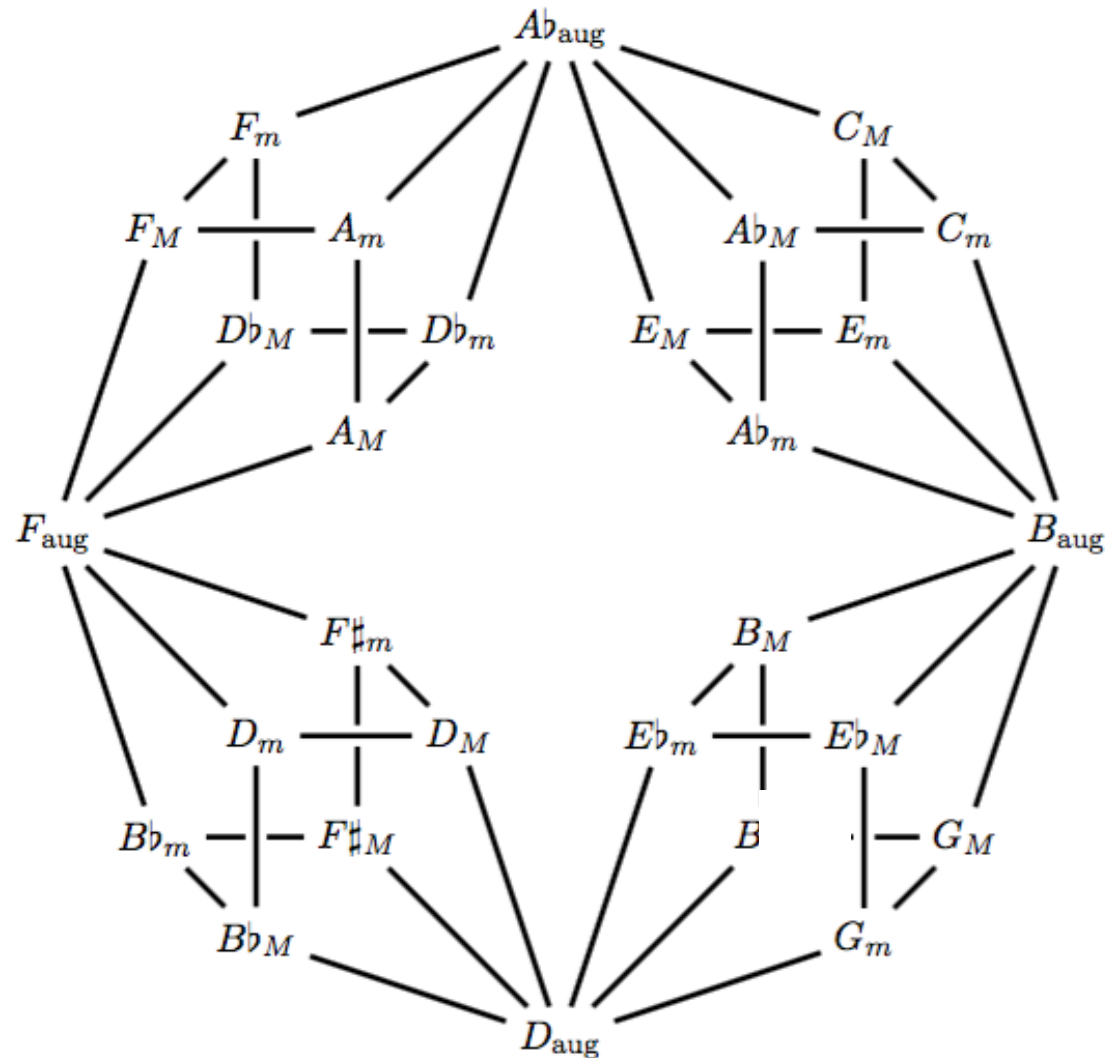
D Dm Bb Bbm | Db |
Ah ! quel trouble interne Avenue des ternes

Fm F | Am | C |
Quel repos intérieur Rue Gît-le-Cœur.



