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Study on Braille Input Output Devices

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ABSTRACT
This document is about the Braille devices .there nearly 45 to 50 million are many people in the world who are blind and more than 269 who visually impaired. before the inversion of Braille device blind people cannot able to read or gain knowledge through reading Louis Braille is the person who invented the device called Braille which became popular by the usage ,nowadays there are many devices arrived in this world to solve the visually impaired peoples problem not only we can use such devices but also we can reduce the cost by combining various techniques. This paper is about the various Braille devices and their methods or their combination to make them cost effective.
Keywords–Braille,copier,embrossor,Tactile,SPARSHA. ,

I. Introduction

Lousis Braille was born on 1809 invented the Braille device when he was fifteen year old . the device Braille was named after his name Louis Braille . he lost his sight completely at the age of five and invented this device for the sake of blind people .This device has the dots raised and lowered according to the word and text with this Braille devices as based many people developed advance techniques or modified to make it ease of use for the people. Some of them are discussed below. The purpose is to make a cost effective and efficient using available technologies.

II. Braille input output devices:

The headings and Representation of Braille cell is shown in figure .It Consists of 6 dots of 3 rows and 2 columns as shown in the Fig1[1].

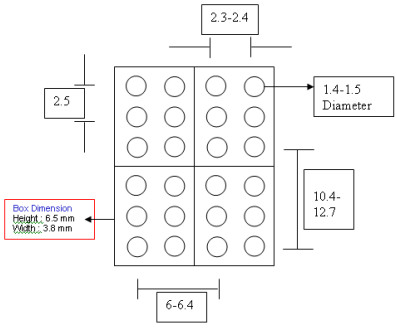

Figure 1[1]-Representation of Braille cell

2.1 Types of Braille

Grade 1
Usual alphabets are used to represented this type Fig2.

Eg. 

Figure 2[1] -The word "Braille" in Grade1 Braille

Grade 2
words in contracted form are used hear[1] Fig3

Figure 3[1]-"brl" in Braille.

2.2 Some other types of Braille representation [2]

2.2.1 Literary Braille
Mostly used for ordinary documents it has text of standard Braille representation.

2.2.2 Math Braille
It is used to represent mathematical and scientific notations it contains Nemeth Braille which is one code used to write mathematics in Braille.

2.2.3 Chemistry Braille
It consists of various chemical notations like notations, formulas etc.

2.2.4 Music Braille
Contains musical notations attached to each keys**.**

2.2.5 Computer programming Braille
It has 8 dots instead of 6 dots hence 256 characters are assigned to 256 characters of computer coding.

2.3 Sparsha Architecture

A low cost tactile refreshable Braille display (named as SPARSHA)It consists of 6 pins which represents 6 dots in Braille device Fig4.when the signal

reaches the pin it prints the dot on the respective output devices Fig5.It consists of 4 steps[3].They are

2.3.1 Language processing

Hear the language is obtained as input and it output as array of characters.

2.3.2 Text processing

Each character is splited into individual character and get feeded to text processing process.

2.3.3 Interpreter

It matches the words with standard Braille representation

2.3.4 Controller

Based on the Braille representation of each character the program sends the corresponding signal to the device through the parallel port.

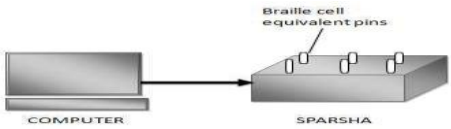

Figure 4[3]-SPARSHA connected to computer

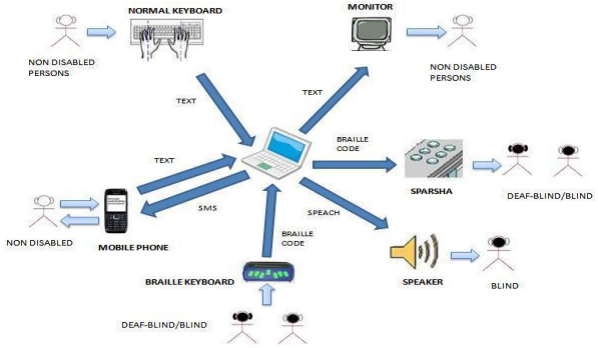

Figure 5[3]-SPARSHA Architecture

2.4 Improving the literacy of the world's visually impaired

In the paper [4] they have remodeled the Braille embosser and reduced the cost they have designed this system to print large number of same copies like books hence this technique can be adapted to industry which prints books. Their advantages are as follows.

