BRAILLECOR LEARNING METHOD. A NEW APPROACH TO BRAILLE TEACHING FOR BOTH BLIND AND SIGHTED PEOPLE, SUITABLE FOR ANY ALPHABET AND LANGUAGE.

# INTRODUCTION

Braille, even in this technological age, is an indispensable tool, and the unique communication system that guarantees full literacy for the blind, if they have never seen.

My intention is to achieve several objectives:

First, the dissemination of my innovative BRAILLECOR approach aims to simplify the teaching and learning of all Braille code signs. This is achieved through the application of straightforward visual mnemonic rules and through a deepening of its intricacies. It proves highly beneficial for both visually impaired and sighted individuals.

To optimize its utilization, it is essential for a blind or visually impaired individual to have sufficient spatial orientation, particularly within confined areas.

It has been conceived starting from the Latin alphabet-based languages, because it is necessary to know the form of the "X". However, similar aids can certainly be found for other phonetic alphabets, even for syllabic or ideographic scripts. It is easily adaptable to any language, and enhanced featured tips can be created to improve Braille learning worldwide. It is beneficial to alter the traditional order of learning the basic line of ten signs. By internalizing only three, one can easily deduce the rest.

Second, the goal is to enhance the acquisition of Braille-reading skills by taking into account the haptic nature of touch, this involves presenting the signs and conditions under which it is feasible to discern the boundaries of an isolated cell.

Third, this study does not aim to modify the sometimes-implicit foundations of the system. Instead, I will derive its natural consequences by establishing a "universal Braille order," particularly emphasizing the signs of lines 6 and 7. Minor alterations in the description of the signs within each line will be made, with a focus on instances where the signs contain any dots in the middle row of the cell. Special attention will be given to empty dots, even though they are not detectable by touch, as they contribute to understanding the overall structure of the Braille system, conveying a deeper knowledge.

Fourth, this ongoing project aims to enhance Braille tables, ensuring that Computer ones closely mirror their literary counterparts. The primary goal is to highlight the dual significance of specific signs, which can represent characters (as referenced in comprehensive sources) and also serve as modifiers for adjacent signs or perform other functions. To date, Computer Portuguese Braille is the only known system that has sketched the dual nature and role of such specific signs. With this perspective in mind, I am developing “BrailleCor” tables. After extensive testing and gathering invaluable feedback, these tables may lead to proposals for modifying standard Braille tables across many languages, which will be submitted to the respective authorities.

Finally, I am developing a software program that takes a unique approach to Braille. Instead of translating text between different Braille codes or converting between various formats and Braille tables, it focuses on a "low-level task." This involves translating between Braille patterns directly, which proves valuable for tasks like transcribing music, mathematics, and other technical materials, and when addressing issues between text codes. My BrailleCor program is designed to work directly with Braille patterns rather than their intended meanings on a specific table.

To sum up, learning the alphabet through my method is, if you will, the first layer of the onion or the tip of the iceberg, as BrailleCor expands braille learning perspectives through different subject matters.

With these proposals, my aim is to enhance the teaching and global dissemination of Braille—a versatile, simple, and universal code of reading and writing that has liberated the blind from prehistoric times.

# WHAT IS BRAILLECOR?

The term "BrailleCor" is a creation of mine that encompasses various hidden meanings. Drawing inspiration from the concept of “petrichor”, which refers to the scent of rain on dry earth and is derived from the Greek words for stone and blood running in gods’ veins, "BrailleCor" likens the Braille cells on paper to a vital, elemental connection.

The interjection “cor” is included to express awe and excitement, emphasizing the emotional resonance that Braille elicits in both its users and advocates.

The term “chord” commands on Braille keyboards, performed by simultaneously pressing the space bar and any dots, is akin to fingers covering the flute's holes, turning the raw air from the lungs into an intimate melody. Like a foreigner deciphering a new language with music, the chord embodies strength, beauty, and emotion, whispered subtly by reading fingers.

Lastly, “core” is incorporated to signify a deep exploration and a focus on the fundamental principles of Braille. These essential principles, not always explicitly acknowledged by its creator, are further developed, and brought to the forefront through the term "BrailleCor".

# BRAILLE CELL

The Braille cell is composed of a rectangular matrix consisting of six dots: three arranged in a vertical line on the long side and two in a horizontal line on the short side. The dots are numbered by columns, from top to bottom, with the left column numbered as 123, and the right column as 456.

There are a total of 64 possible signs or combinations, which include the representation of empty space within the Braille cell.

