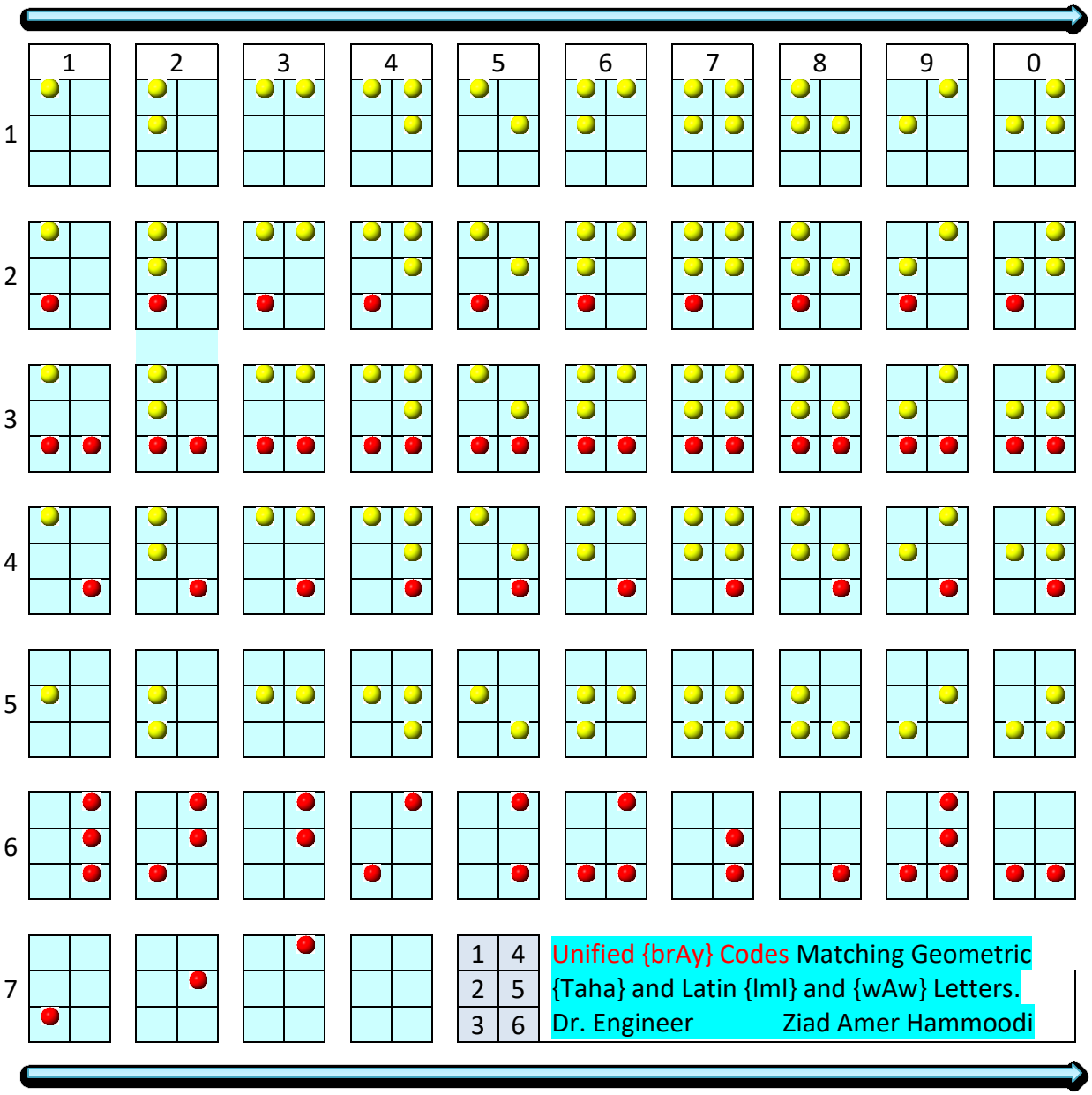
4- Braille Cell and Unified Braille Codes {brAy}

The Braille cell consists of a two-column and three-row matrix, i.e. six primary cells, each one-point cell.