→ http://repmus.ircam.fr/media/moreno/ah_jacquesroubaudhamilton.mp3

Le Cube Dance des accords majeurs, mineurs et augmentés

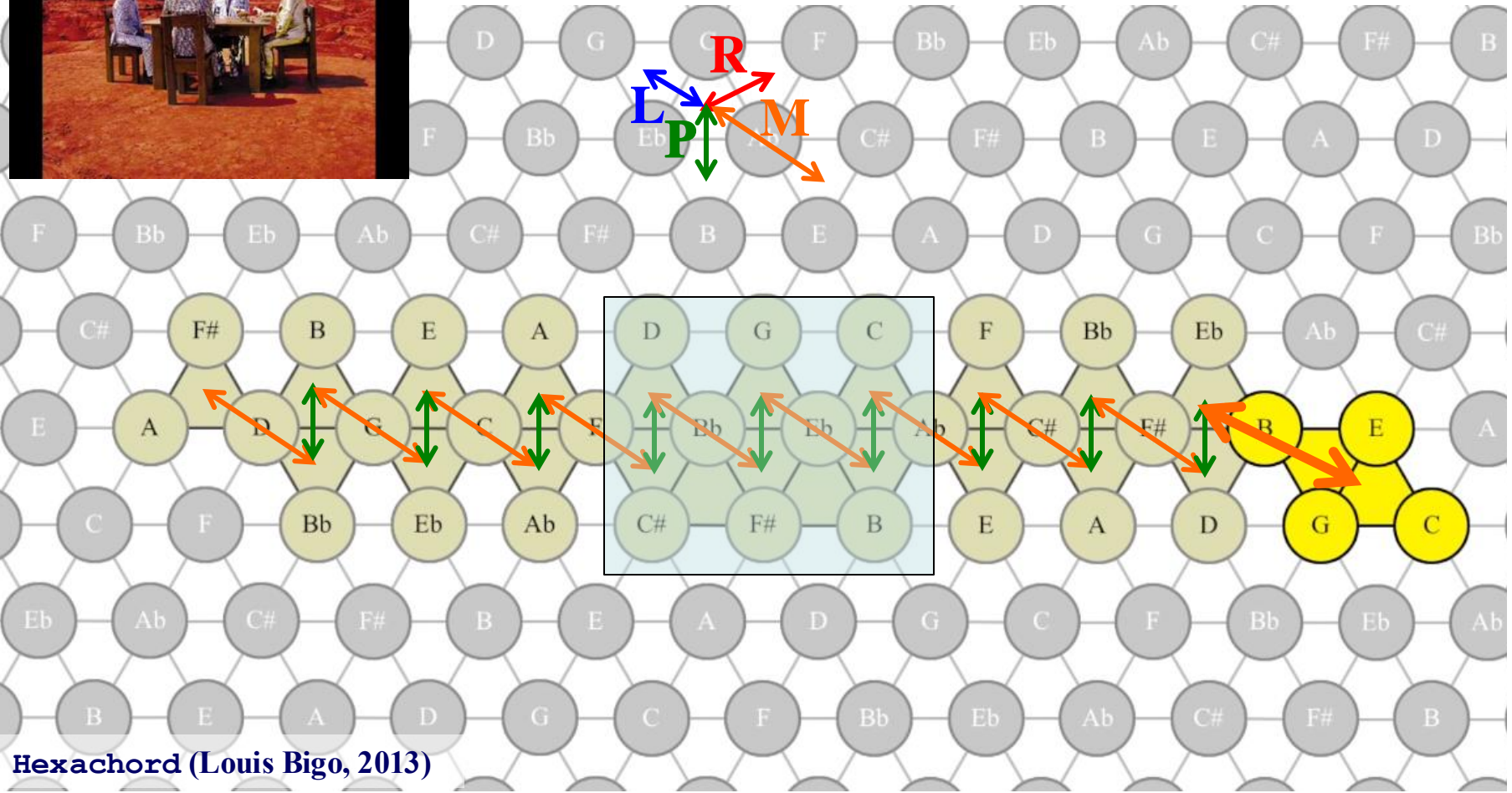


J. Douthett, P. Steinbach, Parsimonious Graphs: A Study in Parsimony, Contextual Transformation, and Modes of Limited Transposition, *Journal of Music Theory*, 42/2, 1998.

