

Solfeo XXI:

Integrating Fixed Do with Movable Do

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ABSTRACT

This article presents Solfeo XXI, a solfege method that consists in integrating Fixed Do solfege system (typically taught in Europe and Russia) with Movable Do solfege system (more common in USA and UK), in a 7x3 matrix, and this matrix into the music stave.

This way, we can integrate both systems and think of them in a joint manner, therefore benefitting from the advantages of both systems, some of which are mentioned in the introduction.

Within this 7x3 matrix we can fit all possible musical cases, including double Sharp and double flat alterations, while the matrix remains constant. This provides us with a space that is easily imaginable, in which to take the notes, both with its fixed or movable names, and relate them with their corresponding sound.

By using both systems, we are developing different complementary aspects of ear-training, which provides very useful information. On one hand, Fixed Do system makes reading easier and educates hearing in an absolute manner, which is always something positive. On the other hand, Movable Do provides relative information about the notes in relation to a central sound, which makes it easier to tune to different tones and facilitates transposition, since all tonalities work the same way.

Out of the need to combine these two solfege systems, Solfeo XXI emerges, and also its hardware application: Pentagrom. Because its interface is so similar to written music, Pentagrom allows to read, and therefore play, music intuitively. It allows anyone, regardless of their previous musical knowledge, to be able to hear the sound of the notes of a given music sheet: all you need is to press the key on Pentagrom that corresponds to the note on the sheet you want to listen to.

In this article, the author explains Pentagrom's advantages as a tool for educating, teaching, learning, ear training, composition, and improvisation.

Keywords: solfege, controller, ear training, education, Movable

This article was written for the 1st National Spanish Congress of High Musical Education (Valencia, March 2014)

Introduction

It's been almost 1000 years since Guido d'Arezzo (circa 991 – 1050) established the tetragram and invented Solmization. Throughout history, written music systems have been changed multiple times to get to be how it is today. However, the seemingly unsolvable dichotomy between movable and fixed solfege has always remained a source of heated debates.

We already find evidence of this dichotomy in the educational proposals of the Enciclopedists, such as Jean-Jacques Rousseau and his successors (Loras Villalonga, 2008).

As a reference, it's worth mentioning that, today, the fixed system is more used in Europe and Russia, while the movable system is more common in the US and the UK (Hung, 2012).

It's beyond the scope of this article to go through the arguments given in this secular debate. Despite investigation, there's yet no consensus as to which is better (for example Bentley, 1959; Houlahan & Tacka, 1990; Larson, 1993; Phillips, 1984; Siler, 1956).

What this article aims to do is to explain a possible solution to integrate both systems, for it has been widely proven that they offer great results, both Fixed Do and the several Movable systems (for example, *Solmización* by Guido d'Arezzo; *Nouvelle Méthode Pour Apprendre le Plan Chant et la Musique* by Jean Jaccques Rousseau (1712-1778); *Tonic Sol-fa* by Sarah Glover (1785-1867) and John Curwen (1816-1880); or *Kodaly Method* by Zoltán Kodály (1882-1967), to mention some of them) all of which are precedents of Movable Do.

The debate concerning the suitability of one against the other is based on the advantages and disadvantages of each. Some of them are discussed below.

Advantages and Disadvantages of the Fixed Do System

Disadvantages: It's not simple to understand and it takes years of practice to master, especially if it hasn't been learnt at an early age. Additionally, it requires years of abstract study before one can connect it with the instrument.

Advantages: It trains the ear in an absolute manner from the beginning. It's easier to learn how to read properly, since it has a direct relationship with written music.

Advantages and Disadvantages of the Movable Do System

Disadvantages: Its very nature doesn't allow its students to train the ear in an absolute way. Also, with this system it's more difficult to sol-fa with tone changes. Additionally, it's more complicated to read correctly, since if the key-signature is not in Do we have

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to do mental calculations constantly.