If there is a need to emphasize a specific part of the shape formed by the dots of a sign, an alternative numbering can be used for teaching purposes. For example, the dots of a letter sign P can be numbered as 123 and 4 or 14 and 23. This example illustrates how to stress the left column, the top row or an outstanding dot from a braille cell.

Likewise, it proves useful to arrange signs in different ways in order to improve learning. I.e. sign 12 can be followed by 45 or by 23, to stress the row or the column, respectively.

Describing signs that are similar can be better learnt by considering variations in the same or another column or row. Signs may also occupy one or more dots of the left or right column, or the upper, middle, or lower row. For instance, the “COMMA” is described as left middle A, and the sign with dots 56 is described as lower right B. For simplicity, signs “K” and “L” (“KNOWLEDGE” and “LIKE”) can also be described based on whether they are made in the right column, as right K or L.

# DETECTION OF DISTINGUISHABLE ISOLATED BRAILLE CELLS

Even before embarking on tactile learning of the alphabet, it proves beneficial to acquaint oneself with the dimensions of the entire cell. This consideration involves recognizing the consistent space between dots within a cell, between cells along a line, and between lines on a sheet.

There are 32 signs specifically designed to spatially determine the boundaries of the cell. These signs possess physical unambiguity, meaning it is not necessary to read other contiguous signs on the same line, therefore there is no need to rely on their context as they stand out. They exhibit this property in two ways:

By occupying at least one axis, connecting the two dots of two diagonal corners, or otherwise, signs where it is possible to draw a semicircle connecting two corners of a long side of the rectangle with the center dot on the opposite side. In essence, these are signs containing dots in both the top and bottom rows and in both the left and right columns of the Braille cell. Please refer to table 4.

Among the 32 distinguishable signs, there are 12 different shapes, each demonstrating specific spatial characteristics. Please see table 6.1.

Let's examine examples of distinguishable signs, which are represented here by capital letters or whole words, such as “NOT”, “AS”, “THE”, and the ending “ED”. For clarity, these examples use capitalization to highlight their representation. Additionally, consider sentences like “There are five OR six people in a ROW” (removing their “R”), “WILL you RATHER stay?”, “She is STILL a CHILD”, “THAT is OUT of the question.” These examples illustrate the diversity of these spatially distinctive Braille configurations.

# AMBIGUOUS INDISTINGUISHABLE SIGNS

The remaining 31 signs introduce a level of ambiguity and require context to be unambiguously identified. Specifically, to avoid confusion, these signs need to either precede or follow another sign. The crucial factor here is that between two contiguous signs detected with a single finger, a shape analogous to that of a distinguishable sign must be perceived. This tactile illusion is produced by the proximity of their respective dots. Please see table 5.

For instance, consider the word “MOTHER,” where dot 5 requires the letter M, with dots 134, so these signs together make dot 5 unequivocally identifiable in space. Achieving this clarity relies on maintaining a proper reading posture. The dots in the right column of one sign must be in contact with specific dots in the left column of the following sign.

This dependency on tactile proximity can lead to errors if two adjacent signs are mistaken for one another. There are a total of 7 shapes that can be generated with non-distinguishable signs. Please refer to table 6.2.

# UNIQUE SHAPES

It's important to highlight that, among the total of 19 unique shapes mentioned previously, 17 can be modified in various ways. These modifications can be achieved through rotating the shape by 45 degrees or by shifting their dots in different directions: upward, downward, leftward, or rightward. This versatility is due to the mirror effects and the symmetry inherent in these shapes. However, there are 2 shapes that stand out because they do not permit any variations due to rotation or shifting. These shapes are represented by the dot configurations for the words “FOR” (dots 123456) and “IT” (dots 1346), respectively. The uniqueness of the 17 variable shapes lies in their ability to demonstrate different configurations through rotation or movement, whereas the uniqueness of the last 2 shapes is defined by their invariance. Please consult tables 6.4 and 6.3, respectively.

# FORMATION OF THE BASIC LINE

The formation of the basic line consists of ten signs that exclusively occupy dots in the upper and middle rows of the Braille cell, creating a square. For analysis, let's temporarily exclude the two lower dots of the Braille cell rectangle.