Symétries et procédés algorithmiques chez *Muse*



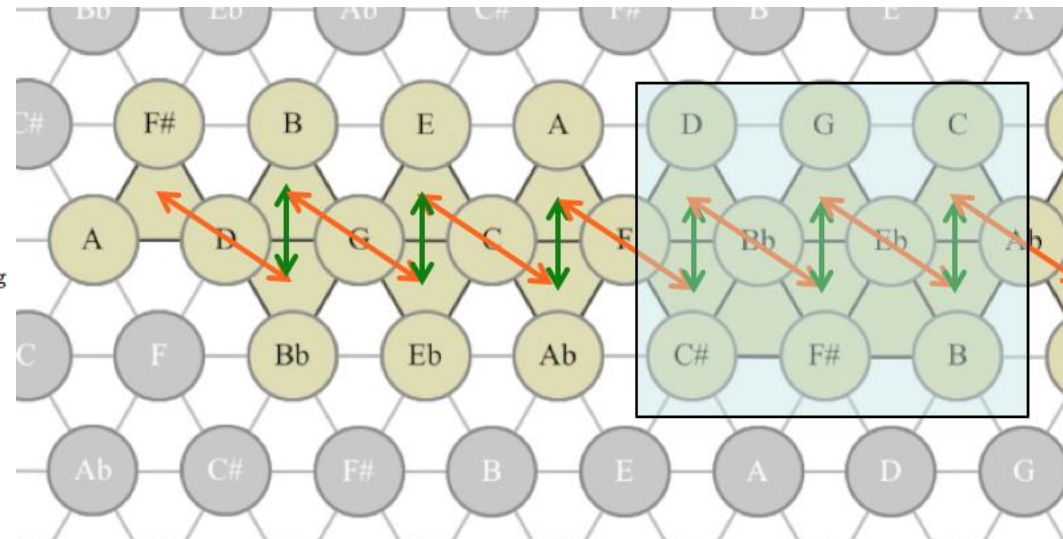
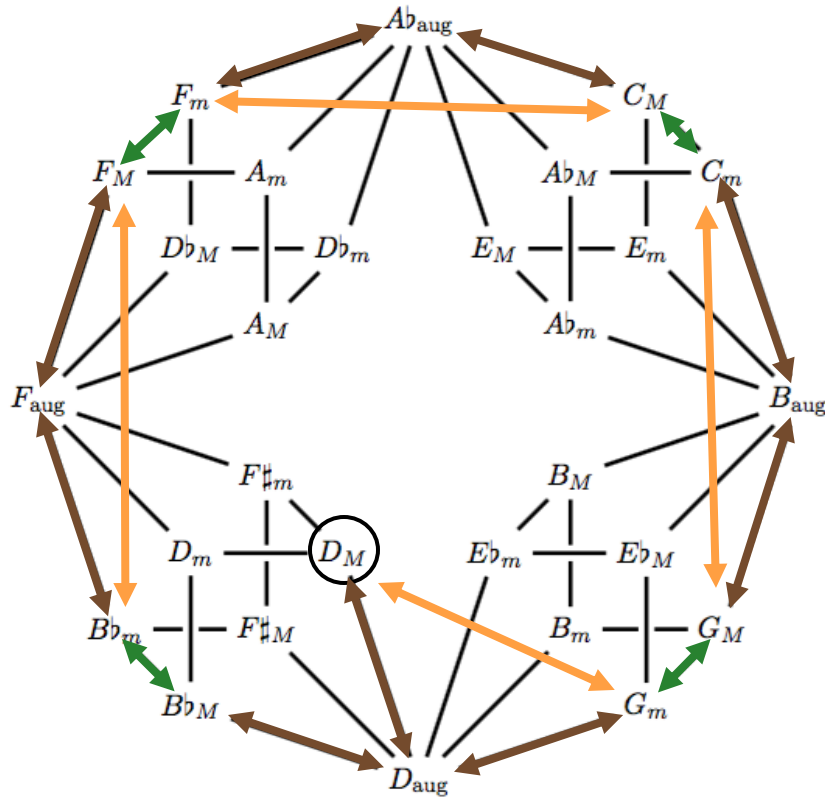
“Take a bow” (*Black Holes and Revelations*, 2006)



Hexachord (Louis Bigo, 2013)

axe temporel →

« Take a bow » dans le Cube Dance

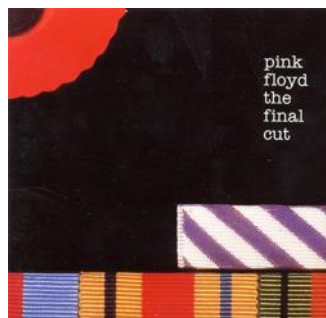


J. Douthett, P. Steinbach, Parsimonious Graphs: A Study in Parsimony, Contextual Transformation, and Modes of Limited Transposition, *Journal of Music Theory*, 42/2, 1998.

The Gunner's Hamiltonian Dream (une expérience *oumupienne* autour de Pink-Floyd)

The Gunner's dream (R. Waters, 1983 / M. Andreatta, 2018)

(C) C+
Floating down through the clouds
Am F
Memories come rushing up to meet me now.
Fm
In the space between the heavens
C# C#m
and in the corner of some foreign field
A F+ Bbm
I had a dream.
F# F#m D Dm
I had a dream.
Bb
Good-bye Max.
D+
Good-bye Ma.
Ebm B
After the service when you're walking slowly to the car
Bm G
And the silver in her hair shines in the cold November air
Gm
You hear the tolling bell
Eb
And touch the silk in your lapel
G+ Em E G#m
And as the tear drops rise to meet the comfort of the band
G# Cm
You take her frail hand
(C)
And hold on to the dream.