Advantages: It's easy to understand because it feels more "natural" to the ear, especially to students that approach solfege for the first time. Since it always works the same way regardless of the tone we are using, transposition is easier. On the other hand, it's simpler to integrate hearing because the relationship between notes always remains the same. In other words, because they have the same relative distance between them, they keep the same name. For all of this, it's simpler to tune in different key-signatures.

Movable Do system is similar to what happens when putting a capo on a guitar. The same fingerings in open position sound the same, relatively speaking, when played on another fret. Movable Do, therefore, feels very natural when thinking of a string instrument, in which the intervals are "repeated" (again, relatively speaking) the same way throughout the fretboard.

When learning certain genres, such as Flamenco or Blues, it's better to use Movable Do as solfege system. Flamenco, for instance, is learned in a totally relative way on the guitar. There are three central keys. *Por arriba* ("upwards"), which is equivalent to Mi since it's the chord that has the tonic in the sixth string in open position. *Por abajo* ("downwards"), which is equivalent to Re since it has the tonic in the fourth string. And *al medio* ("to the middle"), which equals La since it has the tonic in the fifth string. To these names, one adds the fret number in which one is going to place the capo to accompany the *cantaor* (the singer). For example, playing a *Bulería al medio en el tres* ("to the middle in the third"), means it's in Do, since if we have placed the capo in the third fret, that means that the fifth string would be the note Do. Thus, the solfege system they use is very similar to Movable Do, a relative system.

In the previous case, a *Bulería al medio en el tres*, a Flamenco player would say it goes towards Re (fourth degree of La) when he/she listens to Fa (fourth degree of Do). In other words, *al medio* the La chord would always be played in it's open position, being the first degree, regardless of where the player places the capo. What Flamenco players call La can be any real chord.

Solution

Solfeo XXI

As a solution to this debate, I've come up with Solfeo XXI system: this system, as mentioned before, is the result of integrating the Fixed Do system with the Movable Do system in a 7x3 matrix and this matrix into a musical stave (Fig. 1)

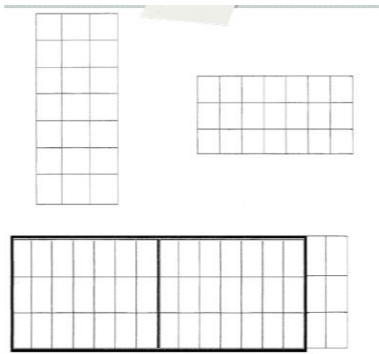


Figure 1 - Matriz 7x3

This way, we can integrate both systems and think of them in a joint manner, benefitting from the advantages of both.

Traditional System			Movable Do		
Si ^b	Si	Si [#]	Te	Ti	Ta
La ^b	La	La [#]	le	la	li
Sol ^b	Sol	Sol [#]	se	sol	si
Fa ^b	Fa	Fa [#]	Fe	FA	Fi
Mi ^b	Mi	Mi [#]	Me	Hi	Ma
Re ^b	RE	RE [#]	Ra	RE	Ri
Do ^b	DO	DO [#]	De	DO	Di
b		#	b		#

Figure 2 - Fixed Do and Movable Do inserted in the 7x3 matrix

One can insert all musical cases possible in the 7x3 matrix, including alterations up to double sharp and double flat, while remaining constant in relation to the key signature. This provides us with a space easy to imagine, in which to relate the notes with their absolute names (Fixed Do) and also their relative names (Movable Do) to their corresponding sound (Fig.2).

