

Automates et oracles d'harmonisation

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*Centenaire Pierre Barbaud (10 octobre 1911 - 10 septembre 1990)
IRCAM-INRIA, 7 novembre 2011*

Séminaire du CAMS

12 janvier 1961

M. P. BARBAUD.

But de ces recherches : réduire au minimum le travail fastidieux du compositeur et, à la limite remplacer celui-ci.

I.- La notation et la définition des hauteurs.

12 objets comptés en base 12.

0	1	2	3	4	5	6	7	8	9	X	Z
ut	ut	ré									

Les unités de 2e ordre indiquent l'octave :

LUDUS MELOTHEDICUS
OU
LE JEU DE DEZ
HARMONIQUE

Contenant plusieurs Calculs

*Par lesquels toute personne composera différents Menuets avec l'accompagnement
de Basse en jouant avec deux Dez même sans savoir la Musique ?*

DEDIÉ

A Monsieur le Comte
DE LAMBERG

Measure Selection for a Musikalisches Würfelspiel

Collaboration...

Select the "dice roll" for each measure of the Minuet (measures 1-16) and Trio (measures 17-32):

1	2	3	4	5	6	7	8
8	4	9	12	4	3	2	6

9	10	11	12	13	14	15	16
3	2	6	8	9	4	4	3

17	18	19	20	21	22	23	24
4	2	5	3	6	3	5	3

25	26	27	28	29	30	31	32
4	5	4	5	5	2	3	1



Sheet music system 1, measures 1-4. Treble and bass staves. Measure numbers M152, M95, M114, and M100 are indicated below the treble staff. A triplet of eighth notes is marked in measure 1. A key signature change to one sharp (F#) occurs at the beginning of measure 3.

-8-

Sheet music system 2, measures 5-8. Treble and bass staves. Measure numbers M153, M40, M11, and M107 are indicated below the treble staff. A triplet of eighth notes is marked in measure 7.

-9-

Sheet music system 3, measures 9-12. Treble and bass staves. Measure numbers M117, M121, M64, and M175 are indicated below the treble staff. Triplet markings are present in measures 10 and 12.

Sheet music system 4, measures 13-16. Treble and bass staves. Measure numbers M51, M50, M145, and M90 are indicated below the treble staff. A slur is present over measures 13 and 14 in the treble staff.



First system of musical notation (Measures 1-4). The key signature is one sharp (F#). The first system contains measures 1 through 4. Measure 1 (M40) features a treble clef with a half note F#4 and a bass clef with a triplet of eighth notes (G#3, A3, B3). Measure 2 (M60) has a treble clef with a half note G#4 and a bass clef with a half note G#3. Measure 3 (M10) has a treble clef with a half note A4 and a bass clef with a half note F#3. Measure 4 (M61) has a treble clef with a half note B4 and a bass clef with a half note E3. A triplet of eighth notes (F#4, G#4, A4) is marked above the first measure of the system.

