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TAMIL BRAILLE SYSTEM: A Conversion methodology of Tamil into Contracted Braille Script (Grade2)

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Abstract: **Different countries of the world have adopted the Braille System to suits their language. The main focus of the paper is the conversion of Tamil to Braille Conversion System. The paper provides a detail description of a system for Tamil Braille and different grades of Braille contraction. The Tamil Braille is designed to facilitate Tamil-speaking visually impaired people interaction with computers, as well as helping sighted users to communicate with the visually impaired person.**

Keywords: **Braille System, Grades of Braille, Tamil Braille Scipt, Tamil to Braille Conversion System.**

I. INTRODUCTION

Braille system is a method that is widely used by the visually impaired people to read and write. It is first developed in the nineteenth century, which is formed by eight/six dots arranged and numbered as in Figure 1. Eight dot Braille is in limited use in the computer application area and is used in the display of text attributes. As such eight dots Braille will not be further considered.

Every Braille character is made up of six dot positions arranged in two columns by three rows. Any of the dots may be raised, giving 2^6 or 64 possible characters. Although Braille cells are used world-wide, the meaning of each of the 64 cells depends on the language that they are being used to depict. Braille is not a language; it is just a code by which languages such as English, Tamil may be written and read. Different languages have their own Braille codes, mapping the alphabets, numbers and punctuation symbols to Braille cells according to need. In addition, there are Braille codes for mathematics and music.

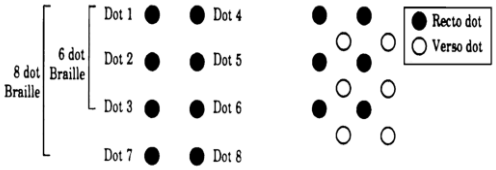


Figure 1: The Braille cell

II. THE BRAILLE ALPHABET

It consists of patterns of embossed dots arranged in cells of up to six dots in a 3 rows and 2 columns configuration. Each cell represents a letter, numeral or punctuation mark. Some frequently used words and letter combinations also have their own single cell patterns.

The following are versions of Braille:

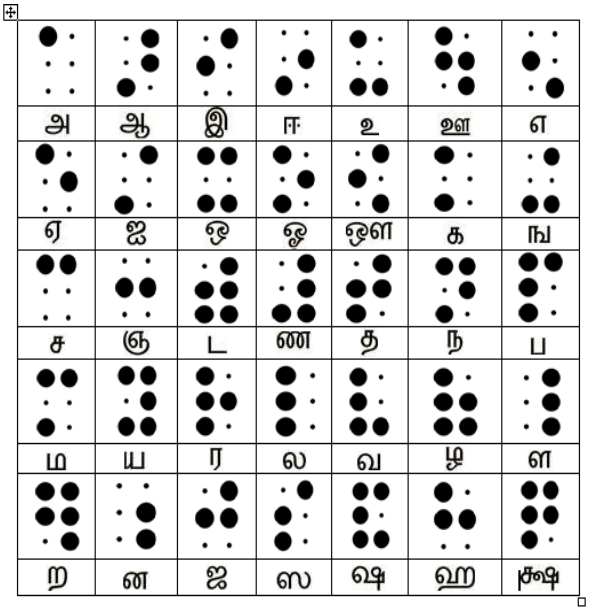
- **Uncontracted or Grade 1** is the simplest form which consists of fully spelt words, punctuation, numbers and composition signs. It is only used by people who are first starting to read Braille. Table 1 shows the Tamil Braille in Grade 1
- **Contracted or Grade 2**, which consists of the standard letters of the alphabet, punctuation and contractions. The contractions are employed to save space because a Braille page cannot fit as much text as a standard printed page. Books, signs in public places, menus, and most other Braille materials are written in Contracted Braille.
- **Grade 3,** is the next version of Grade 2. It is mainly used in personal letters, diaries, and notes and also in literature to some extent.

A. *Difference between Grade 1 and Grade 2 Braille*

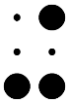
Grade 1 Braille is a literal 1 to 1 translation of printed letters to Braille symbols. Grade 2 Braille employs a very smart utilization of the symbols and combinations of symbols to represent multiple letters or words. There are only 64 possible configurations of a standard Braille cell so most symbols are reused in various contexts to have many meanings. This allows Grade 2 contracted Braille documents to be much shorter than the uncontracted Grade 1 equivalent. Learning to read contracted Braille requires some patience and practice. In the end, the effort is well rewarded.