The first left column contains 3 primary cells that carry from top to bottom the numbers 1, 2, 3 and the second right column contains 3 primary cells that carry from top to bottom the numbers 4, 5, 6.

The six primary braille cells can accommodate 64 different symbols arranged in seven lines so that each line contains 10 different symbols except for the seventh line which contains only 4 symbols in the **Unified {brAy} Codes table** as follows:

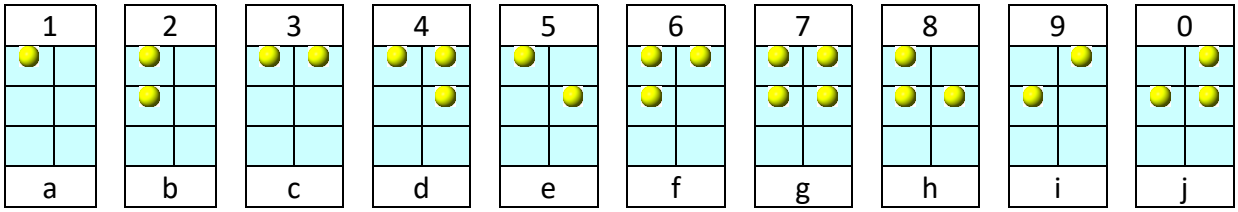


These unified codes, which are called {**brAy**} letters, are matched in Arabic, English, and French with Geometric letters {**Taha**} and with matching Latin letters {**lml**} letters or {**wAw**} letters.

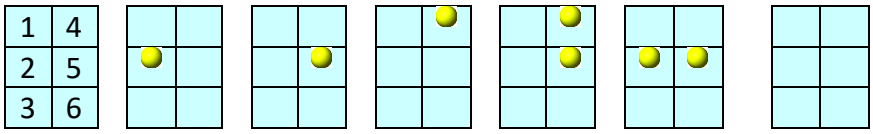
To memorize the arrangement of points in this table, we notice that the **first line** is repeated in the following lines and contains ten {**brAy**} letters in primary cells number 1, 2, 4, 5 in the upper two rows.

Braille matched these ten symbols with the first ten Latin letters and with Arabic numerals (1-9, 0). He also put the digital sign (#) to the left of each symbol to distinguish the numbers from the letters.

We note that 16 different symbols can be placed in the two upper rows. Therefore, Braille excluded 6 symbols, three of them consist of one point and two of them consist of two points, and the sixth symbol is empty of points as follows:



The first line, the first ten Latin letters, and Arabic numerals (1-9, 0) in the Bray symbols table



The primary cells numbers from top to bottom and left to right, and the six excluded symbols

Braille has repeated the codes of the first line in the next three lines of the {bray}table by adding point number (**3**), points number (**3, 6**) and point number (**6**) to **second**, **third** and **fourth line** symbols. Thus the aggregate is **40 used symbols** in four lines and **24 excluded symbols**. The total is 64 symbols.

Braille has been able to duplicate the first line symbols in the lower two rows of the **fifth line**, using ten excluded symbols and assign them to special characters such as comma and semicolon. Another ten symbols were inserted in the **sixth line** and the 4 symbols number (**3**), (**4**), (**5**) and (**null**) in **seventh line**.

The first three lines contain 25 small Latin letters. The letter (**w**), which is one of the letters that were added later to the Latin alphabet, was inserted at the **end of the fourth line** as follows:

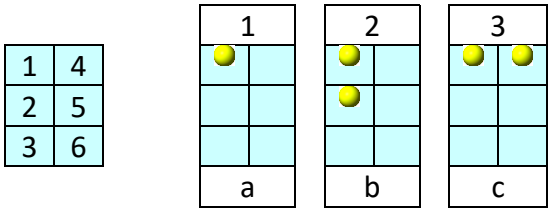
(abcd efghij) - (klmn op qrst) - (uvxyz>>>>>) - (>>>>>>>>>w)

Braille also used the same lower case symbols, preceded by the capital letter sign as he did for numbers. But the capital letters are completely different from the lowercase in the Arabic way of writing {wAw}.