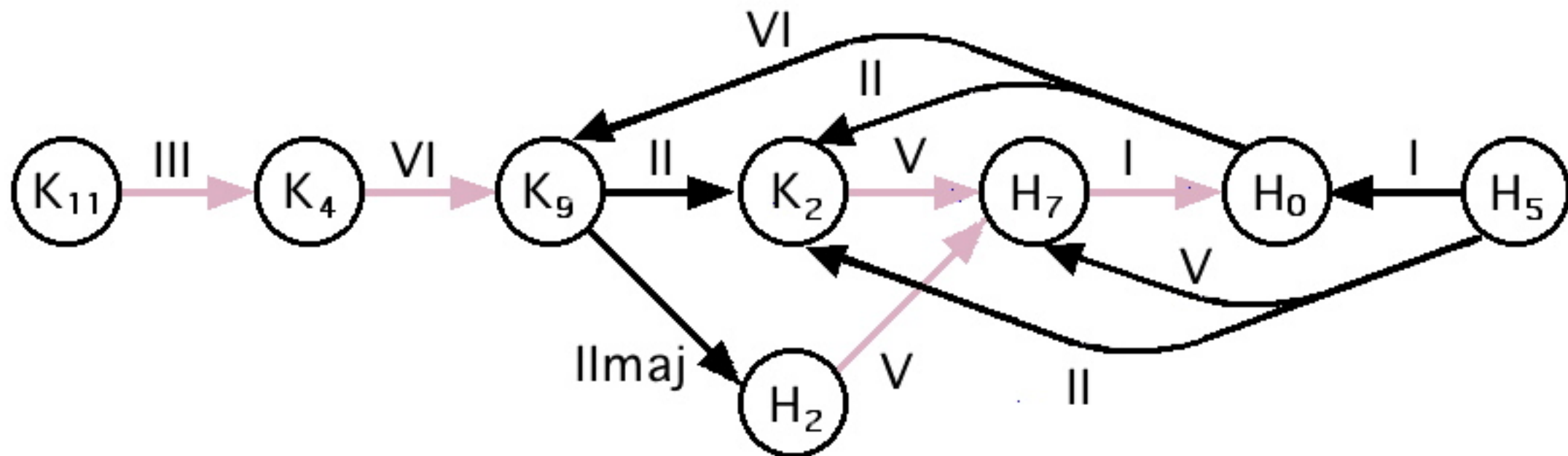
Second system of musical notation (Measures 5-8). The second system contains measures 5 through 8. Measure 5 (M105) features a treble clef with a half note C#5 and a bass clef with a triplet of eighth notes (F#3, G#3, A3). Measure 6 (M46) has a treble clef with a half note D#5 and a bass clef with a half note G#3. Measure 7 (M118) has a treble clef with a half note E5 and a bass clef with a half note F#3. Measure 8 (M5) has a treble clef with a half note F#5 and a bass clef with a half note G#3. A triplet of eighth notes (C#5, D#5, E5) is marked above the first measure of the system.