- It replaces 60 years old design. Braille paper is placed between two embossed zinc plates as shown in Fig6 and inserted into aluminum jacket.
- When pressing the embossed top plates creates Braille characters on one side of sheet and bottom plates creates on the other side of the paper hence both side of the paper is simultaneously printed in a single flow. Distance between them is set by pillow ball bearings. Top roller runs freely and Bottom roller rotates about 42 rpm(rotations per minute).
- They upgraded which leads to zero guidance. To reduce the maintenance, roller and sub assembly is removed from the frame.
- Bend plastic is used to construct the roller guard, which can be detach there by removing four blots. This leads to easy performance and also increases maintenance task to a slight extent.
- Changes to gear box and motor specification reduce cost approximately 200 us dollars. Foot print is reduced from 31 to 21 feet as shown in Fig7.

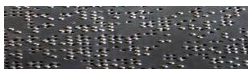

Figure 6[4]-Embossed Zinc Plate

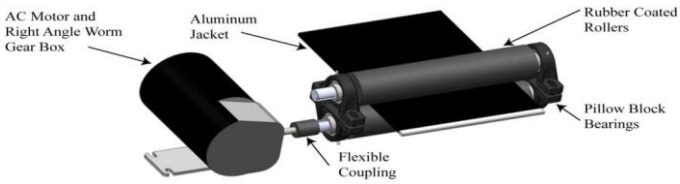

Figure 7[4]-CAD design of original Braille press device

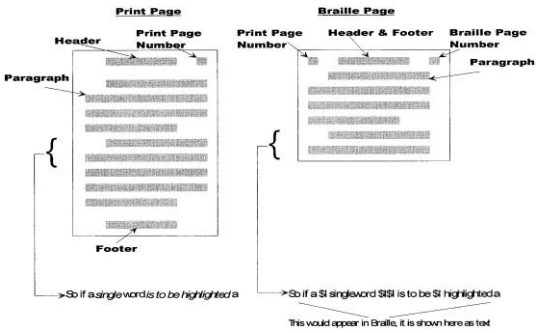

Figure 8[5]-Word Document Format

2.5 Word documents Braille production

This was given in [5] it says about the format of Braille document and translation from text to Braille ,as follows

2.5.1 Format of Braille document:

The Braille document should be in the following format as shown bellow in steps

- Left column is dedicated to print page number related to Braille page. Center is the title as shown in Fig8.
- Page number is printed on the right side of the document
- According to algorithm blank space is provided with respect to number of blank pages. We must specify the font change in bold italics or underline.

2.5.2 To translate text to contracted Braille:

The requirements [5] are as follows

- we need a word document and double side Braille embosser. This prints Braille on both the sides of the sheet.
- It reduce both cost of buying paper and also reduce the weightage of paper. Program is written using c and embedded in vb(6 or later version)
- Vb can be used as interface between word and translation dll. C can be used to translate text to Braille.

2.5.3 Braille Conversion Algorithm:
This algorithm was given in [5] the Braille conversion algorithm is shown in the below steps

- Open text document to translate.Create blank Braille document. Initialize Braille document header text and Initialize Braille document page numbers
- For Each text box with text in document Do Convert text boxes into frames End For
- For Each table Do Convert each row into a set text fields separated by spaces End For
- For Each list (includes bullets and list numbers) Do Convert to text End For.using the Find object If print page number changed Then Change print , print page number on Braille page
- If header changed Then change Braille page header End If.Insert two spaces in Braille document For Each word In paragraph Do
- If word is Bold or Italics or Underlined Then Insert italics information into text,convert modified paragraph into Braille insert in Braille document End If
- If text paragraph alignment is full justification Then full justification not valid in Braille Set Braille paragraph convert multiple spaces into single spaces convert tabs into three spaces remove multiple carriage returns End If.
- For Each paragraph In text document Do If hard page break in text Then change Braille page header End If
- If Insert two spaces in Braille document For Each word In paragraph Do If word is Bold or Italics or Underlined Then Insert italics information into text convert modified paragraph into Braille insert in Braille document End If
- If text paragraph alignment is full justification Then ' full justification not valid in Braille Set Braille paragraph