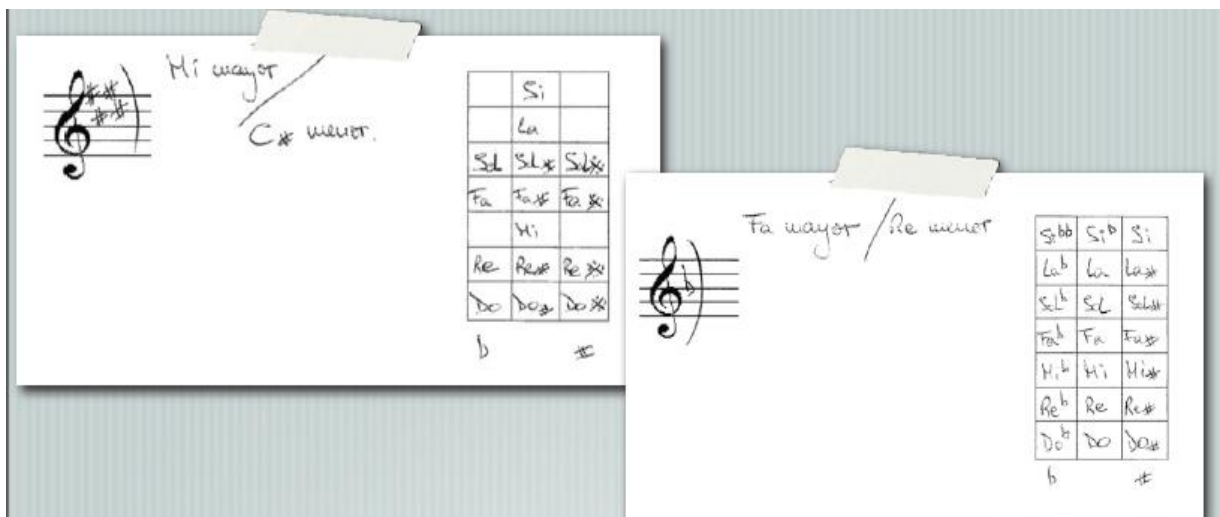


Figure 3 - Examples in different tonalities

By working with both systems, we are developing several complementary aspects of ear training, which provides us with very useful information. As mentioned before, Fixed Do system facilitates reading much more, while training the ear in an absolute fashion, which is always desirable. On the other hand, Movable Do provides us the relative information regarding the notes in relation to a center, which helps to make it easier to tune in the different tonalities, facilitating transposing since this matrix performs the same way in every tonality (Fig. 3)

This is how *Pentagrom* (fig. 4) emerges.

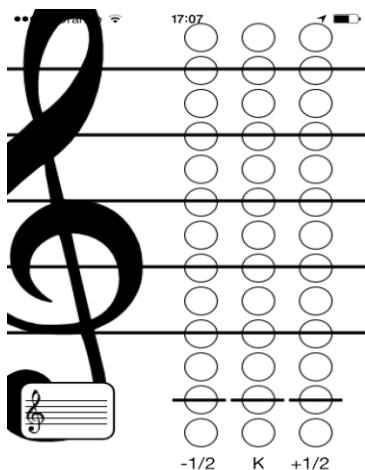


Figure 4 - Pentagrom's interface

Pentagrom is a tool that *works like written music*, therefore being very useful for its teaching and learning.

Pentagrom is a *music controller in the shape of a stave*, thus allowing the user to play all written music in real time, having each note its corresponding key in Pentagrom (just one note per key). This way, there is one key for C# that is different from D \flat . This makes Pentagrom an instrument that pairs up sight (written music) with touch

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(Pentagrom's keys) and hearing, as if the student were playing directly on a stave. This is why it is especially indicated for ear-training.

As a controller, Pentagrom can work as both master and slave keyboards, with the peculiarity of being able to make music and use Pentagrom's interface in a classroom's whiteboard in which the notes light up while making their sound, exactly in the place of the stave where they should be written.

Having just one key per note makes it the only music-sheet editor capable of correctly writing in real time, without the need to go back and correct sharps to flats and viceversa. This way, Pentagrom can be thought of as a musical typewriter.

Because the interface of Pentagrom is so similar to written music, playing it becomes so intuitive it *doesn't require the player to have previous musical knowledge to be able to listen to the notes in the score*. All you need is to press the note of your score in its corresponding key in Pentagrom (fig. 5)



Figure 5 - Correspondence of the notes on the score with the keys on Pentagrom

This way, the player can concentrate on studying rhythm, like with any other instrument with any other methodology. This peculiarity must not be underestimated: today, there is no other instrument or software that allows the player to interpret a score at first sight, without previous training or knowledge. Solfege becomes less abstract, thus immensely facilitating its comprehension and its teaching.

