MALAYALAM BRAILLE TRANSMUTATION TO TEXT AND SPEECH USING FPGA

Adithya R, Kanishma krishnakumar, Mahalekshmi V, Riya jose, B.Tech student, Veena Gopan
B.Tech student, B.Tech student, B.Tech student, B.Tech student, Assistant Professor
Electronics and communication engineering
College of Engineering and Management Punnapra, Alappuzha, India.

Abstract : — The Braille system has been used by the visually impaired peoples for reading and writing and also for the communication and contact with the outside world. This paper presents the implementation of Malayalam Braille Recognition with voice and text conversion. The input is applied as different combinations of six cells to the FPGA Spartan 6 processor. It is converted into corresponding Malayalam text through the decoding logic in Verilog language. The corresponding alphabet is displayed on the desktop using an interface with the Spartan 6 processor. Also it is converted to speech using an IC aP890341/170/085.

IndexTerms **- FPGA, Braille language, Spartan 6, Xilinx, VGA, Verilog.**

I. INTRODUCTION

Braille is a tactile writing system used by cecity people. It is traditionally written with embossed paper. Braille users can read computer screen and electronic supports using refreshable Braille displays. They can write Braille with the original slate and stylus or type it on a Braille writer computer that prints with a Braille embosser. Braille was invented by a blind Frenchman, Louis Braille, in 1829. Braille is comprised of a rectangular six-dot cell on its end, with up to 63 possible combinations using one or more of the six dots. Braille is embossed by hand or with a machine onto a thick paper and read with the fingers moving across on top of the dots. Braille comprises of basic six dots, which are arranged in the form of matrix. Each characters have rectangular blocks called cells that have tiny bumps called raised dots. The number and arrangements of these dots distinguish one character from another. Braille cells are not only thing to appear in Braille text. There are embossed illustrations and graphs, with the lines either solid or made of series of dots, arrows, bullets that are larger than Braille dots etc. A complete Braille cell includes six raised dots arranged in two columns, each column having three dots. The dot positions are identified by six dot system. numbers from one to six.

Bharati Braille is the adaptation of the six dot system for the Indian languages. The history of Bharati Braille dates back to the period prior to independence of India. Schools for the blind had already been established in the country during the latter part of the nineteenth century and Braille had found acceptance as an appropriate medium for educating the blind. The complexities of the writing systems of Indian languages had somewhat hindered the development of Braille specific to the Indian environment. Braille can be actually seen as a script for writing a language. Indian languages are based on a writing system which is phonetic in nature. Hence some scholars had recommended Braille as one of the scripts that could be used for writing text in the different Indian languages. In fact India had recommended to UNESCO to consider a universal standard for Braille, based on a Phonetic representation of sounds using the six dot system.

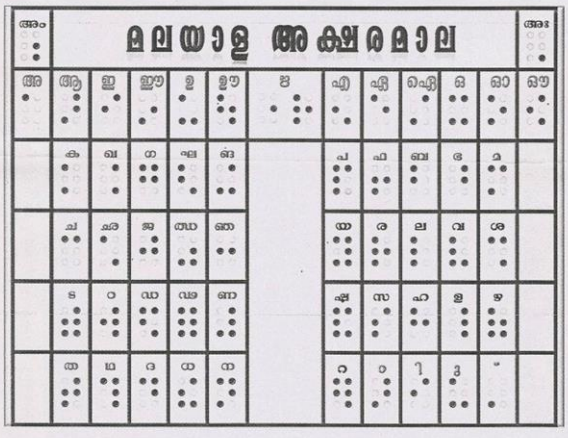


fig 1. malayalam braille

Since Braille is one of the most important ways for the blind to learn and obtain information, transliterating normal text into Braille became a necessity. However, manual transliteration is time consuming and prone to have errors; Hence systems to perform automatic transliteration have been conceived. Out of the 37 million blind population across the globe, over 15 million are from India. But most of the available knowledge resources for blind persons in Braille script are in English, Chinese and Arabic and are not available in Indian languages. The proposed system deals with conversion of printed Malayalam text into Braille and speech using FPGA spartan-6 kit and voice OTP IC aP89341/170/085. In this system the input is given to the FPGA board through Braille keypad which consists of different combinations of cells. FPGA converts this input in to corresponding Malayalam text by decoding in Verilog language. After decoding the corresponding alphabet is converted to speech through an algorithm. Here Voice

OTP IC aP89341/170/085 which has 254 voice groups is used for conversion of text to speech. The result can be obtained in PC which is interfaced with spartan-6 kit.

II. LITERATURE REVIEW

The braille system has been used by the cecity people for reading and writing. Through the computer can be read out scanned Braille document to text. The Braille documents are proprioceptive to enhance the dots and decrease the noise. The segmented Braille cells and the dots from each cell is extricate and converted in to a number sequence. These are represented to the suitable alphabets of the language. The paper provides a mechanism to enter the Braille characters through the number pad of the keyboard. The typed Braille character is mapped to the alphabet and spoken out [1]. Using MATLAB technique Image processing provides the floor to perform the segmentation of Braille cell for pattern selection and hence, Odia letter and word recognition. Braille Data Base creation acts as a storage system for the process and its accuracy is tested [2].

