

**TANIA CANDIANI FIVE VARIATIONS OF
PHONIC CIRCUMSTANCES AND A PAUSE**

ORGANO

by Tania Candiani

Organo allows us to explore the expressive sonorous qualities of language. It renders orality not by its meaning, but rather as pure sound.

This work merges an exploration of language, sound, magic and technology. It is a musical organ, built site specific for the Laboratorio Arte Alameda, programmed with software able to reproduce more than 1,200 phonic syllables from the Spanish language. Tone can be controlled with a pedal.

Through the use of a code that equals syllables to musical particles (notes, chords, intervals, etc.), text fragments can be turned into musical scores to be played in the keyboard. Texts are to be syllabically divided in a phonetic non-orthographic way, that is, in the way it is pronounced rather than written, for example in the word *exactamente* (exactly), division should turn into /ek-sak-ta-men-te/. Each syllable is called phoneme.

Some reductions and modifications has been made to express the phonemes, for instance, the sound of *c* in “ca”, “co”, “cu” and *q* in “que”, “qui” are expressed by phoneme /k/ in the code. Phoneme /b/ represents the sounds of *b* and *v*, since in Mexican pronunciation there is no difference between them. The entire list of reductions is shown below:

Vowels

/a/ = A	/o/ = O
/e/ = E	/u/ = U
/i/ = I, Y	

Consonant

/p/ = P	/g/ = Ga/Gue/Gui/Go/Gu/Gü	/r/ = R
/b/ = B, V	/f/ = F	/rr/ = R(initial)/RR
/t/ = T	/s/ = Z, Ce/Ci, S	/l/ = L
/d/ = D	/j/ = J, Ge/Gi	/ll/ = LL, Y
/k/ = Ca/Co/Cu, K, Qu	/ch/ = CH	

These reductions helped make programming easier, on top of having a closer relation to the way we pronounce. In this sense, words *vino* (wine) and *bilateral* (bilateral) would be pronounced both with phoneme /bi/: /bi-no/, /bi-la-te-ral/; words

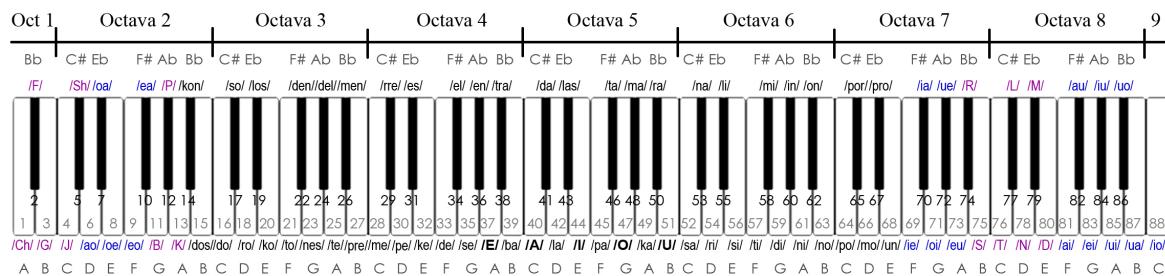
general (general) and **ajedrez** (chess), with phoneme /je/: /ge-ne-ral/, /a-je-dres/, etc. (a complete example of phonemic syllabic division at the end).

The Code

Although arbitrary, the code follows certain logic of syllable distribution on the keyboard that makes it consistent and coherent.

Phonemes were divided according to their frequency in the language. More frequent phonemes (such as /de/, /a/, /ma/, etc.) where assigned to one key each to make it easier for the play it to perform them. Phonemes that are less frequent (such as /abs/, /llas/, /fris/, etc.) are to be produced by a combination of at least two keys, thus creating intervals or chords. In this sense, more frequent phonemes are easier to perform and read, whereas less frequent phonemes are more difficult to perform and read. For example, the phoneme /a/ is produced by playing key C (Do) from the fifth octave¹; while /abs/ is produced by playing the Csus4 chord with the tonic on the fifth octave.

The following diagram shows the distribution of frequent phonemes on the keyboard.



Due to the fact that lower and upper octaves are more difficult to read from scores, not all the 88 keys on the keyboard were assigned with frequent phonemes.

Instead, upper and lower octaves were assigned with single diphthongs and isolated consonant phonemes to be used when needed.