Pentagrom also allows to play chords, of course, making them easier to memorize (fig. 6).

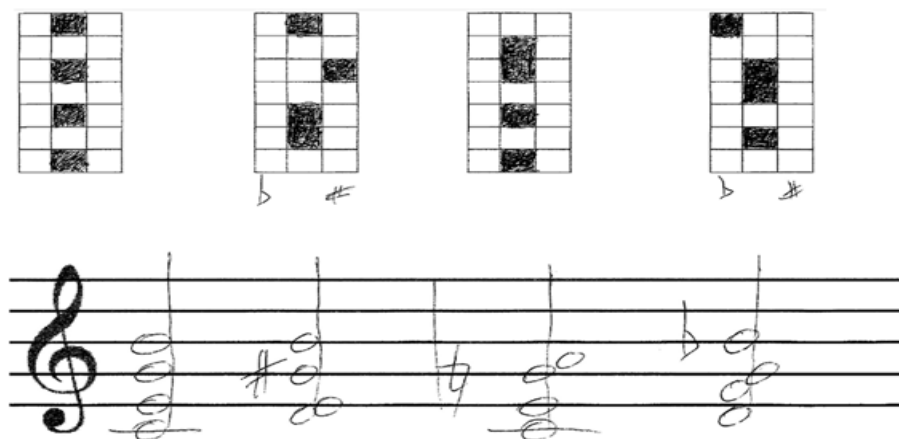
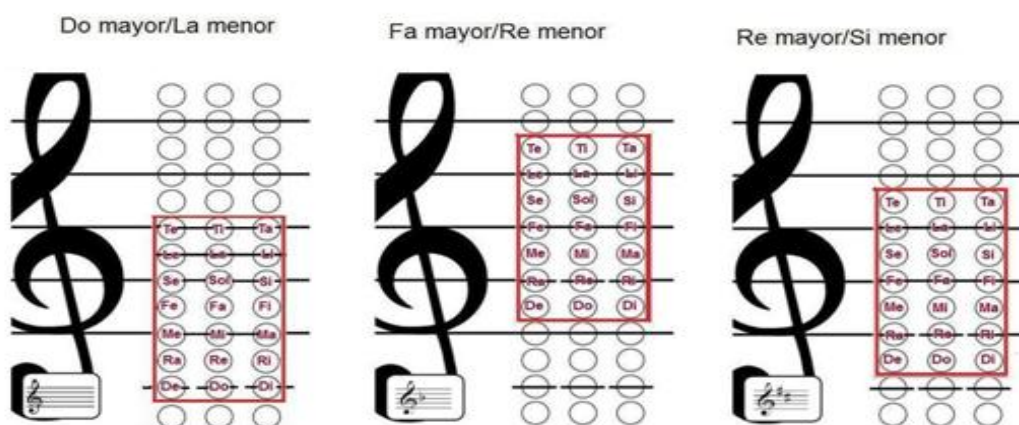


Figure 6 - Chords on Pentagrom

With any other instrument, to be able to listen to the codified music in the score you have to go through two steps: first, recognize the note written on the score (“this dot in this line is an E”); second, we need to know where in our instrument we have to press to get that note (“in my violin, to get an E I have to play here”). To interiorize and embrace these steps to the point to be able to be fluent in the process takes years of practice. Many times, it’s a hard and frustrating learning process, particularly if it’s not learnt at a very early age. The result of this is that many students never understand theory properly, or just end up giving up solfège entirely. Pentagrom, on the other hand, only needs one step to be able to listen to a note written in a score, and this step is learnt in a matter of minutes. This direct relationship between the notes and the keys allows the student to “listen” to the score much faster, playing it him/herself in the correct place. This means that the more a student uses Pentagrom, the more “real” solfège he/she is learning¹.