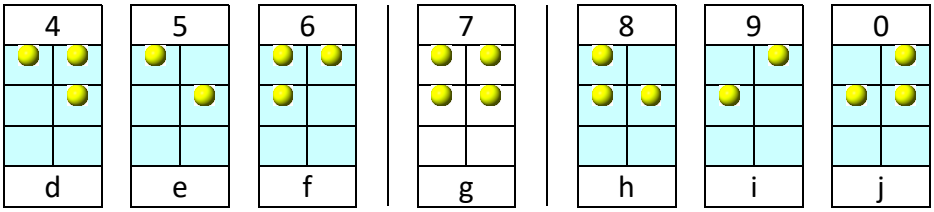
Each of the Geometric letters {Taha}, the Latin matching letters {lml}, or the Braille matching letters {bray} have one form and one role that is sound or movement. So there is no sign of the uppercase letter {brAy}. This facilitates the task of the blind who is not concerned with the beauty of the shape of letters as much as he is concerned with the sounds of these letters that it senses and does not see.

The **first line symbols** in the Unified (**brAy**) Codes table must be memorized as follows:

1- In the first three cells, **the first symbol, point (1),** consists of point in the first primary cell. We go down to add a point to cell number (2) for **second symbol, points (1, 2**) or we go right to add a point to cell number (4) for the **third symbol points, (1, 4),** as follows:



2- In the next three symbols, there is a similarity between the fourth symbol consisting of the three **points (1, 4, 5)** and the sixth symbol consisting of the three **points (4, 1, 2)** in the form of two upper right angles of a square and between them is situated the fifth symbol in the form of a going down square diagonal consisting of two **points (1, 5).**
The seventh symbol consists of four **points (1, 2, 4, 5**) mediates the seven remaining symbols.



3- In the last three symbols, there is a similarity between the eighth symbol, points (1, 2, 5), and the tenth symbol, points (4, 5, 2), in the form two lower right angles of a square and between them is situated the ninth symbol, points (2, 4), in the form of a going up square diagonal.

4- In the first line there are three short vowels and two consonant letters that are not present in the Arabic language and all of them represent odd numbers while the other five letters represent even numbers as follows:

