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Portable Assistance for Deaf-Blind People by Using Braille Language

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Abstract

Braille Method is International language help the Deaf and blind people to interact and deal with other people and outside world, the Braille method used six sensible dots (Deaf-blindness can feel it and understand it by touching) to help them in learning and understand the human language.

Portable Assistance for Deaf-Blind People by Using Braille Language "is portable tool help those how loss their senses of hearing and sight "Deaf-blindness " to communicate with other normal people and that done by converting their language "Braille alphabet" to normal human language automatically and vice versa by using collection of components and electronic devices.

Keywords: Portable Assistance, Deaf-Blind People, Braille Language

Problem statement:

The importance of all the senses we have specially the sense of hearing and sight in our daily life and any lack in this senses leads to defect in understanding of the person, so some people are already born and they can't hear and see and it's well known without them the person will probable isolate from the outside world and can't get any kind of information , luckily someone called " Braille" devised a method and way to help those deaf-blindness people who have lost

their sense of hearing and sight by using six dots called "Braille method" see Figure 1, so this method use the sense of touch to communicate with the people around them and that by using sensible dots have many and different sites and formations see Figure 2. , so every formation of this dots represent as one alphabetic letter and more than one formation will make words and sentences understandable by those deaf-blindness people but to set this communication must the normal people also understand all this formations and signs of the "Braille method" , but in fact most of people had no any knowledge in this method so this issue make a serious problems for the deaf-blindness to dealing with other normal people and live normal life without facing problems every day.

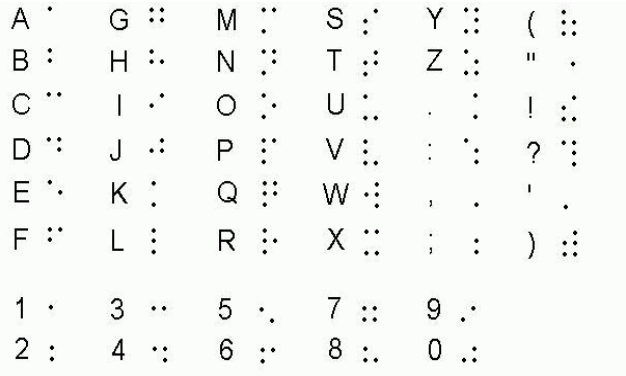


Figure1. Braille alphabets

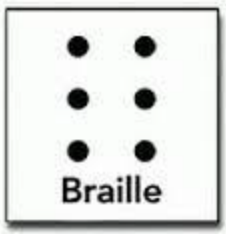


Figure2.General form dots of Braille

This paper is concerned to help deaf-blind people to communicate with other normal people, and aims to implement a permanent helper "translator" for deaf-blindness people to translate their Braille language that already known by them to normal human language and vice versa and that by using electronic devices we can make that

helper "translator" and let it understand and convert the information from side to other one.

Features:

Braille translator is device make real time communication and also it's portable, so the deaf-blindness can use it in outside world to allow them making real conversations with society to improve their thoughts and skills and live individual life, that can be done by using "LCD device" incorporated so all stuff that help the deaf-blindness will be with them permanently without need from them to add or use any other external devices or components. The mediator who will make the human language to be understandable for deaf-blindness is "vibration motor" and since the deaf-blindness understand the collections of Braille dots so the motor use technique to make similar method of the formations of Braille dots but in vibration movement on the hand .

Related works

Mahmoud and Tarek Gaber, developed cloud computing system for deaf-blind people in 2013, its allows communication between deaf and blind especially for those living in Arabic countries and it constructed in three modules technologies [1]:

➢ Mobile technology ➢Cloud resources ➢ Social network

Saba and Maria Design and developed in 2011 system permits sensory motor to allow communication via vibration and consist of two waist belts when one pushed the other will make vibration movement [2].

George T. Ioannidis developed system in 2002 Allows communication by generating description of certain classes of graphic such as [3]:

➢ Electronic circuit. ➢ Uml ➢ Architecture plans.

They are many people they benefit from the process of hearing replacement and this process is low cost. Novich, S.D. and Eagleman, D.M., in 2014 developed additional information to the brain by which information captured to the skin using vibration motor.[4]

Dobelle developed Artificial vision system, it's still in experimentation stage, small camera used above the glasses attached with the blind person. Images of the camera are communicate to a

portable computer and sending it to electrodes are implanted and attached to visual cortex in the brain.[5]

Greene Jr, Morgan developed system in 2002 except incoming signals (speech) and then convert it to a text type. And then convert this text to another form [6]:

- Sign language. ➢ Animation ➢ Computer generator speech.