Pentagrom is, therefore, *isomorphic*. This trait has been sought extensively by music instrumentists throughout history (see Appendix B). This is managed by being able to “tune” Pentagrom according to the key signature: the 7x3 matrix can be moved towards the next center while remaining identical. This also implies that fingering remains the same in all tonalities. This trait is similar to that of placing a capo on string instruments or to the transpose feature of some keyboards, making Pentagrom a tunable keyboard that allows and facilitates transposition and memorization of a certain passage in all tonalities, since the relationship between the notes remains the same (Fig. 7).

**Figure 7 - Isomorphic trait of Pentagrom**

Additionally, as with written music, the key signature can be changed voluntarily. Béla Bartók already, in his “Mikrokosmos”, he used a C# key signature for pieces in D melodic minor (fig. 8)

¹ As with any other instrument, rhythm is not included in this promise.



	Si	
	La	
	Sol	
	Fa	
	Mi	
	RE	
DO	DO#	DO*
b		#

Figure 8 - Key signature for "Mikrokosmos"

Conclusion: Pentagrom as teaching tool

My long experience as teacher leads me to think that a correct understanding and usage of both solfege methods (Fixed and Movable Do) is preferable over choosing just one. Since solfege is the most widely used method for ear-training, teaching, and learning music, both systems should be taught.

As explained above, Movable Do and all the relative systems help tuning, transposing, and learning of how string instruments work. Its a more intuitive system, and more commonly used by people without formal education.

On the other hand, Fixed Do or the absolute system is better to train reading and absolute hearing.

Pentagrom offers the possibility to combine both solfege systems in a simple and intuitive way, facilitating universal approach to written music and its education from the very first moment. Written music is Pentagrom's tabs, in other words, it's instructions manual.

Practicing solfege becomes simple and immediate, just by looking or imagining how a certain melody would be played on Pentagrom. This relationship, almost direct, between the score and its sound, played by the very student, makes playing a score much faster and therefore immediately rewarding. This associative, direct learning gets rid of the typical initial frustration felt by many students when they face a stave.

At the same time, the transition from the absolute to the relative systems becomes easy, for it is only necessary to look at Pentagrom to picture the absolute and superimpose the 7x3 matrix for the relative. All of this makes Pentagrom the perfect tool for written music.

Because it can be used as slave keyboard, it can be used as a screen. This makes it perfect for classrooms and online teaching, because it can be activated by an interactive whiteboard or any MIDI keyboard/controller, or even a mobile. In the screen, students

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could *see* music in real time, recorded or live, in the same place where it would be written, with the possibility of being colored for teaching purposes.

It is worth emphasizing that this direct relationship between the “pattern” in Pentagrom and the “pattern” in the stave allows for everyone, regardless of their previous solfege training, to be able to listen the sound of the notes in a score by pressing the note’s place in Pentagrom’s keys. Since I invented Pentagrom, I have tested this with more than 80 people of every age and every musical level. The results are astounding. Not only were they reading at first sight simple melodies in a matter of minutes, but also many subjects ended up memorizing the melodies so they were able to write them on a blank score from memory (without rhythm).

For all of this, the incorporation of Pentagrom to the classroom would facilitate teaching both to the teacher and student, regardless of the teaching method preferred by the teacher. Pentagrom is a complementary tool, not a substitute.

Additionally, Pentagrom is also interesting for professional musicians who compose or edit music scores using software, because it’s the only real-time score editor that writes alterations correctly. This saves a lot of time of correcting flats to sharps that happens with current controllers, as mentioned before. At the same time, it’s very useful for composing since it maintains the same structure and fingering common to all tonalities.