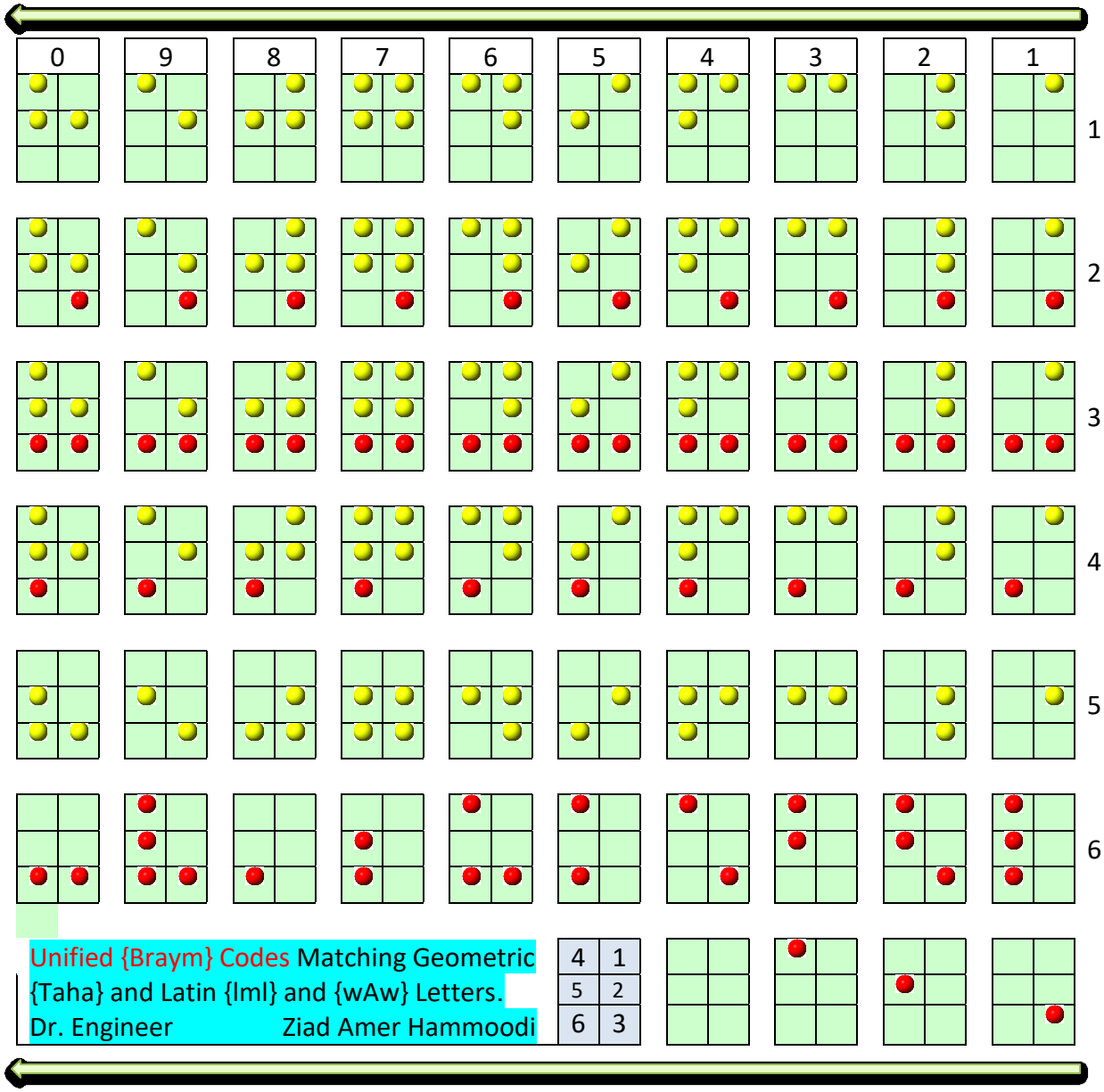
(a, c, e, g, i) => (1, 3, 5, 7, 9) - (b, d, f, h, j} => (2, 4, 6, 8, 0)

5- Compared to the first-line symbols, the rest of the lowercase letters of Latin letters can be known in the second and third lines. For example, the symbol of the vowel (**Offah**), in the second line is (1, **3**, 5) because it is located below the vowel (Kashah) (1, 5).
Likewise, the symbol of the vowel (**Dummah**) in the third line consist of **points (1, 3, 6)** because it is located below the vowel (**Fathah**), whose symbol consist of **point (1)** and the symbol of the consonant letter "**w**" in the tenth position of the fourth line consists **of points (4, 5, 2, 6)**.

Finally, it should be noted that the symbols assigned to special French vowels are also assigned to some special but optional Arabic letters and marks as Taa Marbootah and Tanween marks.

Geometric letters {**Taha**} are written as Arabic letters from right to left, and therefore they are reversed to letters {**Taham**} to write English and French texts from **left to right**.

Unified Braille letters (**brAy**} are also written as Braille letters from left to right, but it can be reversed to {**brAym**} to write Arabic texts from **right to left.** This is done by simply exchanging the points of the first and the second columns in Braille cells as follows in the **Unified {brAym} Codes table:**



The {brAym} cell differs from the {brAy} cell in that the arrangement of the primary cells starts from right to left so that the first column is the right column and the {brAym} cells in the seven lines start from right to left. However, the primary cell numbers that contain the points in the two tables are identical and do not change. Thus, {brAym} letters and {Taha} letters are aligned in the direction.