Grade 1:

Table 1: Tamil Braille Alphabets



Grade 2:



Braille Cell with dot 3, 4, 6 gives **abbreviation** of "**இங்ஙனம்**"

and if **Preceded by Dot 5 its "அங்ஙனம்**"

III. CONTRACTION AND ITS TYPES

Contractions are one of the most important features of Braille and also the one aspect that creates the largest number of special situations for transcribing Braille. However Braille cells have a minimum physical size below which they become difficult to read and this limits a page of Braille to just 25 lines of 40 characters. This means that Braille books can become quite bulky. To try and reduce the size of these books and increase the speed at which Braille can be read Grade 2 or contracted Braille was introduced. A contraction is used to shorten the length of a word.

There are several different types of contractions.

- Whole-word Contraction
    a. Single-cell Whole-word Contraction
    b. Multiple-cell Whole-word Contraction
- Part-word Contraction
    a. Single-cell Part-word Contraction
    b. Multiple-cell Part-word Contraction

Table 2: Whole word Contraction and Abbreviation – Single cell and Multiple cells

Braille Cell	Abbreviation	Preceded by Dot 5	Braille Cell	Abbreviation	Preceded by Dot 5
	அதனால்	-		சமுதாய	சிறந்த
	ஆகையால்	ஆர்வ		-	ஞாபகம்
	இதனால்	இருந்த		-	படி
	ஈ	-		இணை	அணி
	உறுதி	உதாரண		தகுதி	திறமை
	ஊக்கம்	ஊதிய		நன்மை	நிறைவேற்ற
	எனவே	எதிர்		பயிற்சி	பற்றி
	ஏனெனில்	ஏற்கெனவே		மக்கள்	மேலும்
	ஐயா	ஐக்கிய		யாவை	இயக்க
	ஒரு	ஒற்றுமை		-	இராணுவ
	ஒரிரு	ஒவிய		-	இலட்சிய
	அவ்வகை	அவசிய		வளர்ச்சி	வேண்ட
	கல்வி	காரண		-	கிழமை
	இங்ஙனம்	அங்ஙனம்		-	வினா

Whole-word Contraction:

A whole-word Contraction is shorthand for a whole word; whole-word symbols can either one

cell or a sequence of cells which can be an abbreviation of a whole-word as single-cell contraction or multiple-cell contraction. A Single-cell word contraction is the uses of one cell either a single-letter or a part-word letter for entire word. Multiple-cell whole-word contraction is by an initial letter contraction for a word that is formed by preceding the single-cell sign for the initial letter or letters of a word shown in Table 2: Whole word Contraction and Abbreviation - Single cell and Multiple cells.

Part-word Contraction:

A part-word contraction is shorthand for part of a word, not necessarily corresponding to either a diphthong or syllable. The use of certain part-word contractions is restricted as to placement at the first, middle or end of the word. Proper use of contractions depends to some extent on syllabication and pronunciation. The single-cell part word contraction is listed as in Table 3: Single-cell Part-word Contraction chart. The Multiple-cell part word contraction is listed as in Table 4: Multiple -cell Part-word Contraction chart.

Table 3: Single-cell Part-word Contraction chart

Braille Cell	First	Middle	Last	Braille Cell	First	Middle	Last
	-	இல்	இல்		"	ல்ல	?
	-	உம்	உம்		பழ	ள்ள	,
	-	-	இன்		ஏற்	ற்ற	ற்ற
	-	க்க	க்க		விள	-	கள்
	பட	ம்ப	ம்ப		அட	ண்ட	ண்ட
	பொரு	ன்ப	;		இர	ர்க்க	ஆர்
	பிர	-	-		அவ	ந்த	ந்த
	கட	ன்ற	ன்ற		சம	ச்ச	களை
	உட	ட்ச	.		முத	ண்ண	ண்ண
	பண்	ப்ப	ப்ப		முன்	ம்ம	மூலம்
	வர	வ்வ	!		திர	த்த	த்த
	ஆக	ங்க	ங்க		நிர	ன்ன	ன்ன
	(	ஞ்ச	)		உற	ட்ட	ட்ட

Table 4: Multiple -cell Part-word Contraction chart.