Caporusso, and Nicholas developed system in 2008 Used to allow the deaf blind person to communicate with the working area to get knowledge and information without assistance. This system consists of gloves connected to a sensor as input and actuator as output, it made this by easily language called "malossi method ",this language allow tow person which are deaf blind to communicate with each other by typing what they need in their hands when they typing on their hand they touch different areas of their arms [7].

Allen, Jerome developed system in 2003 Used for translate ASL language to printed spoken English letter and it's operate in real time and it developed mat lab, and lab view for recognize the finger letters and then translate it to English letter [8].

Vinitha, and Eelke developed in recent years to allow the deaf blind people and help them to communicate and understand the outside world, it recognize the manual language and then use the hand as display device, this project represent using both hands with sensing devices and technique called "autosem" [9].

Purohit and Parijat developed system in 2015 work when the blind shake the smart phone in one axis, for that the massage will translated from the smart phone to the nearest hand [10].

Based on internal acceleration sensor of mobile device Huang represented a gesture recognition system in 2014 provide user with an original human computer interactive way this system avoid time consuming training set collection process and enhance the scalability of the system [11].

Mohane, and Gode represent portable camera in 2016 to separate object from unnecessary background movement based technique is used to spot object of concern that give moving object are by k-means clustering sift technique used to take out key-point of that product that match with the data base ,[12].

K. Durre developed in 1990 refreshable Braille displays for blind people by using Braille tactile language and this work founded when computers were text-based and not include complex graphical environments, [13].

Bazzani and Mumolo developed in 1998 and present system for communication for deafbind people and its actually not using or to control a computer but through using telephone line, [14].

Su developed communication system in 2001, the built system contains of simplified keyboard and LCD for sight users and Perkins Braille type and Braille display for deaf-blind user [15].

Ramirez present and developed design in 2014 for deaf-blind people contains portable keyboard, speaker device and Braille refreshable display for communication between deafblidness people [16].

Sathiyabama and Devi developed communication system in 2015 by method called Lorm tactile language to make Mobile Lorm Glove system and by using it for both deaf and blind people can translate the sense information to text and vice versa by using the glove [17].

Mahmud developed navigation system in 2014 that give blind people assistance to guide them by among obstacle safety in an indoor and outdoor environment, by using ultrasonic sensor the cane can warning deaf-blindness through voice from speaker and device make vibration movement [18].

Process of Translation:

Step one: from deaf-blind people to normal people:

when the deaf-blindness need to communicate with normal people they will use six push button switches which already located in their right hand on index and middle finger (see Figure 5.) To enter many information of Braille alphabet(by using his left hand to push the buttons) and the Arduino will receives all the information from this push button switches and processes the information and translates to take an action and convert it To normal alphabets (letters and words) and finally displays these information to the people on the LCD.

Step two: from normal people to deaf-blind people:

when any one need also to give the deaf-blindness instructions or information they will use 4*3 keypad to enter the letters so if they

push the buttons of any letter the Arduino will make two actions first the letter or word will appear in the LCD to make sure it was interred correctly and to avoid any miswriting or error typing in the keypad, because we don't want to provide wrong information to the deaf-blindness the second action goes through the vibrations motors which are already located in the other side of index and middle finger see (Figure 6.).

Which produces signal movement which can be felt in the sense of skin signals to make vibration movement with the same information of letter entered it by keypad to be understandable feedback by the deaf-blindness. This information reaches the deaf-blindness people as signal movement.