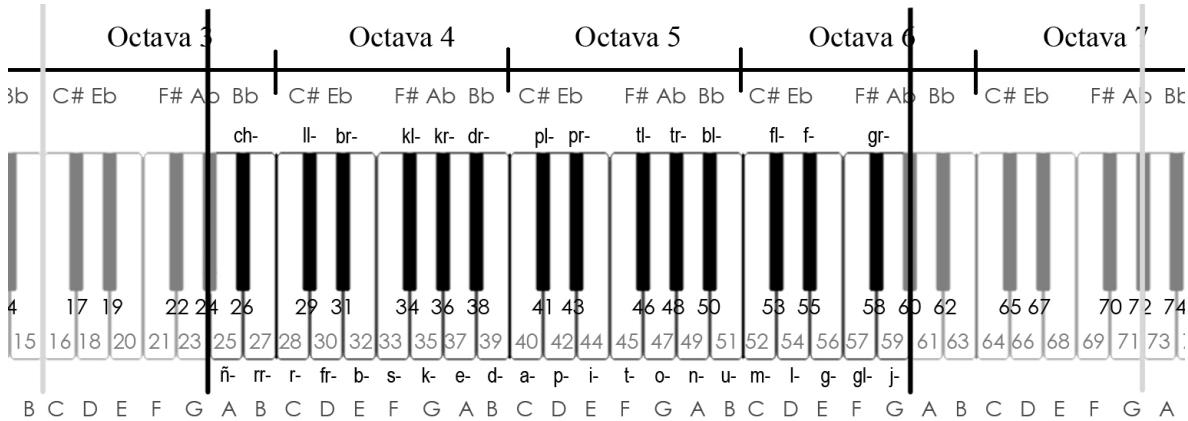
For the non-frequent phonemes, there are three aspects that determine the type of interval or chord which represents them: 1) the starting consonants or vowel, 2) the middle vowel(s), 3) and the ending consonant.

- 1) Starting consonants or vowel.

The letter or letters with which the syllable starts determine the tonic on which the interval or chord will be based. As will be described later, some chords could be

¹ Using Riemann index where C in 5th octave is middle C.

inverted, however, the tonic would remain according to the following diagram of starting letters.



If, for instance, a non-frequent phoneme starts with letters /pr-/ it will be represented with an interval or chord of Eb in fifth octave. We have decided to merge double-lettered starts to facilitate programming, that is, phonemes starting with /g/ have a different tonic from those starting with /gr-/. The diagram also shows, with two black lines, the range of tonics or root notes in the keyboard. The gray lines show the approximate extension of chords (taking into account long chords or inversions). A table of tonic keynotes is provided at the end.

2) The middle vowel.

Every syllabic phoneme should have at least a vowel on it, most of the times in the middle part of the syllable. The intermediate vowel of the phoneme determines the type of **interval** (if phoneme does not have an ending consonant), or if the **chord** is major or minor (when phoneme ends with consonant). The list of interval types is shown below.

Intervals

- If starting with consonant:

$$\begin{array}{ll} -a = 3M \\ -e = 3m \\ -i = 4 \end{array}$$

$$\begin{array}{ll} -o = 5 \\ -u = 8 \end{array}$$

If the phoneme is, for instance /pri/, then, given it does not have an ending consonant, is an interval. One should look for the tonic keynote in the previous

diagram (Eb in fifth octave) and use the interval list to determine the type of interval, in this case /pri/ is an interval of 4 from Eb in fifth octave.

- If starting with vowel:

-d = 3m	-s = 5	-r = 7(b)
-n = 3M	-p = 5+(#)	-k = 7maj
-b = 4	-m = 6	
-l = 8		

If phoneme (with no ending consonant) starts with vowel, it follows the same logic of intervals. /ab/ phoneme would be an interval of 4 from C in 5th octave, whereas /ad/ would be an interval of 3m from the same tonic.

Chords

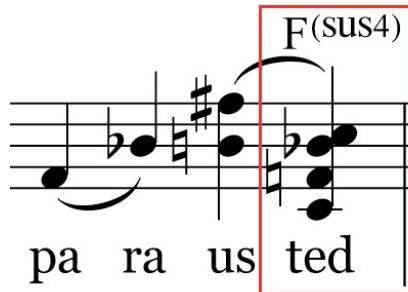
Chords represent syllabic phonemes that start with one or two consonants and also have an ending consonant. In these cases, the middle vowel determines if the chord is major or minor. When the intermediate vowel is /a/ or /e/, the chord is major, whereas if it is /i/, /o/ or /u/ the chord is minor. Phonemes with /a/ and /i/ remain as pure major or minor chords, whereas phonemes with /e/, /o/ are added with an extra fifth note in a lower octave to differentiate them from pure chords. Phonemes with /u/ are added with an extra third note in a lower octave for the same reason. For phonemes where the middle vowel is made up by a diphthong, we assigned inverted chords arbitrarily in a non-systematic way, we recommend to consult the entire code for this.

3) The ending consonant.

The ending consonant determines the type of chord that represents the phoneme. Due to the fact that many syllables in Spanish end with /-s/, these syllables remain as minor or major chords (depending on middle vowel). The rest of consonant endings follow the table below.