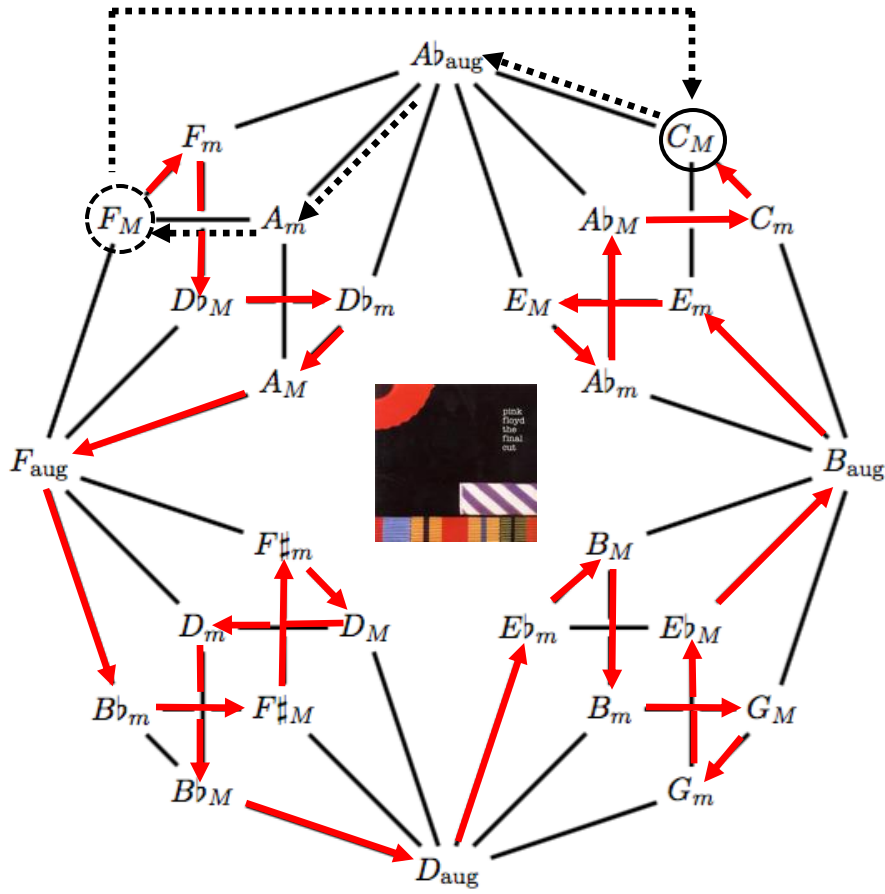


Le rêve du canonnier

Flottant parmi les nuages
Des souvenirs se ruent à ma rencontre.
Dans l'espace entre les cieux
Et dans un recoin d'un lointain champ de bataille
J'ai fait un rêve,
J'ai fait un rêve.
Au revoir Max
Au revoir maman
Après le service, quand tu marches lentement vers la voiture
Et l'argent dans ses cheveux luit dans l'air froid de novembre
Tu entends sonner le glas
Et touche la soie sur ton revers
Et tandis que les larmes versées s'élèvent pour se fondre dans le confort du groupe
Tu prends sa frêle main
Et tu t'accroches au rêve.



The Gunner's Hamiltonian Dream (une expérience *oumupienne* autour de Pink-Floyd)



The Gunner's dream (R. Waters, 1983 / M. Andreatta, 2018)

C C+
 Floating down through the clouds
 Am F
 Memories come rushing up to meet me now.
 Fm
 In the space between the heavens
 C# C#m
 and in the corner of some foreign field
 A F+ Bbm
 I had a dream.
 F# F#m D Dm
 I had a dream.
 Bb
 Good-bye Max.
 D+
 Good-bye Ma.
 Ebm B
 After the service when you're walking slowly to the car
 Bm G
 And the silver in her hair shines in the cold November air
 Gm
 You hear the tolling bell
 Eb
 And touch the silk in your lapel
 G+ Em E G#m
 And as the tear drops rise to meet the comfort of the band
 G# Cm
 You take her frail hand
C
 And hold on to the dream.