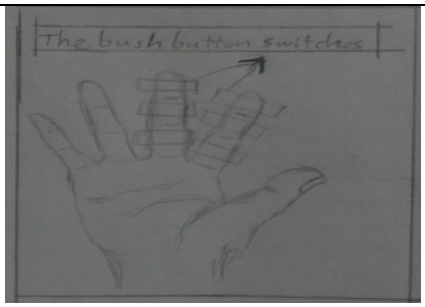


Figure 5.Push buttons position on hand

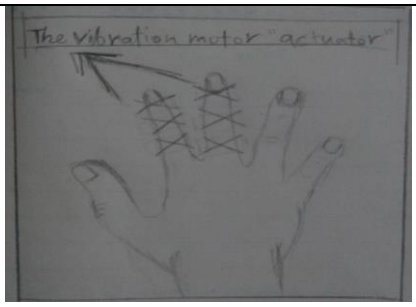
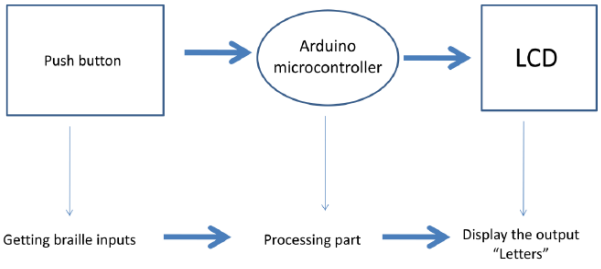


Figure 6. Actuators position on hand

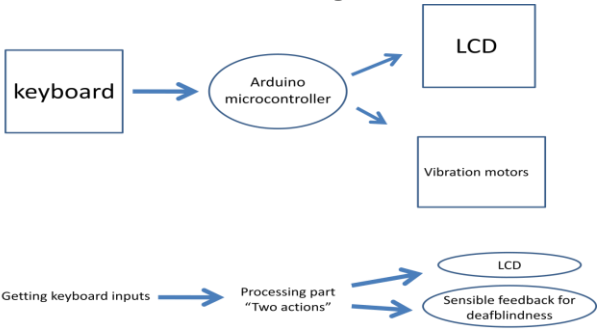
Flow chart and Block diagram for stage one:



Block diagram of Stage one: Translation form deaf-blind to normal people

Flow Chart of Stage one: Translation form deaf-blind to normal people

Block diagram and Flow Chart for stage two:



Block diagram of Stage two: Translation from normal people to deaf-blind people

Flow Chart of Stage two: Translation from normal people to deaf-blind people

Keyboard:

This is 6x7 matrix keyboard used to get input of normal alphabets see Figure 7 , You have basically keyboard in front of you so if you are not familiar to key matrices you think that is there small micro-chip in side it but the true is far from that the matrices are interface technique it can be used to interface the input pc keyboard keys but also to control multiple outputs such as LEDs according to this technique the matrices can be divided into two sections columns and rows keyboard can come in different shapes and types such as: 3x4, 4x4, and 6x7 as it use in this paper.

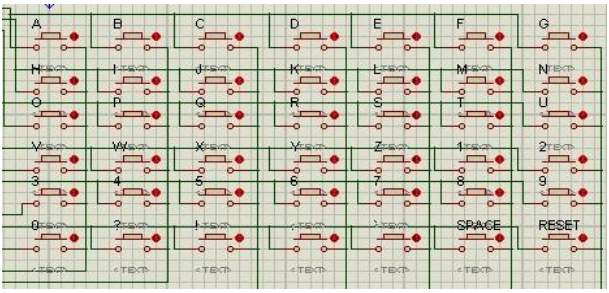


Figure 7. Matrix keyboard of the project (6x7)

In this case 6x7 keyboard contains 6 rows and 7 columns used to get normal alphabets which is used by the normal people since we have

two stages, stage one and stage two in this project this is designed in stage two for the normal people to use.

How the keyboard works:

When no key is pressed all column read Low. If any key is pressed causes one of the column to go High (the column that key is pressed go High) see Figure 8 so to know that if a key was pressed microcontroller needs to identifies if any input lines are in low state, if the microcontroller detects that some of keys is pressed and in the same time it also needs to find out which key was pressed, it's simple process, the microcontroller firstly detects which column goes low and the which row belongs the key is being pressed the key can only be on once one of the row outputs of microcontrollers are set high, on input port the microcontroller finds that the pressed key only occurred on selected row if the it finds inputs all are lows so the pressed key was not on that row and microcontroller selects the next row and continues to repeat the process until it finds the desired row once the row is identified the specific column of the pressed key microcontroller will recognize the matrix method in keyboard.