-d = sus2(if minor), sus4(if major).	-k = 7maj
-n = dim (if minor), aug (if major).	-p = add-9
-m = 6	-b = add9
-l = add8	
-r = 7dom	

Below is an example of a complex chord of a non-frequent phoneme alongside with frequent phonemes and an interval.



In this example, phoneme /ted/ starts with a /t-/ and thus should be a chord with F in 4th octave as its tonic. The phoneme has an /-e-/ as its middle vowel, since it is not /a/, an extra fifth note is added in a lower octave (C in 4th). Finally, it ends with consonant /-d/, hence making it a sus4 chord (Fsus4).

ANNEX

Example of syllabic phonemic division

Text: Si bien recuerdo, fuiste tú.

- Ortographic syllabic division: Si bien re-cuer-do, fuis-te tú.
- Phonemic division: /si/ /bien/ /re-kuer-do/ /fuis-te/ /tu/

Tonics table

Number	Phoneme	Tonic	Octave
1	/ñ-/	A	3
2	/ch-/	Bb	3
3	/rr-/	B	3
4	/r-/	C	4
5	/ll-/	C#	4
6	/fr-/	D	4
7	/br-/	Eb	4
8	/b-/	E	4
9	/s-/	F	4
10	/kl-/	F#	4
11	/k-/	G	4
12	/kr-/	Ab	4
13	/e-/	A	4
14	/dr-/	Bb	4
15	/d-/	B	4
16	/a-/	C	5
17	/pl-/	C#	5

18	/p-/	D	5
19	/pr-/	Eb	5
20	/i-/	E	5
21	/t-/	F	5
22	/tl-/	F#	5
23	/o-/	G	5
24	/tr-/	Ab	5
25	/n-/	A	5
26	/bl-/	Bb	5
27	/u-/	B	5
28	/m-/	C	6
29	/fl-/	C#	6
30	/l-/	D	6
31	/f-/	Eb	6
32	/g-/	E	6
33	/gl-/	F	6
34	/gr-/	F#	6
35	/gl-/	G	6

Inteligencia Artificial*

Partitura para la obra *Órgano* de Tania Candiani

*fragmento

David en *Inteligencia Artificial*

ad libitum

Órgano

Por fa vor, haz me un ni ño de ver dad.

Em⁷ E⁷

B(sus4)

Jaque Mate

Autor: Wolfgang von Kempelen (1734-1804)
Frase del turco jugador de ajedrez (Schachtürke)

ad libitum

4

Órgano

Ja que ma te.

The image shows a musical score for organ. The title 'ad libitum' is at the top left, followed by a '4' indicating common time. The organ part begins with a treble clef, a B-flat, and a bass clef. The lyrics 'Ja que ma te.' are written below the notes. A vertical bar line separates the first two measures from the third measure, which starts with a bass clef. The score consists of five staves of music.

Anoché soñé

Partitura para la obra *Órgano* de Tania Candiani

ad libitum

Órgano

The musical score for organ consists of two staves. The top staff is in treble clef and the bottom staff is in bass clef. The lyrics "A no che so ñé." are written below the notes. The first measure starts with a quarter note on the G line of the treble staff, followed by a half note on the F line, a whole rest, another whole rest, and a final whole rest. The second measure begins with a half note on the C line of the bass staff, followed by a half note on the A line with a sharp sign, a whole rest, and a final whole rest. The lyrics "A no che so ñé." are placed under the notes in both measures.

El escrito más inteligente. Un poema

Partitura para la obra *Órgano* de Tania Candiani

Órgano

ad libitum

The musical score for organ consists of two staves. The top staff is in treble clef and the bottom staff is in bass clef. The key signature changes from C major to G+ major. The lyrics are:

El es cri to más in te li gen te. Un po e ma.

Sueños de robot (Leyes de la robótica)

Partitura para la obra Órgano de Tania Candiani

Autor: Isaac Asimov (1920-1992)

ad libitum

Órgano

Pri me ra ley: Un ro bot no de be da ñar a un ser hu ma no o, por
A⁷ F⁷

in ac ci ón, per mi tir que su fra da ño un ser hu ma no. Se gun da ley:
Fm⁶ F⁷

Un ro bot de be o be de cer las or de nes da das por los se res hu ma nos, ex cep
F⁷ C

to cuan do di chas or de nes es tén en con flic to con la pri me ra ley.
A_b B_b F⁺ C^{#m(maj7)} D

The musical score consists of four staves of organ music. The first staff begins with a treble clef, a key signature of one flat, and a tempo marking of 'ad libitum'. The lyrics 'Pri me ra ley: Un ro bot no de be da ñar a un ser hu ma no o, por' are written below the notes, with harmonic analysis showing chords A7 and F7. The second staff starts with a bass clef, a key signature of one flat, and continues the lyrics 'in ac ci ón, per mi tir que su fra da ño un ser hu ma no. Se gun da ley:' with harmonic analysis showing Fm6 and F7. The third staff begins with a treble clef, a key signature of one flat, and continues the lyrics 'Un ro bot de be o be de cer las or de nes da das por los se res hu ma nos, ex cep' with harmonic analysis showing F7 and C. The fourth staff begins with a bass clef, a key signature of one flat, and concludes the lyrics 'to cuan do di chas or de nes es tén en con flic to con la pri me ra ley.' with harmonic analysis showing Aflat, Bflat, F+, Csharp major 7, and D.