Louis Braille did not explicitly outline the criteria for choosing certain signs over others. Through reflection, empirical experience, and references listed in the Bibliography of my comprehensive work, I have deduced the following criteria:

* For 7 signs, Braille chose those that occupied at least one axis of the upper square of the cell.
* For the remaining 3 signs, among those with the same shape, he selected those on the top and left side of the square over those on its bottom and right side.
* Louis Braille established the basic line with 10 main signs and 2 supplementary ones that he placed at its right. These were the letters A and B, situated at the top and middle of the right column, marked with dots 4 and 45, respectively. This arrangement presupposed the existence of a blank space to the left of the 10 signs mentioned, a space that is sometimes represented by a '0' to denote the absence of dots.

# REMAINING 4 ORIGINAL LINES

The Braille system, as devised by its author, is organized into 5 lines. Once the first line is introduced, the signs in the second to fifth lines derive from it.

In the second line, dot 3 is added as a diacritical mark and as an extra dot in addition to those in the first line. In the third line, dots 36 are added, which are more distinguishable than adding dot 6 first. In the fourth line, dot 6 is added.

The signs in the fifth line mirror those in the first line, but they are located in the lower square of the cell. In other words, if there is any dot in the top row, it is moved down to the middle one. If there is a dot in the middle row, it is pushed down to the bottom. If there is any dot on the bottom row, it remains in its original position.

Louis Braille included all the signs in his system but strategically positioned some at a more distant location within the same or different line to avoid potential confusion. Please refer to table 1.

# BASIC LINE CORE LETTERS

The BrailleCor’s approach to teaching the letters of the basic line deliberately avoids studying them in alphabetical order, focusing instead on rules that are mnemonically effective and foundational to Braille systematics.

Consider the words “DARE” and “DEAR”. By removing their letter “R”, we are left with three Core letters: “A”, “E”, and “D”. These letters become the focus for studying the basic line and shorting the other signs accordingly.

The letter "A" serves as the starting point, from which we derive  
the vertical "B", and the horizontal "C".

To progress further, attention is directed to the word “IT”, abbreviated by the letter “X”, so altogether is pronounced "EXIT". Vowels pronounced in “EXIT” include "E" and "I". The letter equidistant between these vowels is "G" representing the word GO, as in "Go, depart, exit”. The Braille sign for the letter "G" is formed by drawing the blades of the "X" and writing the signs for the letters "E" and "I", dots 1524, arranged easier to remember.

The remaining four signs of the main line, excluding supplementary ones, have the shape of a small roof. This roof rotates 45 degrees anticlockwise, aligning with the alphabetical order of the letters. Specifically, these signs represent the letters “D”, “F”, “H”, and “J”, or the words “DO”, “FROM”, “HAVE” and “JUST”. The occupied and empty dots, although not detectable by touch, are indicated as 2, 5, 4, and 1 in order, allowing reflection on the configuration of these four letters.

# LEFT OVER LETTERS

25 letters of the Latin alphabet occupy the first two lines and the first half of the third. Special signs are provided for particular situations such as ligatured or diacritic letters, the "W", punctuation marks, or the transcription of visual typographic attributes, depending on each language and subject area.

When the Braille system adapts to non-Latin-phonetic alphabets, efforts are made to follow quasi-phonetic criteria, for instance, "GAMMA" is represented as "G" and not as "C," even though it is the third Greek letter. This quasi-universalization of phonetics in Braille encounters challenges when adapting to syllabic or ideographic scripts.

Given the inherent limitations of the Braille cell, the creation of signs using multiple cells becomes essential. The sign 3456 placed in front of the first ten letters transforms them into numbers, with the "A" representing 1 and the "J" representing 0. Additionally, the sign 6 before the letters becomes them into uppercase en English, whereas the rest of the Latin-based alphabet languages use 46 instead.

Certain braille tables, such as Unified English Braille (UEB) and Computer Portuguese, have taken the logical creation of compound signs to its extremes. In these tables, specific signs are designated as prefixes, altering the value of the following signs, and preventing subsequent signs from modifying the value of a previously perceived sign to eliminate uncertainty and ambiguity in reading or writing. In Unified English Braille (UEB) all signs formed with dots in the right column and the number sign 3456 are considered prefixes. Please see table 7 where you can find the five first lines arranged according to the three core letters.

# SEVEN LINES

While Louis Braille originally established 5 lines, it is a common practice in many languages to divide the 6-dot code into 7 lines. This division creates lines 6 and 7 accommodating there supplementary signs and those formed solely by dots 3, 36, and 6, which are denominated as DIACRITIC SIGNS.

# BRAILLE ORDER

The concept of Braille order allows for the abstraction of the alphabetic meaning of signs, encompassing all symbols, including letters, punctuation, and those with no specific use in the alphabet or language in question.