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Larson, S. (1993) The value of cognitive models in evaluating solfege systems. *Indiana Theory Review*, 14, 73- 116

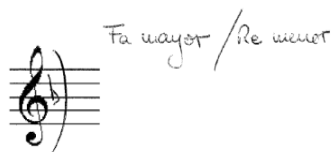
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Phillips, K. H. (1984) Sightsinging: Where have we been? Where are we going? *The Choral Journal* 24, 11-17

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Appendix A – Key signatures

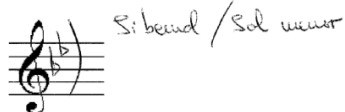


Sibb	Sib	Si
Lab	La	La#
Solb	SL	Sol#
Fab	Fa	Fa#
Mib	Mi	Mi#
Reb	Re	Re#
Do ^b	Do	Do#
b		#



Sol becuad /
Mi becuad menor.

Sibb	Sib	Si
Lab	La	La
Solb	Sol	Sol
Fa		
Mib	Mi	Mi
Reb	Re	Re
Do ^b	Do	Do
b		#

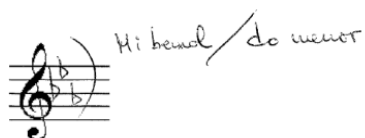


Sibb	Sib	Si
	La	
	Sol	
	Fa	
Mib	Mi	Mi
	Re	
	Do	
b		#



Do becuad /
La becuad menor.

Sibb	Sib	Si
Lab	La	La
Solb	Sol	Sol
Fab	Fa	Fa
Mib	Mi	Mi
Reb	Re	Re
Do ^b	Do	Do
b		#

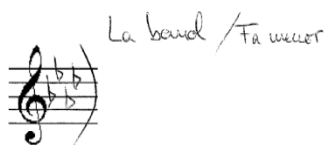


Sibb	Sib	Si
Lab	La	La
	Sol	
	Fa	
Mib	Mi	Mi
	Re	
	Do	
b		#



Sol mayor / Mi menor.

	Si	
	La	
	Sol	
Fa	Fa#	Fa#
	Mi	
	Re	
	Do	
b		#

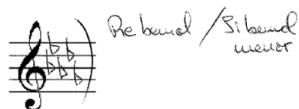


Sibb	Sib	Si
Lab	La	La
	Sol	
	Fa	
Mib	Mi	Mi
Reb	Re	Re
	Do	
b		#

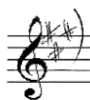


Re mayor / Si menor

	Si	
	La	
	Sol	
Fa	Fa#	Fa#
	Mi	
	Re	
Do	Do#	Do#
b		#

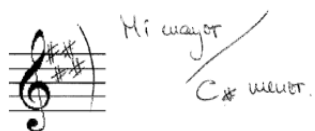


Sibb	Sib	Si
Lab	La	La
Solb	Sol	Sol
	Fa	
Mib	Mi	Mi
Reb	Re	Re
	Do	
b		#

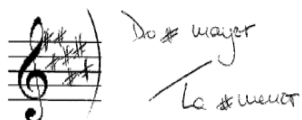


La mayor /
Fa# menor.

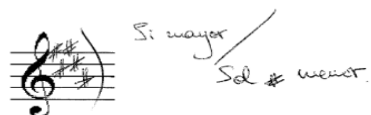
	Si	
	La	
Sol	Sol#	Sol#
Fa	Fa#	Fa#
	Mi	
	Re	
Do	Do#	Do#
b		#



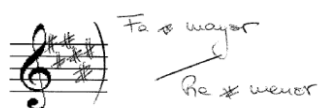
	Si	
	La	
Sol	Sol#	Sib
Fa	Fa#	Fa#
	Mi	
Re	Re#	Re#
Do	Do#	Do#
b		#



Si	Si#	Si#
La	La#	La#
Sol	Sol#	Sib
Fa	Fa#	Fa#
Mi	Mi#	Mi#
Re	Re#	Re#
Do	Do#	Do#
b		#