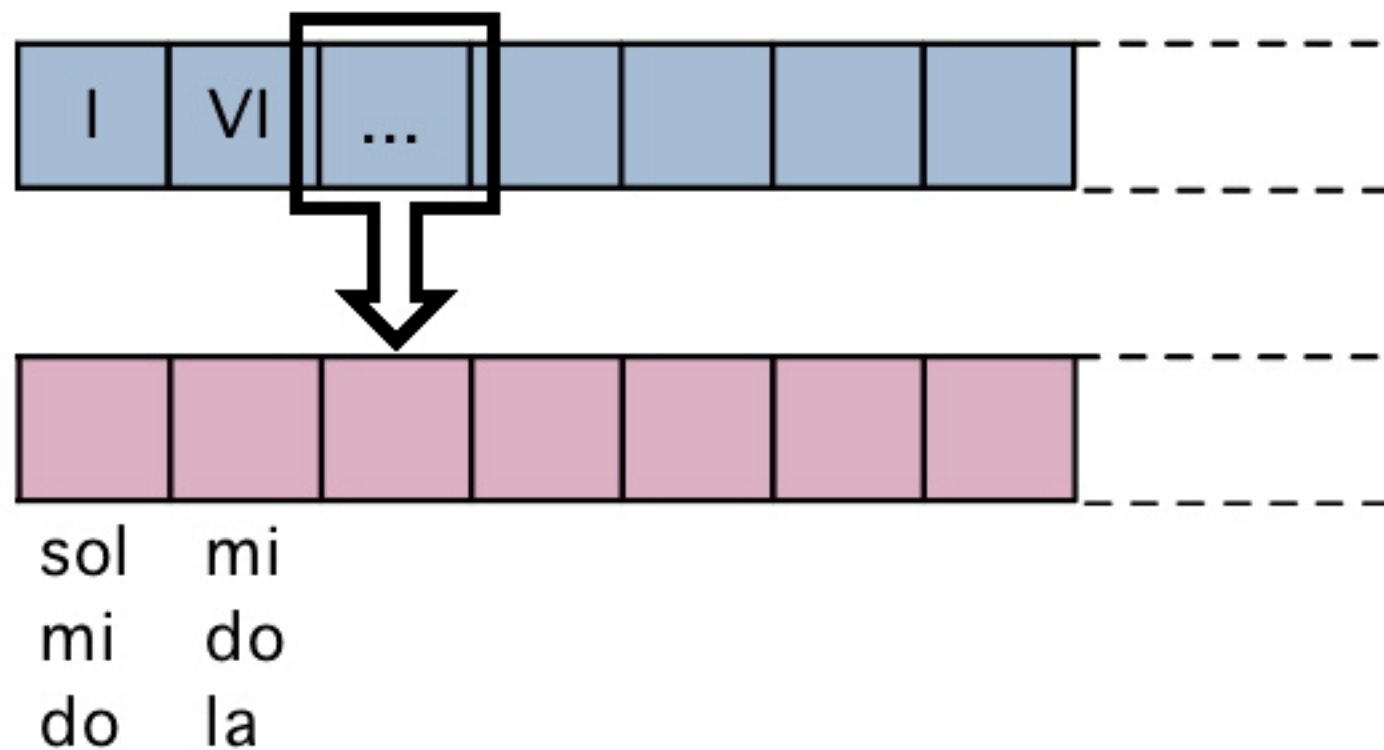
Third system of musical notation (Measures 9-12). The third system contains measures 9 through 12. Measure 9 (M90) features a treble clef with a half note G#5 and a bass clef with a triplet of eighth notes (F#3, G#3, A3). Measure 10 (M10) has a treble clef with a half note A5 and a bass clef with a half note G#3. Measure 11 (M48) has a treble clef with a half note B5 and a bass clef with a half note F#3. Measure 12 (M20) has a treble clef with a half note C#6 and a bass clef with a half note E3. A triplet of eighth notes (G#5, A5, B5) is marked above the first measure of the system.

Fourth system of musical notation (Measures 13-16). The fourth system contains measures 13 through 16. Measure 13 (M101) features a treble clef with a half note D#6 and a bass clef with a half note G#3. Measure 14 (M136) has a treble clef with a half note E6 and a bass clef with a half note F#3. Measure 15 (M72) has a treble clef with a half note F#6 and a bass clef with a half note G#3. Measure 16 (M14) has a treble clef with a half note G#6 and a bass clef with a half note A3. A triplet of eighth notes (D#6, E6, F#6) is marked above the first measure of the system.



	H_0	K_2	H_2	K_4	H_5	H_7	K_9	K_{11}
H_0	0	.30	.12	.04	.12	.12	.30	0
K_2	0	0	0	.10	0	.80	.10	0
H_2	0	0	0	.04	0	.92	0	.04
K_4	0	0	0	0	0	0	1	0
H_5	.32	.32	0	0	0	.32	.04	0
H_7	.92	0	0	.04	0	0	0	.04
K_9	0	.48	.48	0	0	0	0	.04
K_{11}	0	0	0	1	0	0	0	0