Curtin University Braille (CUB) is a Personal Digital Assistant (PDA) for visually impaired people. The translator impledges Blenkhorn' s algorithm in hardware, clearing the microprocessor to perform other functions. The Braille keyboard controller along with a low cost keyboard provides users with a note-taking function. These modules are used as intellectual property (IP) cores coupled to a 32-bit Micro blaze processor in an embedded system-on-a-chip (SoC) [3]. System is linked with to establish a two way communication path by using a computer system and Braille pad. We will send the message to the computer of blind person where it is connected to the computer which is able to read the message using the MAX232 IC through built-in command. Then it converts the character of the message by using a lookup table. The converted message is in the form of a braille language which is read by the blind person [4].

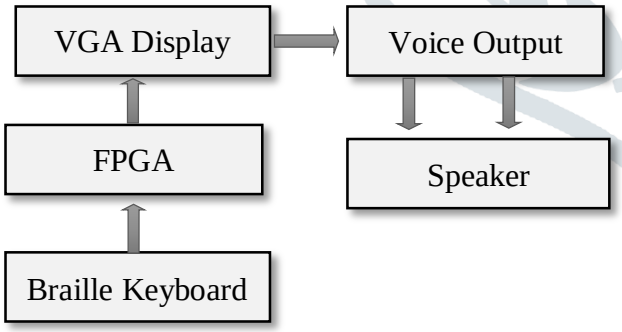
The input from the braille keypad which consists of dissimilar combinations of cells. This input goes to the FPGA Spartan3 Kit. FPGA converts the input into corresponding English text through the decoding logic in VHDL language. After decoding, the proportionate alphabet is converted to speech along algorithm. Also it is displayed on the LCD by interfacing the LCD to the Spartan3 kit [5].The system, converts the message that the person wants to communicate to other person into a voice and text. The system is implemented on the open source Arduino platform which makes it more efficient and also cost effective. The push button is pressed, it will connect the two points in a circuit. 9v battery is used as an input to these push buttons and the 9v power supply is converted into 5v using IC7805.In the serial monitor the output will be displayed. The output from the Arduino is given to the voice module, here we get the voice output [6].

III. CONVERSION OF BRAILLE TO MALAYALAM

The Spartan-6 family of Field-Programmable Gate Arrays is explicitly designed to meet the needs of high volume cost-sensitive costumer electronic applications. The Spartan-6 family builds on the success of the earlier Spartan-IIE family by increasing the amount of logic resources, the capacity of internal RAM, the total number of I/O, and the overall level of performance also by improving clock management functions.

For converting braille to Malayalam text, input is taken through braille keyboard. In this conversion method, Braille input is converted to appropriate Malayalam text. Input given from keyboard to FPGA is first converted to the number sequence. This combination of number sequence forms corresponding Malayalam text. VGA display is used for display of the Malayalam text. A voice output similar to the Malayalam text is presented as a response to the user. ICap89042is used as output IC.

3.1 Block Diagram



Block diagram of braille to Malayalam text and speech converter consist of the following block

- Braille Keyboard
- FPGA
- VGA
- Voice output device (IC aP89341/170/085)

The input is applied as different combinations of six cells to the FPGA Spartan 6 processor. Push button on braille keypad, after that pressed button combination of dot cell(characters) are taken by software as input. It is converted into corresponding Malayalam text through the decoding in Verilog language. Alphabet is then displayed on the desktop using an interface with Spartan 6 processor. The corresponding speech is generated using IC ap89341/170/085.

3.2 Units Voice Output Device

aP89341/170/085 series is a high performance Voice OTP which is fabricated with Standard CMOS process with embedded 8M/4M/2M bits EPROM. It has maximum 254 voice groups. This voice device can store up to 341/170/085 sec voice message with 4-bit ADPCM compression at 6KHz sampling rate. PCM of 8-bit is also available as user selectable option. Three trigger modes, simple Key trigger mode, Parallel CPU trigger mode and CPU serial command mode, facilitates different user

interface. The user selectable triggering and output signal options provide maximum flexibility to various applications. 8-bit current mode D/A output, Built-in resistor controlled oscillator, and PWM direct speaker driving output minimize the number of external components. PC controlled programmer and developing software are available.