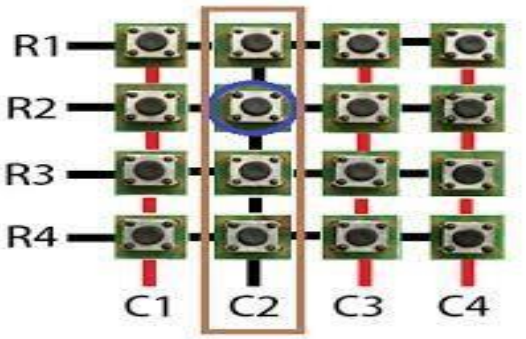


Figure 8.Example of how keyboard works

The location of the components in deaf-blindness's hand:

All the components will be located on deaf-blindness's hand The LCD, keyboard, and Arduino will be placed the far-arm while the mini push buttons are placed In the index and middle finger in the front hand vibrator motors will also be placed in the same hand But the back of hand in the same fingers index and middle. Also these components will be light as possible and even portable so the deaf-blindness can go without complication or complexity of the

components to protect components all the equipment's will covered smart Gloves which protects the components and at the same time makes components smart In order to implement our project in real life we use helpful electronics tools and components, so for that we consider main standards for that as following:

- Light tools: It's portable assistance so it's important to use light and not heavy tools and components.
- Simple to use: All components use to be simple when the normal people or deaf-blind use it 3 - Low cost equipment's: All components are cheap so it will be available for all people.
- Small in sizes: The system made to be portable, so it's important to have small size for all equipment because it's allow deaf-blindness to hold it anywhere.

Results:

The results will separate for two stages as we knew in previous chapter (from deaf-blindness to normal people and from normal people to deaf-blindness), so both of results will appear on Simulation software and Real life hardware.

Results from deaf-blindness to normal people:

Table 1 shows the Results from deaf-blindness to normal people:

Braille switch's						
S1	S2	S3	S4	S5	S6	Output on LCD
ON	OFF	OFF	OFF	OFF	OFF	A
ON	ON	OFF	OFF	OFF	OFF	B
ON	OFF	OFF	ON	OFF	OFF	c
ON	OFF	OFF	ON	ON	OFF	d
ON	OFF	OFF	OFF	ON	OFF	e
ON	ON	OFF	ON	OFF	OFF	f
ON	ON	OFF	ON	ON	OFF	g
ON	ON	OFF	OFF	ON	OFF	h
OFF	ON	OFF	ON	OFF	OFF	i
OFF	ON	OFF	ON	ON	OFF	j
ON	OFF	ON	OFF	OFF	OFF	k
ON	ON	ON	OFF	OFF	OFF	l
ON	OFF	ON	ON	OFF	OFF	m
ON	OFF	ON	ON	ON	OFF	n
ON	OFF	ON	OFF	ON	OFF	o
ON	ON	ON	ON	OFF	OFF	p
ON	ON	ON	ON	ON	OFF	q
ON	ON	ON	OFF	ON	OFF	r

OFF	ON	ON	ON	OFF	OFF	s
OFF	ON	ON	ON	ON	OFF	t
ON	OFF	ON	OFF	OFF	ON	u
ON	ON	ON	OFF	OFF	ON	v
OFF	ON	OFF	ON	ON	ON	w
ON	OFF	ON	ON	OFF	ON	x
ON	OFF	ON	ON	ON	ON	y
ON	OFF	ON	OFF	ON	ON	z
OFF	OFF	ON	OFF	ON	ON	0
OFF	ON	OFF	OFF	OFF	OFF	1
OFF	ON	ON	OFF	OFF	OFF	2
OFF	ON	OFF	OFF	ON	OFF	3
OFF	ON	OFF	OFF	ON	ON	4
OFF	ON	OFF	OFF	OFF	ON	5
OFF	ON	ON	OFF	ON	OFF	6
OFF	ON	ON	OFF	ON	ON	7
OFF	ON	ON	OFF	OFF	ON	8
OFF	OFF	ON	OFF	ON	OFF	9
ON	OFF	OFF	ON	ON	ON	?
OFF	ON	ON	ON	OFF	ON	!
OFF	OFF	OFF	ON	OFF	ON	.
OFF	OFF	OFF	ON	OFF	OFF	‘
OFF	OFF	OFF	ON	ON	ON	SPACE
OFF	OFF	ON	OFF	OFF	OFF	CLEAR

*** S1, S2… S6 = switches allow deaf-blindness to enter data.**

Result from normal people to deaf-blindness:

Table 2 shows the Results from normal people to deaf-blindness:

INPUT	OUTPUT						
	Actuator motors						LCD
	M1	M2	M3	M4	M5	M6	
‘a’ pressed	ON	OFF	OFF	OFF	OFF	OFF	A
‘b’ pressed	ON	ON	OFF	OFF	OFF	OFF	B
‘c’ pressed	ON	OFF	OFF	ON	OFF	OFF	C
‘d’ pressed	ON	OFF	OFF	ON	ON	OFF	D
‘e’ pressed	ON	OFF	OFF	OFF	ON	OFF	E
‘f’ pressed	ON	ON	OFF	ON	OFF	OFF	F
‘g’ pressed	ON	ON	OFF	ON	ON	OFF	G
‘h’ pressed	ON	ON	OFF	OFF	ON	OFF	H
‘i’ pressed	OFF	ON	OFF	ON	OFF	OFF	I
‘j’ pressed	OFF	ON	OFF	ON	ON	OFF	J
‘k’ pressed	ON	OFF	ON	OFF	OFF	OFF	K
‘l’ pressed	ON	ON	ON	OFF	OFF	OFF	L
‘m’ pressed	ON	OFF	ON	ON	OFF	OFF	M
‘n’ pressed	ON	OFF	ON	ON	ON	OFF	N
‘o’ pressed	ON	OFF	ON	OFF	ON	OFF	O
‘p’ pressed	ON	ON	ON	ON	OFF	OFF	P

'q' pressed	**ON**	**ON**	**ON**	**ON**	**ON**	**OFF**	**Q**
'r' pressed	**ON**	**ON**	**ON**	**OFF**	**ON**	**OFF**	**R**
's' pressed	**OFF**	**ON**	**ON**	**ON**	**OFF**	**OFF**	**S**
't' pressed	**OFF**	**ON**	**ON**	**ON**	**ON**	**OFF**	**T**
'u' pressed	**ON**	**OFF**	**ON**	**OFF**	**OFF**	**ON**	**U**
'v' pressed	**ON**	**ON**	**ON**	**OFF**	**OFF**	**ON**	**V**
'w' pressed	**OFF**	**ON**	**OFF**	**ON**	**ON**	**ON**	**W**
'x' pressed	**ON**	**OFF**	**ON**	**ON**	**OFF**	**ON**	**X**
'y' pressed	**ON**	**OFF**	**ON**	**ON**	**ON**	**ON**	**Y**
'z' pressed	**ON**	**OFF**	**ON**	**OFF**	**ON**	**ON**	**Z**
'1' pressed	**OFF**	**ON**	**OFF**	**OFF**	**OFF**	**OFF**	**1**
'2' pressed	**OFF**	**ON**	**ON**	**OFF**	**OFF**	**OFF**	**2**
'3' pressed	**OFF**	**ON**	**OFF**	**OFF**	**ON**	**OFF**	**3**
'4' pressed	**OFF**	**ON**	**OFF**	**OFF**	**ON**	**ON**	**4**
'5' pressed	**OFF**	**ON**	**OFF**	**OFF**	**OFF**	**ON**	**5**
'6' pressed	**OFF**	**ON**	**ON**	**OFF**	**ON**	**OFF**	**6**
'7' pressed	**OFF**	**ON**	**ON**	**OFF**	**ON**	**ON**	**7**
'8' pressed	**OFF**	**ON**	**ON**	**OFF**	**OFF**	**ON**	**8**
'9' pressed	**OFF**	**OFF**	**ON**	**OFF**	**ON**	**OFF**	**9**
'0' pressed	**OFF**	**OFF**	**ON**	**OFF**	**ON**	**ON**	**0**
'?' pressed	**ON**	**OFF**	**OFF**	**ON**	**ON**	**ON**	**?**
'!' pressed	**OFF**	**ON**	**ON**	**ON**	**OFF**	**ON**	**!**
'.' Pressed	**OFF**	**OFF**	**OFF**	**ON**	**OFF**	**ON**	**.**
' ' ' pressed	**OFF**	**OFF**	**OFF**	**ON**	**OFF**	**OFF**	**'**
'space' pressed	**OFF**	**OFF**	**OFF**	**ON**	**ON**	**ON**	**SPACE**
'Clear' pressed	**OFF**	**OFF**	**ON**	**OFF**	**OFF**	**OFF**	**CLEAR**

Simulation Design:

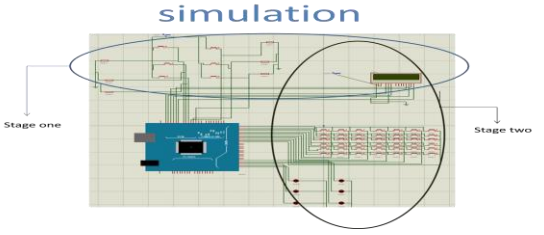


Figure 9. Software Design

Simulation Result:

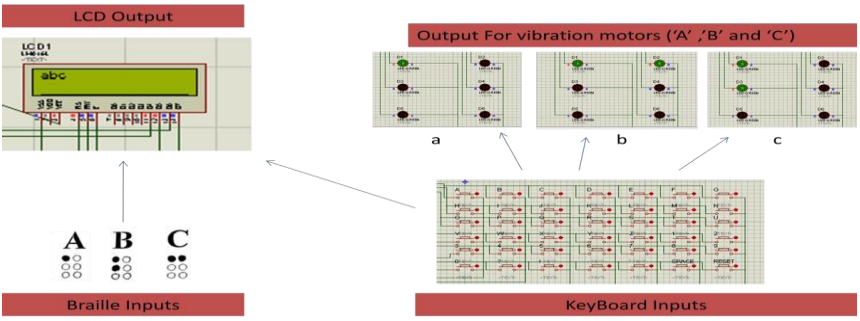


Figure 10.Software Results

Hardware Implementation (on Breadboard):

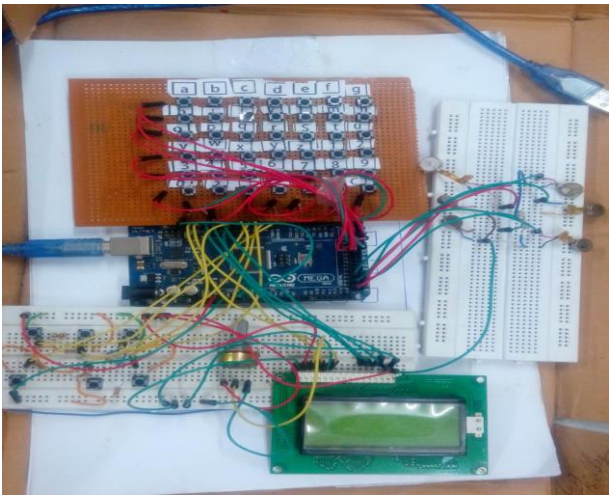


Figure 11. Hardware Design

Discussion:

As we know the in first chapter in problem statement deaf-blind people face problems in communicate with other normal people and vice versa, so the objective of the project to make portable assistance device that help them to set this communication ,so from the objective we made the methodology we want use to solve this problem, and also as we know in our methodology the inputs will be taking from two sides (deaf-blind side and normal people side) and give also two results to both sides for deaf-blind (vibration movement) and normal people (LCD) and this will be done by using our equipment and

components on simulation and in real life , the results come as expected in the proposal for both simulation and real life hardware .

Results of translation process:

The results will separate for two stages as we know in last chapter (from deaf-blindness to normal people and from normal people to deaf-blindness), so both of results will appear on Simulation software and Real life hardware and by using the switches and the keyboard we can enter the data to microcontroller who will take action to do processing operation and send orders to output devices at the end the using of Methodology give us correct results on both LCD and vibration motor.

- *Result Translation from deaf-blind to normal people :*

In this stage deaf-blindness can enter the data from six switches by using Braille language , the output will appear on LCD in term of English letters so when deaf-blind continuous entering data the letters will make understandable words for normal people on LCD and all this happens instantaneously .

- *Result Translation from normal people to deaf-blind :*

In this stage normal people will enter data from keyboard by using English alphabetic, so two action will take place, first the actuator motor will vibrate in hand of deaf-blindees in same term of Braille dots so it give sensible information and it will be understandable for them, second all the letters will appear on LCD for people to make sure they enter the right letters.

Conclusion:

As we know there are large number of deaf-blind people across the world and they face series problems every day because the miscommunication between them and normal people and they Have to get help from professional assistant how have good knowledge on Braille tactile language every time they need to communicate with society, and this is will be difficult for them.

Braille translator is electronic system and portable assistant use integrated equipments how serve to help the deaf-blind and set this communication with normal people ,by using electronic equipments from switches and keyboard to get inputs and for output

motors to give sensory information to deaf-blind and LCD to show the data in normal human language .

In this report Braille Translator using portable design to allow deaf-blind move anywhere without facing problem in weight of design because all equipment using in this project is not heavy and it's easy to carry, by using Braille translator deaf-blind will not dace the problem in communication with people and society and they can be more confident to go for outside world and share their thoughts and ideas and success in life as Proud deaf-blind persons.

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