Exemple: remplacement des
minuscule par des majuscules

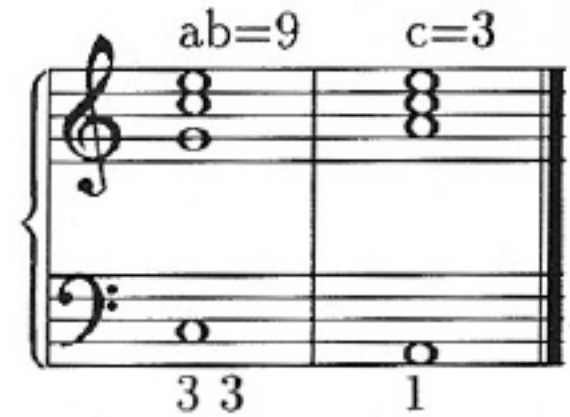
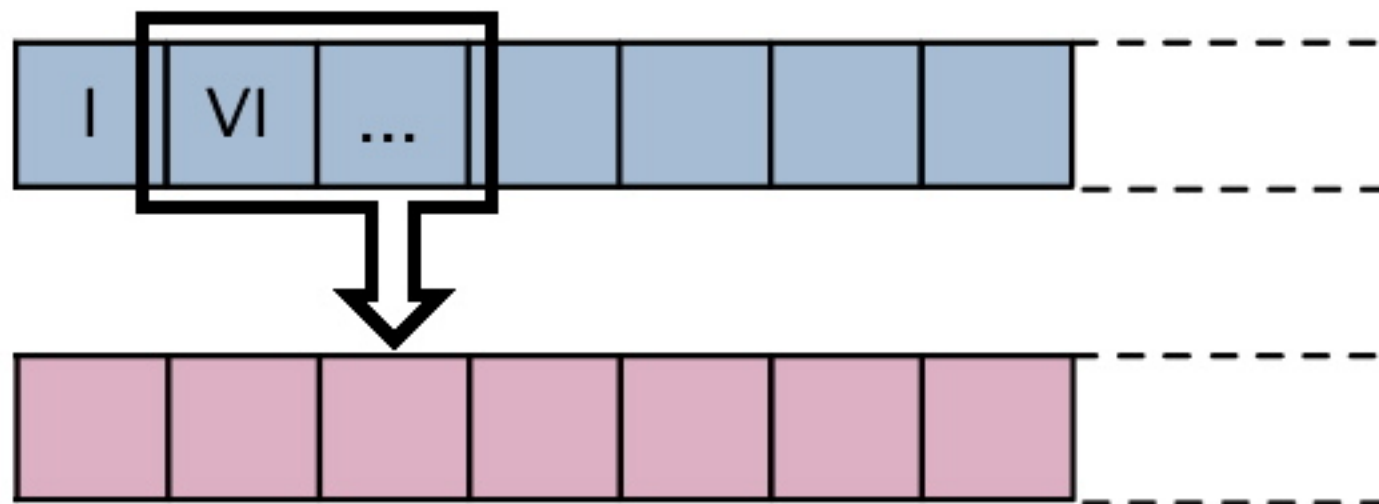
I / {do, mi, sol}

