

A New Multimedia Approach to Combat Illiteracy in blind Children

Mehak Khurana

Department of Computer Science
The NorthCap University
Gurugram, Haryana, India
mehakkhurana@ncuindia.edu

Jyotika Pruthi

Department of Computer Science
The NorthCap University
Gurugram, Haryana, India
jyotikapruthi@ncuindia.edu

Abstract—Less than 3% of the 145 million blind people living in developing countries are literate. This low literacy rate is partly due to the lack of trained teachers and the challenges associated with learning Braille on a traditional slate and stylus. The solution to this problem is to develop a prototype of a cost effective and user friendly device, capable of facilitating Braille tutoring among the blind. The proposed device aims to incorporate tactile, audio and visual output for the user that can be used for both self and peer-to-peer learning. The prime feature of this system is 3D pattern formation in Braille language for different alphabets and numbers to facilitate Braille learning through a sense of touch.

This device opens up the possibility of an adult who does not have formal Braille training but can assist and help the blind student to learn Braille and also assess their learning levels. This paper provides an overall survey about problems faced using conventional methods for teaching and an insight into developing an effective tutor system for the blind.

Keywords—Braille; sense of touch; tactile output; multimedia

I. INTRODUCTION

In a developing country like India, the current student-teacher ratio for the blind is 23:1 in government schools, which is far more than the proposed 10:1 student-teacher ratio. This results in inefficient teaching or complexities in the learning process. To overcome such a scenario, the need of the hour is a system that not only reduces the current stress faced by the teachers but also is cost effective and eliminates the unnecessary paperwork. Keeping this in mind, the proposed system supports the following functionalities [1][3].

Teaching of Braille through a haptic device: The device inculcates the functionality of 6 balls representing those of Braille cells, having arranged themselves creating a pattern according to the input.

Interactive test mode to assess learning levels: The device incorporates an LCD display and a keypad through which an input can be passed and checked if the output is same in the display

Lesser Complexity: It does not require any formal training to use the device or understand Braille to teach the blind student.

Reduce expensive paperwork and load: It eliminates the use of Braille sheets and hence, would save a lot of cost and also help teachers by reducing their load.

Audio, Visual & Tactile Output: The audio announcement, an LCD for visual verification along with a haptic feedback ensures better level of understanding and learning.

II. LITERATURE SURVEY

Before building this system, a visit to Rashtriya Blind School & Training Center, New Delhi was carried out where an extensive feedback of teaching process for blind students was taken. The entire process was noted down, the problems faced were penned and possible solutions were brainstormed. The shortcomings of traditional methods of Braille tutoring such as the slate and stylus were also researched and their cost-benefit analysis was evaluated [2][5].

The conclusion came out to be an idea of a device that could incorporate tactile output and is cost effective and easy to understand [4].

A lot of websites were explored with a motive to accumulate as many problems as possible and answer most of them through a single device [6]. It was observed that the current implementations like Perkins SMART Braille or the Next Generation Perkins Braille, are either too expensive or suffer from other shortcomings such as the lack of interactive learning and no tactile output [7][8].

III. WORKING OF THE PROJECT

A. Block Diagram

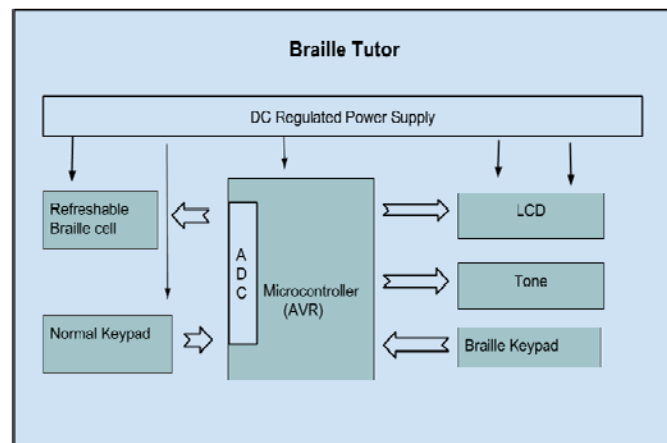


Figure 1. Block Diagram of the tutor system

The main component of the system is the programmable AVR microcontroller which guides the entire system. The user can input the letter from keypad to make the students learn or from the braille keypad to assess their learning levels. On the basis of input correspondingly the braille pattern gets generated along with audio and LCD output [9].

B. Modes

The prototype of the proposed system has 2 working modes, Learning mode and the Assessment Mode.

Learning Mode: As a part of the learning mode, the teacher can input any alphabet or number through a standard keyboard. As a result, the pattern for that alphabet or number is generated in Braille through the movement of the balls arranging themselves. The output also comprises of LCD display along with an audio announcement for the input.

Assessment Mode: As a part of the assessment mode, the teacher can ask the blind student to make the braille pattern for any alphabet through braille keypad. If the pattern drawn is correct, the output can be verified through the LCD by the teacher.

C. Images

The real time working of the project can be understood through the following images:

Figure 2 represents the manual diagram which demonstrates the input given and the output received.

Figure 3 shows the input, output and display mode of the system. Input mode takes input from the user and output mode will give the output through voice and display mode displays the output through LED's.