In systems with a Braille order and 7 lines, the first 5 lines consist of 10 signs each, totaling 50 signs representing the letters “A” to “J” and their explained derivations. In line 6, signs are used with at least dot 3, and varying combinations of dots in the right column. Lastly, the remaining signs utilizing at least one dot in the right column are used in line 7.

However, the sorting of signs in lines 6 and 7 in different Braille order scripts appears to be chaotic. This divergence is evident in the tables provided for English, Portuguese, and Spanish, the only languages I am aware of that use the Braille Order concept. Please refer to table 3.

# BRAILLECOR 6 AND 7 LINES ORDER

To organize the BrailleCor system, I propose breaking down lines 6 and 7 from the original 5 lines of the Braille system, and arranging them according to the principles discussed.

In this approach, Line 6 signs always include the dot 3. It begins by taking the top right “A” and “B” (the supplementary signs of the original second Braille line). Next, it includes the top right “A” and “B” and adds dots 36 to them, incorporating the supplementary signs of the original line 3. Finally, it encompasses the dot signs 3 and 36, allowing the differentiation of the original lines 2 and 3 (diacritical signs of these).

Similarly, Line 7 includes signs containing any dot on the right column 456. First, it includes the top right “A” and “B” (supplementary signs of the original line 1). It then takes the right “K” and “L”, representing the supplementary signs of the original line 4. Next, it includes the signs middle right “A” and bottom right "B," signifying the supplementary signs of the original line 5. Additionally, it takes bottom right “A”, serving as the diacritic of the original line 4. Finally, it adds the sign 0, indicating an empty cell.

This structure for lines 6 and 7 aligns with the principles of the Braille system. Among the three systems known to use the Braille order, the Portuguese system is the closest to this logic, respecting line 6 completely and almost adhering to line 7. Please compare table 2 to 3.

# RUBIK KEY RING

To aid in teaching this method, there is a practical 6-dot key ring available that enables the creation of any combination of dots by rotating its hinged parts.

# NUMBRL BRAILLE DOT LEARNING SYSTEM.

This system has been developed and promoted by dotlessbraille.org, it assigns values to Braille dots (123456 as 10-20-40-1-2-4) for intuitive numeric codes, with two-digit representation per cell and no "carry-over" between columns or cells, enhancing learning and application in Braille education.

# CONCLUSION

Only those who attempt the absurd can achieve the impossible. The rigor of mechanical habits, which may seem immutable, prevents us from knowing their causes and detrimental effects. By moving away from inertia, the quality of life can be radically improved.

# APPENDIX 1

# Contact Information and important notice on my work

This paper is a summary of my work. The full text, along with many more tables, proposals, bibliographic references, and the legal link to the license, can be found by visiting my profile at the link provided below.

For any inquiries, feedback, or to request authorization for translations or adaptations, please contact me at BrailleCor@gmail.com.

To stay informed about my ongoing or published works and to access all future editions, you can visit my Safe Creative profile at https://safecreative.org/user/BrailleCor. Additionally, this content may be available through entities that choose to host this method on their website.

Invitation to Translators: Translations and adaptations are highly valuable for making the "BrailleCor Method" accessible to a wider audience, including blind individuals, advocates, and teachers worldwide. It is imperative that these are undertaken with proper authorization. I encourage those interested in contributing to this effort to reach out, ensuring that adaptations uphold the integrity and objectives of the original method.

# APPENDIX 2

# Brf Tables

Please be aware that in the next Tables, you will see signs arrangements in various ways. In any case, for a clearer understanding, signs are divided in variable length lines, and within each line, they will be grouped in compounds separated by a space. Each compound is preceded by the sign 123456, to help locating them. Lastly, the blank or empty cell will be worded on each table it appears to ensure it is not mistaken for a separation among cells.

# TABLE 1. Five Original Lines arrangement

Line 1: empty cell =abcdefghij =@^

Line 2: =' =klmnopqrst =/>

Line 3: =- =uvxyz&=(!) =+#

Line 4: =, =\*<%?:$]\[w =.\_

Line 5: =1234567890 =";

# TABLE 2. Seven Lines BrailleCor arrangement

Line 1: =abcdefghij

Line 2: =klmnopqrst

Line 3: =uvxyz&=(!)

Line 4: =\*<%?:$]\[w

Line 5: =1234567890

Line 6: =/>+#'-

Line 7: =@^.\_";, empty cell

# TABLE 3. Lines 6 and 7 in several languages

# TABLE 3.1. Portuguese:

Line 6: =/>+#'-

Line 7: =@^\_".;,

# TABLE 3.2. English:

Line 6: =/+#>'-

Line 7: =@^\_".;,

# TABLE 3.3. Spanish:

Line 6: =/>#+-'

Line 7: =@^\_;,".