2 22 F⁷ D, G⁷ D(sus4) F⁺

Ter ce ra ley: Un ro bot de be pro te ger su pro pia ex is ten cia siem pre y cuan do

Fmaj⁷ Fm⁷ D Fm Fm⁶ A_b

28 di cha pro tec ción no en tor pez ca el cum

Fm⁶ Gm⁶

31 Cm E^o D

pli mien to de la pri me ra y la se gun da ley.

No pienso, ¿por lo tanto no existo?

Partitura para la obra Órgano de Tania Candiani

frase de autómata por
Pierre Jaquet-Droz (1721-1790)

ad libitum

Órgano

The musical score is for organ, indicated by a brace and the word "Órgano". It consists of two staves: a treble staff and a bass staff. The treble staff starts with a forte dynamic and a Dm⁶ chord. The lyrics "No pienso, ¿por lo tanto no existo?" are written below the notes. The melody continues through various chords including F⁺ and Fm. The bass staff has a single note marked with a sharp sign. The score is labeled "ad libitum" at the top left.

Dm⁶ F⁺ Fm

No pien so, ¿por lo tan to no ex is to?

Nosotros*

Partitura para la obra Órgano de Tania Candiani

*fragmento

Cm(maj⁷)

Autor: Yevgueni Zamiatin (Замятин)

Órgano

ad libitum 8va

Pro n to lle ga rá la mag na ho ra his tó ri ca en que el In te gral
colla parola

6 C° F# Dmaj⁷
se re mon ta rá al es pa cio si de ral. Mi In te gral, ví tre o, e léc

11 Bm Fm⁷ C
tri co y vo mi ta dor de fue go, in te gra rá la in fi ni ta e cua ci ón del U
D Gm Fm⁶

17 F⁷
ni ver so. Y mi mi sión es la de so me ter al ben di to yu go de la ra zón to
E F^o

23 E⁷ B B^{b+} C F F
dos a que llos se res des co no ci dos que pue bien los de más pla ne tas y que tal vez
C[#]m C Dm E

The musical score is for organ, featuring five staves of music with lyrics in Spanish. The score includes various chords and key changes indicated above the staff.

2

29

se en cuen tren en el in ci vil es ta do de la li ber tad. Y si es tos se res no

A_b⁺ *Em* *F(sus4)* *Fm* *(\natural)*

E⁷

35

com pren die ran por las bue nas que les a por to u na di cha ma te má

Gm⁶ *E_b⁺* *A* *D*

Bm⁷ *C⁺* *Em*

40

ti ca men te per fec ta, de be re mos y de bo o bli gar los a es ta vi da fe

D⁷ *E_bmaj7* *Cm* *E⁷*

46

liz. Pe ro an tes de em pu ñar las ar mas

Dm, *F* *C*

A⁷

49

voy a in ten tar lo grar lo con el ver bo.

Em *F⁺* *F⁷* *F^{#7}* *E⁷*

¿Sueñan los androides con ovejas eléctricas?*

Partitura para la obra Órgano de Tania Candiani

*fragmento

Autor: Phillip K. Dick

Órgano { *ad libitum* Am(maj7)

El te le vi sor gri ta ba: Nue va men te, los dí as fe li ces de los
colla parola Fm⁷ F

Org. 6 F
esta dos su re ños an tes de la gue rra ci vil. Ya se a co mo un cri a
Am Em

Org. 11 D⁷ A G⁶,
do per so nal, o un cam pe si no in can sa ble, el ro bot hu ma noi
G⁺

Org. 16 F(sus4)
de he cho a su me di da, di se ña do so la men te pa ra us ted

Org. 21 Amaj7 B
y pa ra sus ex clu si vas ne ce si da des, se le en tre ga a su
Fm

26

Org.

Fm Gm⁶

lle ga da ab so lu ta men te gra tis y com ple ta men te e qui pa

31

Org.

A♭m⁷ E♭m⁷ B

do de a cuer do con sus pro pias es pe ci fi ca cio nes for mu la das

Fm D⁶ Fm⁷

36

Org.

F D⁷ C

an tes de su par ti da. Es te com pa ñe ro le al sin pro ble mas ha

F°

41

Org.

G° C

de cons ti tu ir en la ma yor y más o sa da a ven

C♯m⁷ E⁺

45

Org.

B⁷ C

tu ra hu ma na de la his to ria mo der na.

C