III. Braille Devices

Different types of Braille devices[2] available are listed below
Table

S.No	Name	Description	Advantages	Diagram	Cost
1	Braille writers	Braille writers are the Braille equivalent of typewriters. Unlike typewriters, they are still going strong despite the advent of the personal computer. Many individuals who do a significant amount of writing in Braille prefer to use a Braille writer	1.Easy to write large documents		$64.95 to $206.95
2	Braille copiers	Thermoform embossers use a vacuum and heat to create raised areas on special plastic paper. This process is primarily used to create tactile graphics (raised drawings and diagrams that can be felt by blind people), but the process can also be used to make copies of Braille documents. The American Thermoform Corporation manufactures a Braille copier called EZ-Form that can be used to produce multiple copies of a Braille document on Brailon plastic paper	The advantage of plastic paper is that it can survive handling by many readers, such as children in school. To make Brailon copies on the EZ-Form, the user first embosses a master on heavyweight Braille paper then runs the master through the machine. This process can also be used to reproduce existing Braille books and other documents		$1,750 to $2,895
3	Braille printers	"Braille embosser" and "Braille printer" are interchangeable because it operate by embossing raised Braille dots onto Braille paper . In order to create raised dots on the other side embosser press pins into one side of the paper. Printers of this type are called "plate embossing device" or PED printers.	1.Braille printers differ in their speed, measured in characters per second or pages per hour. Some models print as many as 850 sheets per hour. 2.It is very efficient compared to others		$3,500 to 15,000

4.	Braille software	Braille translation software usually comes with a Braille editor, which is needed because automatic Braille translation leads to problems like those seen in automatic conversion from one electronic format to another or even automatic translation from one language to another	1.This programs may differ in their ability to handle the situations such as special formatting, multiple languages,documents,mathematical symbols, special notation. 2. Companies often make timed demo versions available so customers can try their software before purchasing it.		$200 to $500
5	Braille embossers [7]	It is an impact device that renders text as tactile Braille cells.	1.Comparing with ink printers and presses, embossers are used by large publishers. 2.Using Braille translation software, a document can be embossed with relative ease, making Braille production efficient and cost-effective		$2,000 to $150,000.

Some of the Braille devices[6]available in the market are below Table

Name	**Purpose**	**Hardware used**	**Speed**	**Cost**	**Advantages**	**Diagram**
Tiger Elite200+ Braille Printer	In a production setting where speed and performance are essential	Braille printer	200 cps	$19,995	1.Heavy-duty hardware for high-volume production 2.Compact and quiet design 3.Automatic double-sided embossing	
Tiger premier Braille printers	It can be used for efficient and effective printing	Braille embossing printer	100 cps	$9,995	Automatic double-sided embossing High-speed Braille and Tiger tactile graphics Onboard network port for easy connectivity	
EmFuse Toner Cartridge Package	media/paper types—works with Braille paper and standard office media including cardstock, copy paper and labels	combined print and Braille	400 cps	$1,435	Adjustable: heavy, normal, light 1.Double-sided print and Braille instantly 2. different dot heights for high-resolution raised graphics 3.Ethernet port for easy networking 4.High-capacity production—holds 2,350 pages up to 12x18 .	

I. Recent Technologies

4.1 Body Braille system

The advantages of body Braille system[3] are

- It consists of 6 vibertaors as shown in Fig9.Can be used in their body surface[].
- Sensitive to palm, fingers, head, ears, abdomen, back, arms, legs as shown in Fig
- Best results to arms and back.

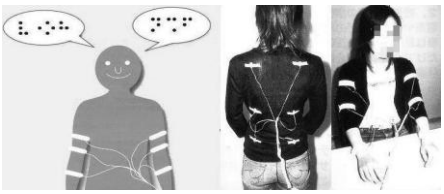

Figure 9[3]- Mounting 6 vibrators on the different parts of the body

4.2 Braille box:

The advantages of Braille box[3] are as follows

- Type of Braille printer which is Used for high volume production.
- Mile stone for Braille embossers and Easy to locate contents.

Figure 10-Braille Box

- Automatically organizes magazine format as shown in Fig 10.Prints 300 characters per second. Cost around $10,995 to $14,995.

II. Conclusion

As we have seen in the above document the various types of Braille,sparsha architecture[3] for the low cost device, low cost printing for large number of pages [4]and word document for Braille with and algorithm[5] .It also contains latest technologies[2][6][7] and current devices available in the market. using the above devices we can make cost effective and efficient Braille devices by combining the ideas for example in the sparsha architecture if we use the input as embosser can improve efficiency else if we use printers the cost is reduced. Both can be balanced by using appropriate devices when there is a need this leads to advantageous product that can be used for day to day applications to bring a new model or product.

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