The three Hamiltonian Cycles (C_M = C, C_m = Cm, C_{aug} = C+)

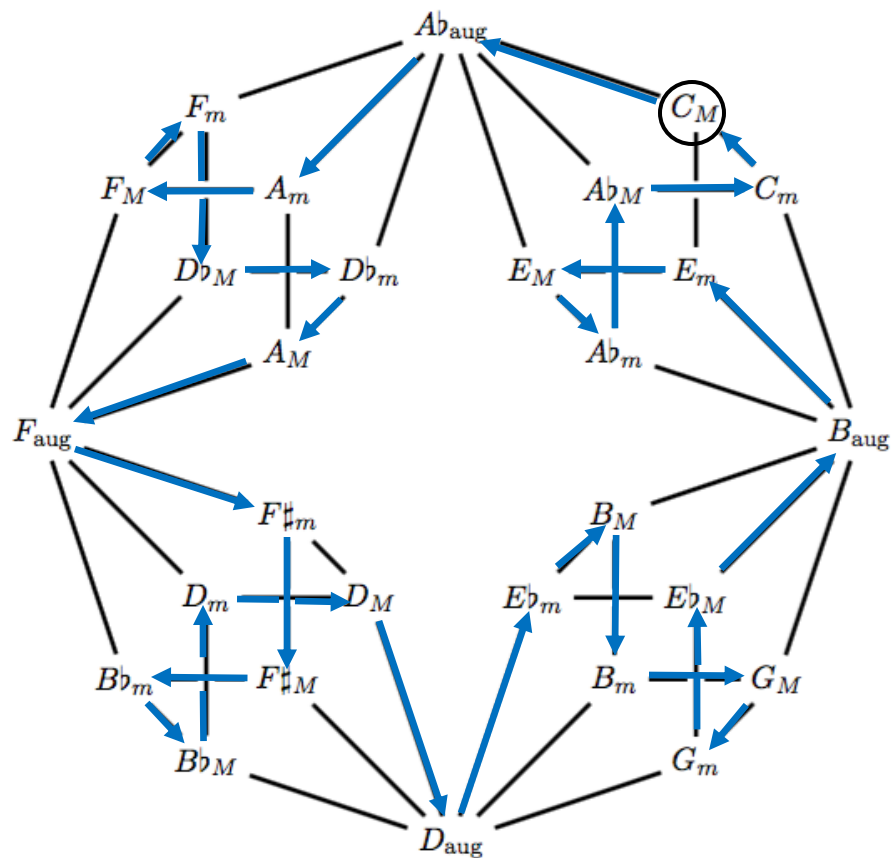
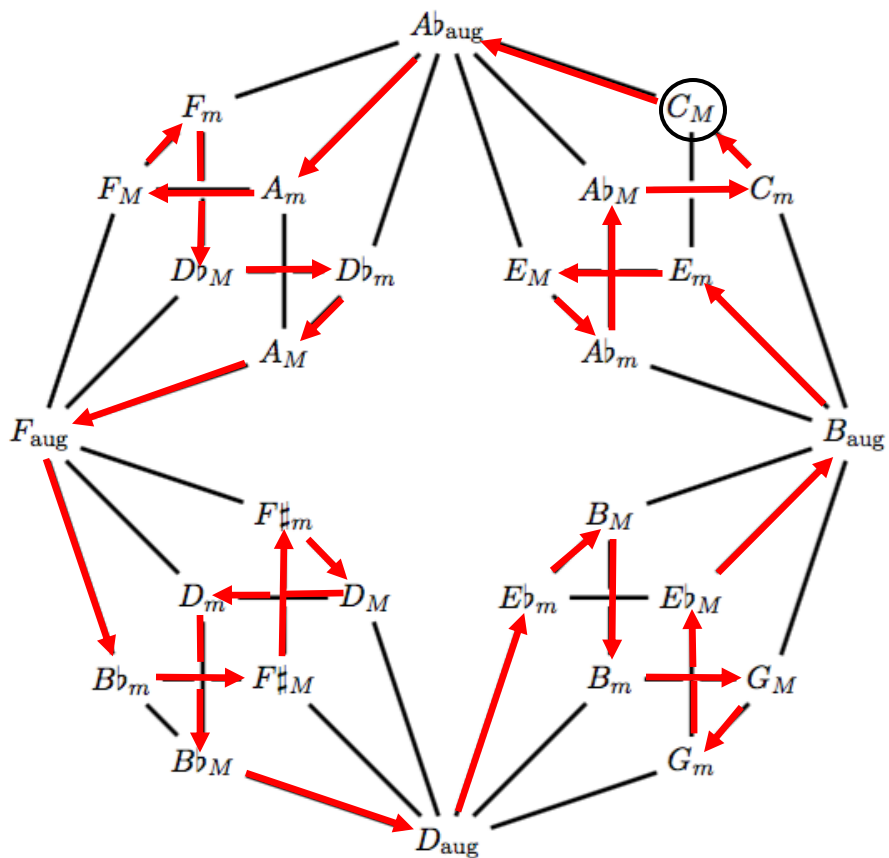
C-->C+-->Am-->F-->Fm-->C#-->C#m-->A-->F+-->Bbm-->F#-->F#m-->D-->Dm-->Bb-->D+-->Ebm-->B-->Bm-->
 -->G-->Gm-->Eb-->G+-->Em-->E-->G#m-->G#-->Cm-->C