	Si	
La	La#	La#
Sol	Sol#	Sib
Fa	Fa#	Fa#
	Mi	
Re	Re#	Re#
Do	Do#	Do#
b		#



	Si	
La	La#	La#
Sol	Sol#	Sib
Fa	Fa#	Fa#
Mi	Mi#	Mi#
Re	Re#	Re#
Do	Do#	Do#
b		#

Appendix B - Previous attempts at isomorphism

There are several previous attempts at searching for isomorphic representation of notes:

a) Systems for concertine keyboards:

Wheatstone Duet System	
Wheatstone Double System	
Maccann Duet System	
Crane (Triumph) Duet System	
Jeffries Duet System	
Jeffries Duet System	
Wheatstone Chidley Duet System	
Hayden Duet System.	
Linton Duet System	
Rust ("Piano") Duet System	

Figure 9- Systems for concertine keyboards

b) The Array System of note arrangement. Copyright 2008.

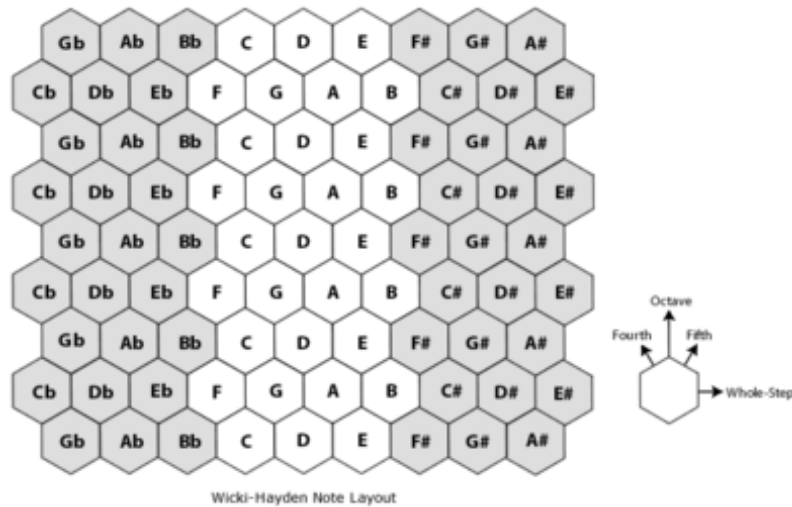


Figura 10 - Array System

c) Other patents for systems:

Janko P. N° 25282 May 1983

John Hill McLann P. N° 4752 London, 1884

John Butterworth P. N° 21,730, año 1896

Kaspar Wiki P. N° 13329, octubre 1896

Wilson US 3,012,460 Diciembre 12 1961

Coles "Keyboard type musical instrument" US 3,943,811 marzo 16 1976

Coles "Electronic musical instrument" US 3,986 422 octubre 19, 1976

Sohler US 4,054,079 octubre 18, 1977

Thomson US 4,031, 800 junio 28 1977

Rickey "graphic/tactic musical keyboard" US 4,926,734 mayo 22, 1990

Nakagome US 5,233,899 agosto 10, 1993

Davies US 5,741,990 abril 21, 1998

Boyer "device for patterned input and display of musical notes" US 6,392,131 B2 mayo 21, 2002

Wesley "sensor array MIDI controller" US 6,501,011 B2 diciembre 31, 2012

Pettchick US 6,566,593 B2 mayo 20, 2003

Egan "morpheus music notation devices" US 2008/0127810 A1 junio 5, 2008.

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Appendix C

- Pentagrom is a patented product by Jaime Iglesias Álvaro-Gracia
SPAIN APPLICATION NO. 200800181 PUBLICATION NO. 2 324 268 A1.

EUROPE 09704094.3.

USA 12/864.116

MEXICO 2010/008114

RUSSIA 2010 135340

CHINA 200980106132.X

JAPAN REFERENCE TBC

INDONESIA UW-00201002864

SINGAPORE 201005372-6

- Solfeo XXI is a scientific work registered as intellectual property in Madrid, España. Number M - 2812/200
- Pentagrom got a grant from the Ministerio de Cultura to favor modernization, innovation, and technological adaptation of cultural sectors, in the year 2010. Ref. N° 2943