# TABLE 4. Distinguishable signs

# Mirror-effect and number of dots arrangement

Signs in this table are grouped in lines according to their number of dots. Within the lines, they are arranged in compounds. Each compound shows all variations of each shape.

2 Dots: =\*/

3 Dots: =<>s: =m%u+ =[o

4 Dots: =p?v# =rw =$n!z =\t =x

5 Dots: =q]() =&y

6 Dots: ==

# TABLE 5. Non distinguishable signs

# Mirror-effect and number of dots arrangement

Signs in this table are arranged in lines by their number of dots. Within each line they are grouped in compounds. Each compound contains all variations made by each shape.

1 Dot: =a1'@",

2 Dots: =b^2;c3- =k. =ei59

3 Dots: =l\_ =fdhj6480

4 Dots: =g7

# TABLE 6. Shapes

In the next four sub tables, signs, each being a unique shape, are grouped into compounds. These shapes are selected and sorted according to the number of dots they comprise.

# TABLE 6.1. Distinguishable Shapes

=\* =<m[ =$pr\x =q& ==

# TABLE 6.2. Non distinguishable shapes

=a =bke =lf =g

# TABLE 6.3. Both Invariable and distinguishable shapes

=x ==

# TABLE 6.4. Variable (either non distinguishable or distinguishable) Shapes

The next signs, which are themselves shapes, are arranged into compounds in this table. Initially, you will encounter non-distinguishable shapes, followed by distinguishable shapes. All these are grouped into compounds based on their number of dots.

=a =bke =lf =g =\* =<m[ =$pr\ =q&

# TABLE 7. Five lines whose characters are arranged according to the three core signs

These 50 signs are easier to learn, corresponding to the words “Dear”, “Dare”, and “Exit”.

Within each line, signs are grouped into compounds based on their derivation from the three main letters. For example, “B” and “C” are grouped in the same compound as “A”, indicating their origin from it.

Line 1: =abc =eig =dfhj

Line 2: =klm =osq =nprt

Line 3: =uvx =z!= =y&()

Line 4: =\*<% =:[] =?$\w

Line 5: =123 =597 =4680

# APPENDIX 3

# BIBLIOGRAPHY

Please note that the comprehensive work includes a bibliography of 44 items. Due to their interest, I would like to bring to this summary the works or resources in Spanish or Portuguese, as they may be less known to the English-speaking audience. Furthermore, the "NumBraille" system, developed to enhance Braille numbering techniques, has been discussed THERE in detail AND HERE BRIEFLY OUTLINED. This discussion, along with other topics such as endianess and Unicode Braille patterns, will be expanded upon in the next edition of this document.

1. Domínguez, Francisco Rodrigo. 1980. “Escrituras y alfabetos en relieve” [scripts and alphabets in relief]. Organización Nacional de Ciegos Españoles.

2. "Numbrl for Nerds." Dotlessbraille. Retrieved from <https://www.dotlessbraille.org/nerdsNUMBRL.htm>

3. Ministério da Educação (Ministry of Education). "Grafia Braille para Informática" [Braille Notation for Computing]. Retrieved from:

- TXT: <http://portal.mec.gov.br/images/revista_inclusao/grafiainfo.txt>

- PDF: <http://portal.mec.gov.br/seesp/arquivos/pdf/grafiainfo.pdf>

4. Fernández del Campo Sánchez, José Enrique. (2001). "Desafíos didácticos de la lectura braille" [Didactic Challenges of Braille Reading]. Organización Nacional de Ciegos Españoles, Dirección de Educación. ISBN 84-484-0241-3.

5. Martínez Liébana, Ismael. (2004). "Guía Didáctica para la Lectoescritura braille" [Teaching Guide for Braille Literacy]. ONCE. ISBN: 84-484-0149-2.

6. ONCE (Spanish Organization of the Blind). "Braille Fonts from the Spanish Braille Commission" These Braille fonts are distributed free of charge for anyone interested. However, prior to using them, it is important to check the provided webpage to see if the terms of use have changed and to ensure alignment with the current conditions. Retrieved from <https://www.once.es/servicios-sociales/braille/comision-braille-espanola>.

ZAMORA (SPAIN), MARCH 8th, 2024

IVAN ARGOTE-PEREZ.