C-->C+-->Am-->F-->Fm-->C#-->C#m-->A-->F+-->F#m-->F#-->Bbm-->Bb-->Dm-->D-->D+-->Ebm-->B-->Bm-->
 -->G-->Gm-->Eb-->G+-->Em-->E-->G#m-->G#-->Cm-->C

C-->C+-->Am-->F-->Fm-->C#-->C#m-->A-->F+-->F#m-->D-->Dm-->Bb-->Bbm-->F#-->D+-->Ebm-->B-->Bm-->
 -->G-->Gm-->Eb-->G+-->Cm-->G#-->G#m-->E-->Em-->C



The Gunner's Hamiltonian Dream (une expérience *oumupienne* autour de Pink-Floyd)



Les trois cycles hamiltoniens ($C_M = C$, $C_m = C_m$, $C_{aug} = C+$)

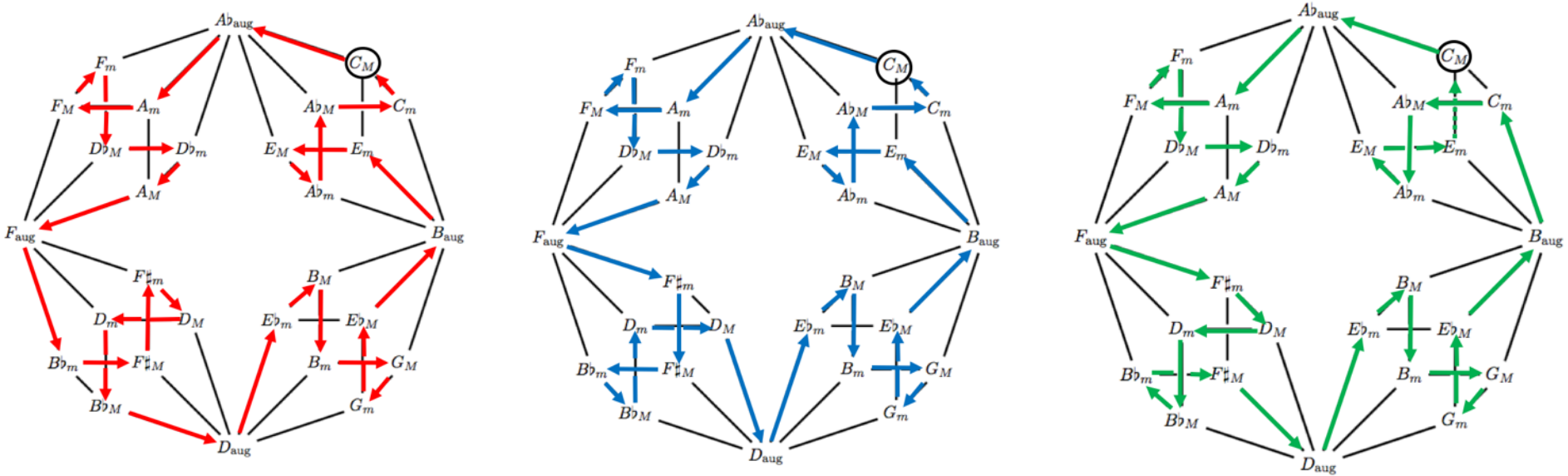
$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\# \rightarrow C\#m \rightarrow A \rightarrow F+ \rightarrow Bbm \rightarrow F\# \rightarrow F\#m \rightarrow D \rightarrow Dm \rightarrow Bb \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow$
 $\rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Em \rightarrow E \rightarrow G\#m \rightarrow G\# \rightarrow Cm \rightarrow C$

$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\# \rightarrow C\#m \rightarrow A \rightarrow F+ \rightarrow F\#m \rightarrow F\# \rightarrow Bbm \rightarrow Bb \rightarrow Dm \rightarrow D \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow$
 $\rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Em \rightarrow E \rightarrow G\#m \rightarrow G\# \rightarrow Cm \rightarrow C$