Braille Cell	First	Middle	Last	Braille Cell	First	Middle	Last
	-	-	ஆவது		-	தவிர	தவிர
	-	ஆல்	ஆல்		தாக	தாக	தாக
	-	-	ஆள்		போன்ற	போன்ற	போன்ற
	-	ஆன்	ஆன்		பொழுது	பொழுது	பொழுது
	இல்லை	இல்லை	இல்லை		போது	போது	போது
	உடைய	உடைய	உடைய		-	-	ஆம்
	உடன்	உடன்	உடன்		மல்	-	மல்
	ஒடு	ஒடு	ஒடு		முறை	முறை	முறை
	ஒடு	ஒடு	ஒடு		.	வது	வது
	-	-	ஒம		-	-	வாது
	.	கிற	கிற		வரை	வரை	வரை
	.	கின்ற	கின்ற		பின்	பின்	பின்
	விட	விட	விட		.	ள்ர்	ள்ர்
	-	-	தான்				

IV. PROPOSED METHODOLOGY

The Proposed Methodology is derived from Grade 1 to Grade 2 Tamil Braille Script and it will have the following process as shown Figure 2.

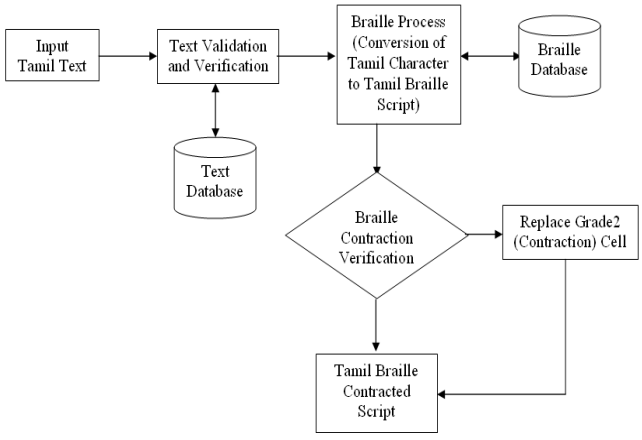


Figure 2: The Proposed method of Conversion of Tamil to Grade 2 Tamil Braille Script

1.Input Tamil Text:

The process of input of a Tamil text can be entered in to the provided area or can browse and attach a text document.

2.Text Validation and Verification:

The Main purpose of this block is to validate and verify the Tamil text entered. Validation process is the part of validating the meaningful string and verifies the word through the database (Text Database)

3.Braille Process:

Braille Process converts each and every character into equivalent Braille character. The symbols of each and every character can be extracted through the available Database (Braille Database). Braille Process proposed to be coded in the ***Mat lab***.

4.Braille Contraction:

The upgraded Grade of Braille is through Contraction and punctuation. Where equivalent contraction script are replaced according to the type of contraction under Grade 2.

5.Tamil Braille Output:

Once the conversion is replaced accordingly the final output can be processed through the output interface to reach the user.

The above process will help Visually challenged to read and write Braille fast when compared to Grade1.

It was tested manually with 100 Visually Challenged people, out of which 92% are able to read fast. Inspite of that the above methodology have few following setback.

- Before testing the upgraded version has to be explained in detail.
- Before testing the people expecting intimation whether the Grade2 script included.

The above problem found in the methodology will be taken in to consideration while developing software in the implementation process the software developed will be tested with visually challenged person and final outcome will be analyzed.

V. CONCLUSION AND FUTURE SCOPE

Braille has been developed as the reading and writing system for the visually impaired. The attention was given on this is very difficult to teach a visually impaired people in the early stage and more training is needed for teaching them and converting text to Braille, is costly and cumbersome work.

As from the user of Tamil Braille system, Grade 1 has some disadvantage as usage of papers and time are more compare to Grade 2 or Contracted Braille. The reading time also is reduced when on usage of Grade 2 Braille system. The Grade 2 method for Tamil Braille is not yet implemented. The lot of scope of Research to work on Grade 2 Tamil Braille Script.

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