VI / {la, do, mi}

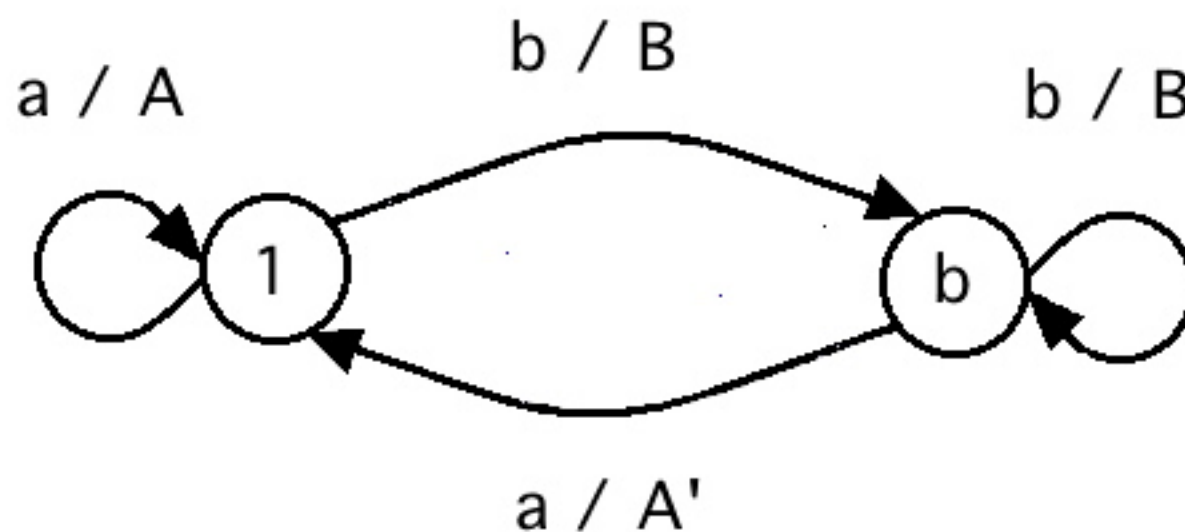


$$\begin{aligned} f(a_1 a_2 \dots a_n) &= A_1 A_2 \dots A_n \\ &= f(a_1) f(a_2) \dots f(a_n) \end{aligned}$$

$\Rightarrow f$ morphisme

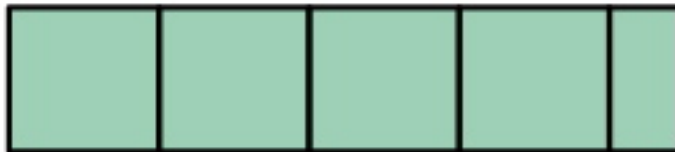
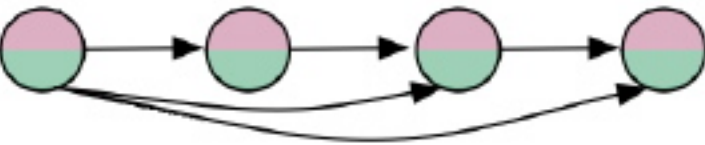
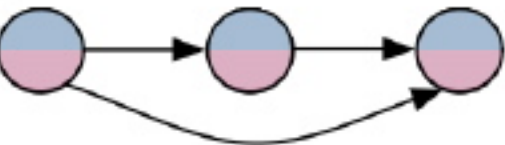


Exemple: remplacement des minuscule par des majuscules avec condition « a précédé de b => a devient A' »

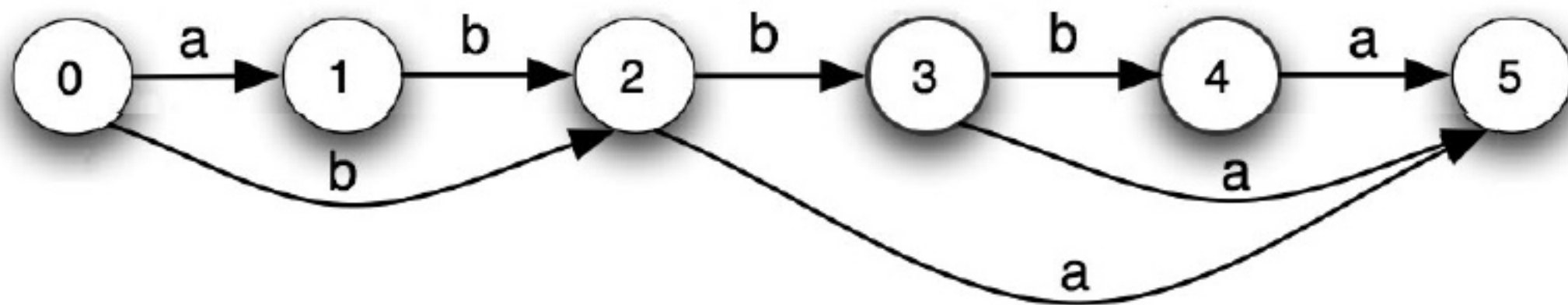


$$f(aaabbab) = AAABBA'B$$

=> f transduction
rationnelle



a b **b b** a





CONCERT MANIFESTE

fondateur pierre marietan

mardi 14 mars 1989
20h30

Porte de la Suisse
11bis, rue Scribe
Paris 9

Pierre Barbaud

"Castor"

programme de composition et de réalisation automatique
interprète en temps réel par Remi Lengagne

"Saturnia Tellus"

(1980)