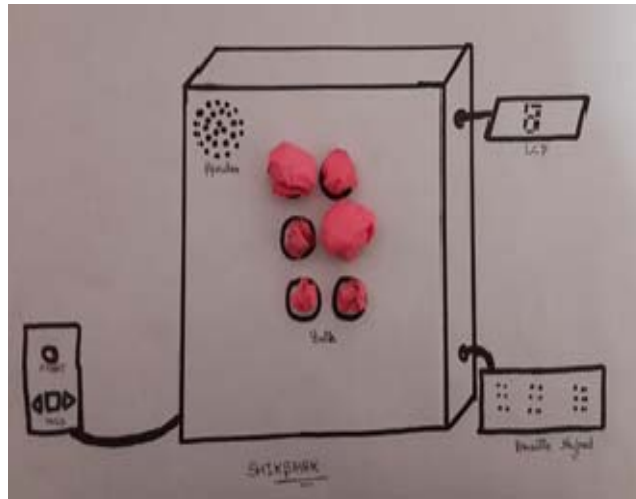


Figure 2: Demonstration of the tutor system

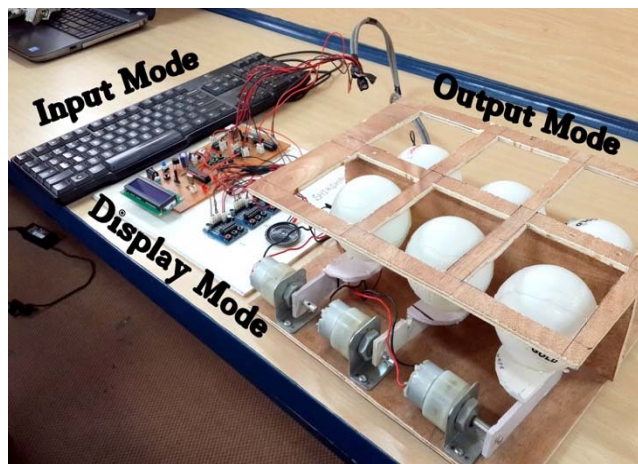


Figure 3: Working of the system

IV. APPLICATIONS

The device can be used in a variety of applications like in education centers and blind schools where it can be used as a standalone system to make the students learn Braille language.

Alternatively, it can be used by parents in homes for their blind children and can use it as a fun learning device.

V. CONCLUSION

Shikshak Tutor facilitates learning of Braille through a sense of touch along with aided audio and visual display. The teachers who don't even know Braille can make the students learn the language by providing inputs through keyboard and the students can feel the corresponding pattern and therefore, memorize it better.

Shikshak Tutor system in its prototype version supports pattern formation for all alphabets and numbers along with a test mode to evaluate the learning levels.

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REFERENCES

- [1] M. Dias ; Sarah Belousov ; Mohammed Rahman ; Saurabh Sanghvi ; Imran Fanaswala ; Wael Ghazzawi ; Ameer Abdulsalam ; Noura El-Moughny ; S. Menon,, An automated braille writing tutor with multilingual exercises and educational games, Information and Communication Technologies and Development (ICTD), 2009 International Conference on Year: 2009,Pages: 478 -478, DOI: 10.1109/ICTD.2009.5426741.
- [2] N. Kalra; T. Lauwers; D. Dewey; T. Stepleton; M. B. Dias, Iterative design of a Braille writing tutor to combat illiteracy, Information and Communication Technologies and Development, 2007. ICTD 2007. International Conference on Year: 2007, Pages: 1 9, DOI: 10.1109/ICTD.2007.4937386
- [3] Md Khalilur Rahman; M. F. Dias; S. Belousov; S. Sanghvi, Enhancing an automated Braille Writing Tutor, Intelligent Robots and Systems, 2009. IROS 2009. IEEE/RSJ International Conference on Year: 2009, Pages: 2327 2333, DOI: 10.1109/IROS.2009.5354812
- [4] B. Abdellah, D. Theo and M. Bernard. An approach of reinforcement learning use in tutoring systems. In Proceedings of International Conference on Machine learning and Applications, ICMLA'02, 2002.
- [5] C. R. Beal, I. Arroyo, J. M. Royer, and B. P. Woolf, "Wayang Outpost: An intelligent multimedia tutor for high stakes math achievement tests." Accepted to the American Educational Research Association annual meeting, April 2003
- [6] Nidhi Kalra, Tom Lauwers, and M. Bernardine Dias, "A Braille Writing Tutor to Combat Illiteracy in Developing Communities," Artificial Intelligence in Information Communication Technology for Development workshop at IJCAI 2007. Available at: http://www.ri.cmu.edu/pub_files/pub4/kalra_nidhi_2007_1/kalra_nidhi_2007_1.pdf
- [7] Johnson and L., "The Braille Literacy Crisis for Children", Journal of Visual Impairment & Blindness, v90, n3, p276-78, ISSN: 0145-482X, May-June 1996
- [8] World Health Organization, "Fact Sheet: Visual impairment and blindness", October 2013, Web, July 01, 2014, <http://www.who.int/mediacentre/factsheets/fs282/en/>.
Baker, R. S. J. d., de Carvalho, A. M. J. A., Raspat, J., Corbett, A., & Koedinger, K. R. (2009). Educational software features that encourage or discourage "gaming the system." Proceedings of the 14th International Conference on Artificial Intelligence in Education (pp. 475-482). Amsterdam, The Netherlands: IOS