$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\# \rightarrow C\#m \rightarrow A \rightarrow F+ \rightarrow F\#m \rightarrow D \rightarrow Dm \rightarrow Bb \rightarrow Bbm \rightarrow F\# \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow$
 $\rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Cm \rightarrow G\# \rightarrow G\#m \rightarrow E \rightarrow Em \rightarrow C$



The Gunner's Hamiltonian Dream (an *oumoupien* experiment on a song by Pink-Floyd)



Les trois cycles hamiltoniens ($C_M = C$, $C_m = C_m$, $C_{aug} = C+$)

$C \rightarrow C+ \rightarrow A_m \rightarrow F \rightarrow F_m \rightarrow C\# \rightarrow C\#_m \rightarrow A \rightarrow F+ \rightarrow B_{b_m} \rightarrow F\# \rightarrow F\#_m \rightarrow D \rightarrow D_m \rightarrow B_b \rightarrow D+ \rightarrow E_{b_m} \rightarrow B \rightarrow B_m \rightarrow G \rightarrow G_m \rightarrow E_b \rightarrow G+ \rightarrow E_m \rightarrow E \rightarrow G\#_m \rightarrow G\# \rightarrow C_m \rightarrow C$

$C \rightarrow C+ \rightarrow A_m \rightarrow F \rightarrow F_m \rightarrow C\# \rightarrow C\#_m \rightarrow A \rightarrow F+ \rightarrow F\#_m \rightarrow F\# \rightarrow B_{b_m} \rightarrow B_b \rightarrow D_m \rightarrow D \rightarrow D+ \rightarrow E_{b_m} \rightarrow B \rightarrow B_m \rightarrow G \rightarrow G_m \rightarrow E_b \rightarrow G+ \rightarrow E_m \rightarrow E \rightarrow G\#_m \rightarrow G\# \rightarrow C_m \rightarrow C$

$C \rightarrow C+ \rightarrow A_m \rightarrow F \rightarrow F_m \rightarrow C\# \rightarrow C\#_m \rightarrow A \rightarrow F+ \rightarrow F\#_m \rightarrow D \rightarrow D_m \rightarrow B_b \rightarrow B_{b_m} \rightarrow F\# \rightarrow D+ \rightarrow E_{b_m} \rightarrow B \rightarrow B_m \rightarrow G \rightarrow G_m \rightarrow E_b \rightarrow G+ \rightarrow C_m \rightarrow G\# \rightarrow G\#_m \rightarrow E \rightarrow E_m \rightarrow C$