3.3 Braille word interpretation

Braille is the world's first binary encoding device corresponding to writing alphabet by braille language. These interpretations are used many things like mathematics and music etc., which have different meanings supported by the setting. The Braille keypad has vertical and horizontal dots, containing six dots. The dots are listed 1, 2, 3 from top of leftward column and 4, 5, and 6 from rightward column 3X2 matrix number pad is used to provide input to the FPGA there are different number sequence Malayalam alphabet.

table 1 : mapping of alphabets

Characters	Representation	Characters	Representation
□	74	□	7842
□	851	□	784512
□	84	□	8512
□	51	□	8451
□	712	□	7852
□	7452	□	785
□	8452	□	8412
□	42	□	7851
□	75	□	7841
□	81	□	451
□	7812	□	74
□	751	□	85
□	842	□	781
□	71	□	78512
□	82	□	7412
□	7845	□	741
□	742	□	7412
□	812	□	782
□	78	□	78412
□	72	□	841
□	845	□	745
□	512	□	852
□	45	□	74512
□	84512	□	78452
□	8452		

IV. EXPERIMENTAL RESULT

Implementation of Braille to Malayalam text and speech using FPGA processor has been presented. FPGA processor is the main component in this project. The Spartan 6 FPGAs provide high speed serial connectivity, high-performance chip-to-chip interface capability, high memory capacity, flexibility and low power. We developed a Braille keyboard through which input is given to the Spartan 6 FPGA, which is processed by Xilinx impact software. The text output is displayed in the monitor. Corresponding speech is also generated through an IC ap89341/ 170/085 which can store up to 254 voice groups. It drives speaker directly. The code is written using Verilog programming language.

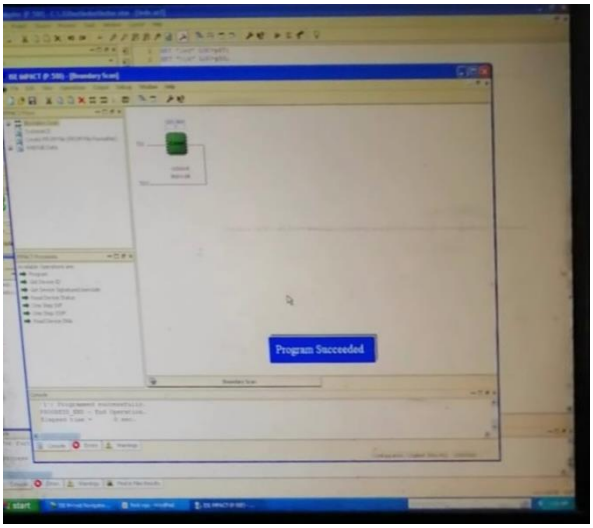


fig 2. program running successfully

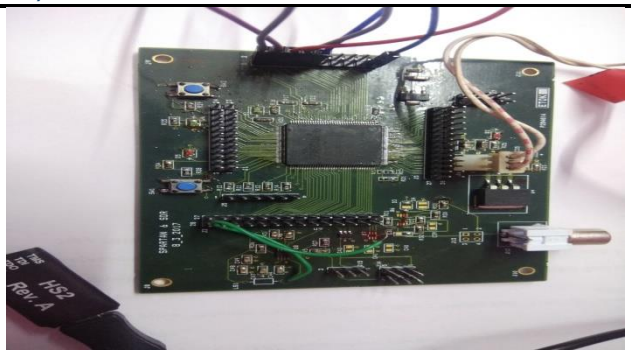


fig.3. spartan 6 fpga

V. CONCLUSION

The paper focuses on conversion of Braille to Malayalam text and audio that will provide a platform for the cecity persons to interact with others in their native language. It is a convenient method to communicate with the help of braille keyboard where the output is displayed in the monitor and corresponding audio is produced through a speaker simultaneously. It helps a normal person to understand braille script and the voice output through the speaker would enable us to understand what the blind person want to convey. The Spartan 6 FPGA processor is used because of their high speed, high memory capacity and high performance chip-to-chip interface. The voice is processed through an IC ap89341/170/085. It can store upto 254 voice groups. In this paper we have created only basic 51 Malayalam characters. Hence the voice synthesizer for native language had pronunciation errors. The improved system can be built using another ap89341/170/085 IC and including all other combinational letters of Malayalam language.

REFERENCES

[1] S.Padmavathi, Manojna K.S.S, Sphoorthy Reddy .S & D Meenakshy., On Conversion of braille to text in English, Hindi and Tamil languages" International Journal of Computer Science, Engineering and Applications (IJCSEA) Vol.3, No.3, June 2013

[2] K.Parvathi, B. Maynoher Samal & Jitendra Kumar Das, Odia Braille:Text Transcription via Image Processing" 1st International conference on futuristic trend in computational analysis and knowledge management (ABLAZE 2015)

[3] Xuan Zhang, Cesar Ortega-Sanchez & Iain Murray, Reconfigurable PDA for the Visually Impaired Using FPGAs" International Conference on Reconfigurable Computing and FPGAs, 2008.

[4] O.G. Hastak, Shubham Tingane, Apurva Malokar, Sonu Gadwe, & Vrushabh Patle, Interpreter System For Blind People Using Braille Pad" International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 03 | Mar - 2017.

[5] P. P. Chitte, Y. A. Pimpalkar, P. B. Nair, & S. A.Thombe,Braille to Text and Speech for Cecity Persons" IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308.

[6] K.Krishna Kishore ,G. Prudhvi ,M. Naveen " Braille Script to Voice Conversion" IEEE International Conference on Computing Methodologies and Communication (ICCMC) 2017.