QURANIC BRAILLE WITH STANDARD UNICODE BRAILLE

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ABSTRACT

This work discuss Arabic Braille in Unicode. We focus on identify braille pattern for Arabic characters by using standard Unicode Braille and map it to Quranic Braille used by *Persatuan Orang Cacat Penglihatan Islam Malaysia* or PERTIS. Quranic Braille used by PERTIS is based on Standard Braille Code grade 1 for Arabic language. Based on our study we found that most of the braille pattern of Hija'iyyah characters, some Quranic annotation and Dicritics, and extra characters are already mapped with standard Unicode Braille. We also found that at least nine other Quranic annotation still not mapped with standard Unicode Braille.

Keywords: Braille Pattern, Unicode Braille, Quranic Braille.

INTRODUCTION

The Braille script is made of cells, each cell contains six raised dots that arranged in three rows and two columns as can be seen in Figure 1, these six dots can be raised or flat according to the Braille character, so these dots are combined to give 26 = 64 different combinations (including the empty Braille character "space").
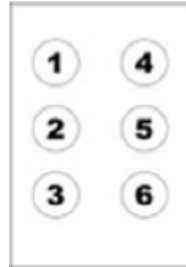

Figure 1: Braille cell.

Based on Samer & Radwan (2015) the dimensions of a Braille dot have been set according to the tactile resolution of the person's fingertips. The horizontal and vertical distance between dots in a character and the distance between cells that represent a word are known. Dot height is approximately 0.02 inches (0.5 mm); the horizontal and vertical spacing between dot centers within a Braille cell is approximately 0.1 inches (2.5 mm); the blank space between dots on adjacent cells is approximately0.15 inches (3.75 mm) horizontally and 0.2 inches (5.0 mm)vertically. A standard Braille page is 11 inches by 11.5 inches and typically has a maximum of 40 to 43 Braille cells per line and 25 lines as shown in Figure 2.
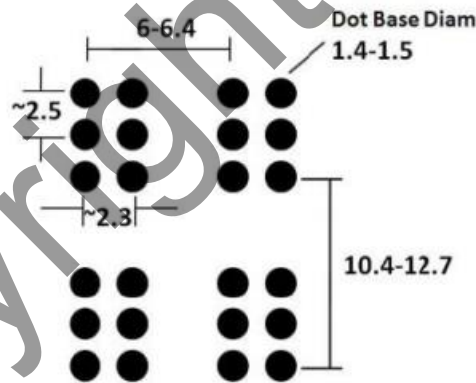

Figure 2: Braille cell dimensions - Size and Spacing of Braille Characters

Braille language consists of three grades: Grade 1: which each Braille cell represents a single language character, a word is made up of a combination of Braille cells. While Grade 2 is like grade 1 but with some abbreviations and contractions. Finally, Grade 3 is the most complicated grade of Braille which combines complex phrases and sentences, (Samer & Radwan, 2015).

Persatuan Orang Cacat Penglihatan Islam Malaysia or PERTIS used Standard Braille Code grade 1 for Arabic language which is our main focus of this work. For the next section we will discuss braille pattern in Quranic Braille based on structure and method used by PERTIS.

MAPPING BRAILLE SYMBOLS WITH ARABIC, JAWI AND ROMAN CHARACTERS WITH STANDARD UNICODE BRAILLE

Very little discussion on mapping braille pattern with standard Unicode Braille chart for Quranic Braille used by PERTIS. Figure 3 shows some Standard Braille Code grade 1 for Arabic language used by PERTIS - in this grade each Braille cell represents a single language character, a word is made up of a combination of Braille cells, (Mustaqim, 2014). See also World Braille Usage (2013).

Figure 3: Some Standard Braille Code grade 1 for Arabic language – Hija'iyyah characters, extra characters, and Dicritics.

Based on Figure 3, we should identify braille pattern for Arabic by using standard Unicode Braille, (Braille Patterns, 2019; Arabic Braille, 2019; Arabic script in Unicode, 2019). In Unicode, braille is represented in a block called Braille Patterns (U+2800…U+28FF). The block contains all 64 possible patterns of an 6-dot braille cell, thereby including the complete 6-dot cell range. Table 1, Table 2, and Table 3 shows a mapping braille pattern with Arabic, Jawi and Roman characters with standard Unicode Braille chart.