"Pomarium in Arte Musicae Speculativae"

en souvenir de Jean de Muris, mathématicien musicien du XIIIe siècle
(création)

interprétation en temps réel par Remi Lengagne de la partition donnée
par le programme de composition **Platon**

coproduction **INRIA**

Avec le soutien du Service Culturel de l'Ambassade de Suisse à Paris
et de l'Office National Suisse du Tourisme à Paris
participation aux frais 50 / 40 F

GROUPE D'ETUDE ET REALISATION MUSICALES (GERM)

13, rue Buzelin 75018 Paris tél (1) 42 08 07 29

Camille Bonamy Guillaume Billaux Giuseppe G. Englert Françoise Kaltemback



no. 50

Musical score for no. 50, measures 1-24. The score is written for three staves (treble, alto, and bass clefs) in a key signature of three sharps (F#, C#, G#) and common time (C). The tempo is marked 'no. 50'. The notation includes various note values, rests, and dynamic markings.

Musical score for no. 50, measures 25-48. The score continues from the previous page, maintaining the same key signature and time signature. It includes measures 25 through 48, ending with a double bar line. The notation includes various note values, rests, and dynamic markings.


```
;; Vademecum.lisp / 21 novembre 1999 / 21 octobre 2011
;;
;; D'apres P. BARBAUD, "Vademecum de l'ingenieur en musique", Springer, 1993, chap. 3-4
```

```
#l
```

```
(play (setf chsq (vademecum->chordseq 20))) ;parfois bloque sur un accord et ne donne rien
```

```
(save-as-midi chsq)
```

```
;;; EXEMPLE: Calcul de 3 mesures avec pour mesure initiale accord do-mi-sol
```

```
;;; (vademecum (make-mesure :accord (make-accord :mode 'h :hauteur 0 :fonction 0) :ton 0 :position 1) 3)
```

```
(vademecum-midi 3)
```

```
((67 48) (64 48) (65 48) (64 48) (65 192) (64 192)) ((64 96) (62 48) (60 48) (72 192) (72 192)) ((60 96) (55 96) (69 192) (67 192)) ((48 96) (47 48) (48 48) (53 48) (55 48) (57 48) (59 48) (48 192))
```

```
durees: 48=croche (en ticks) -> croche=250 ms tempo BPM=120
```

```
96=noire -> = 250 * 96/48
```

```
(voix->liste5uples '((67 48) (64 48) (65 48) (64 48) (65 192) (64 192)))
```

```
((67 0 250 100 1) (64 250 250 100 1) (65 500 250 100 1) (64 750 250 100 1) (65 1000 1000 100 1) (64 2000 1000 100 1))
```

```
(play (mf-info->chord-seq (sort (apply 'append (mapcar 'voix->liste5uples '(((67 48) (64 48) (65 48) (64 48) (65 192) (64 192)) ((64 96) (62 48) (60 48) (72 192) (72 192)) ((60 96) (55 96) (69 192) (67 192)) ((48 96) (47 48) (48 48) (53 48) (55 48) (57 48) (59 48) (48 192))))) #'<= :key #'car)))
```

```
)
```

```
l#
```

```
(in-package :om)
```

```
(defun vademecum->chordseq (n)
```

```
  (mf-info->chord-seq (sort (apply 'append (mapcar 'voix->liste5uples (vademecum-midi n))) #'<= :key #'car))))
```

```
(defun vademecum-midi (n)
```

```
  (let* ((accord-init (make-accord :mode 'h :hauteur 0 :fonction 0))
         (mesure-init (make-mesure :accord accord-init :ton 0 :position 1))
         (liste-mesures (vademecum mesure-init n))
         (4voix (faire-midi liste-mesures)))
    4voix))
```

```
(defun vademecum (m n)
```

```
  (if (= n 1) (list (completer-mesure-finale m))
      (let ((couple-mesures (calcul-transition m)))
        (cons (car couple-mesures)
              (vademecum (cadr couple-mesures) (- n 1))))))
```