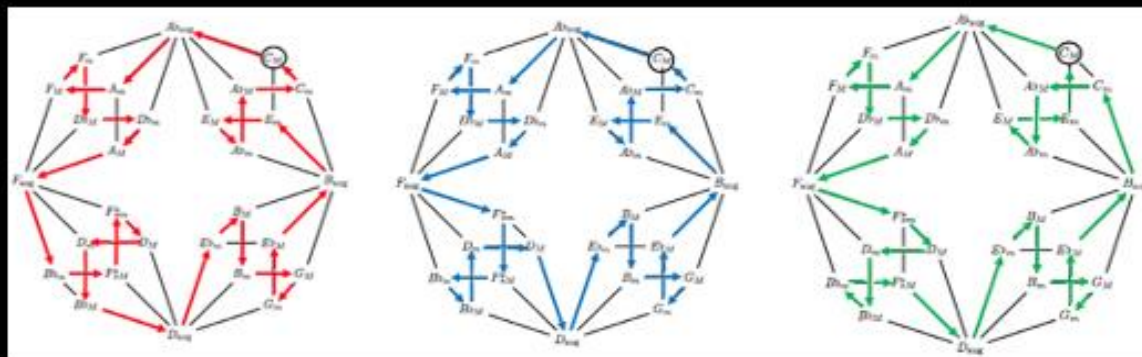
HamilFloyd

The Gunner's
Hamiltonian Dream

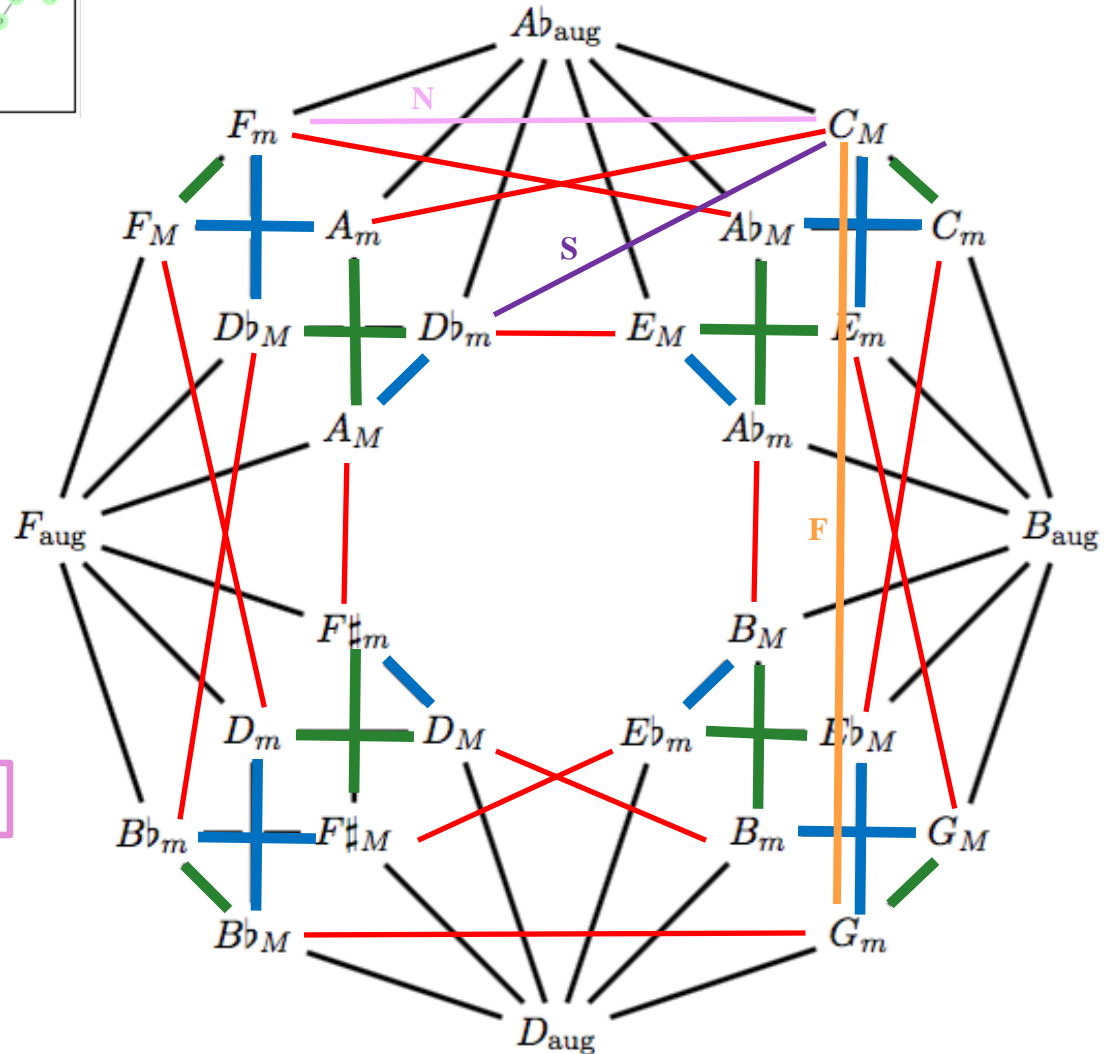
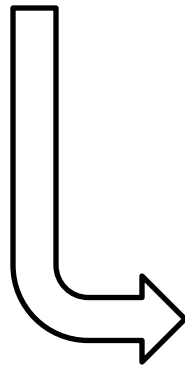
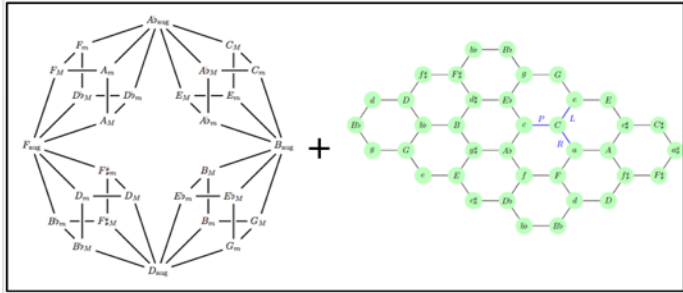
Moreno Andreatta
Gilles Baroin 2022



→ https://www.youtube.com/watch?v=nz5TYob02B4&ab_channel=MatheMusic4D



Autres transformations dans le Cube Dance



LPR = S = SLIDE

RLP = N = NEBENVERWANDT

PRL = F = FAR FIFTH