Table 1 Arabic Character & Braille Symbols With Roman Characters
Tranliteration (Abdallah, 2011).

Braille	Arabic	Braille. Dots	Dot	English	Braille
	ا	1	100000	a	
	ب	12	110000	b	
	ت	2345	011110	t	
	ث	1456	100111	ˁ	
	ج	245	010110	j	
	ح	156	100011	:	
	خ	1346	101101	x	
	د	145	100110	d	
	ذ	2346	011101	!	
	ر	1235	111010	r	
	ز	1356	101011	z	
	س	234	011100	s	
	ش	146	100101	%	
	ص	12346	111101	&	
	ض	1246	110101	$	
	ط	23456	011111	)	
	ظ	123456	111111	=	
	ع	12356	111011	(	
	غ	126	110001	<	
	ف	124	110100	f	
	ق	12345	111110	q	
	ك	13	101000	k	
	ل	123	111000	l	
	م	134	101100	m	
	ن	1345	101110	n	
	ه	125	110010	h	
	و	2456	010111	w	
	ي	24	010100	i	
	ى	135	101010	o	
	ة	16	100001	*	
	لا	1236	111001	v	
	أ	34	001100	/	
	إ	46	000101	.	
	آ	345	001110	>	
	ء	3	001000	'	
	ؤ	1256	110011	|	
	ئ	13456	101111	y	
	ـَ	2	010000	1	

Table 2: Quran Braille with Standard Unicode Chart: Hija'iyyah characters

Braille	Arab Al-Quran	Unicode (Braille)
a	ا	2801
b	ب	2803
t	ت	281e
?	ث	2839
j	ج	281a
∴	ح	2831
x	خ	282d
d	د	2819
!	ذ	282e
R	ر	2817
Z	ز	2835
S	س	280e
%	ش	2829
&	ص	282f
$	ض	282b
)	ط	283e
=	ظ	283f
(	ع	2837
<	غ	2823
f	ف	280b
Q	ق	281f
k	ك	2805
L	ل	2807
m	م	280d
N	ن	281d
W	و	2825
h	ه	2813
V	لا	2827
'	ء	2804

Table 3: Quran Braille with Standard Unicode Chart: extra characters and Quranic annotation

Braille	Arab Al-Quran	Unicode (Braille)
/	أ	280c
|	ؤ	2833
y	ئ	283d
>	آ	281c
*	ة	2821
o	ى	2815
1	َ◌	2802
e	ِ◌	2811
U	ُ◌	2825
2	ً◌	2806
9	ٍ◌	2814
5	ٌ◌	2824
3	ْ◌	2812
,	ّ◌	2820
>	أ◌	281c
@	◌	2808
~	ٔ	2818
+	و	282c
:	إ	2828

Some symbols also need to address as shown in Table 4. These characters should assign braille pattern and very important because it represent Quranic annotation and letter variants used for various non-Arabic language, (FileFormat, 2019; Arabic script in Unicode, 2019).

Table 4: Nine Arabic special characters without braille pattern.

Arab Al-Quran	FORMAT	Unicode (Braille)
◌ۖ	ARABIC SMALL HIGH LIGATURE SAD WITH LAM WITH ALEF MAKSURA	06D6
◌ۗ	ARABIC SMALL HIGH LIGATURE QAF WITH LAM WITH ALEF MAKSURA	06D7
◌ۘ	ARABIC SMALL HIGH MEEM	06D8
◌ۙ	ARABIC SMALL HIGH LAM ALEF	06D9
◌ۚ	ARABIC SMALL HIGH JEEM	06DA
◌ۛ	ARABIC SMALL HIGH THREE DOTS	06DB
◌ۨ	ARABIC SMALL HIGH NOON	06E8
◌ۜ	ARABIC SMALL HIGH SEEN	06DC
۩	ARABIC PLACE OF SAJDAH	06E9

CONCLUSION

We hope that we can find suitable braille pattern for nine other Arabic special character in Table 4 although there not much possible patterns of an 6-dot braille cell left.

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