



DEVELOPMENT OF ELECTRONIC “BRAILLE KEYBOARD” FOR SMARTPHONES AND COMPUTERS

Shohruh Begmatov¹

Mukhriddin Arabboev²

Associate Professor, Department of TV and Radio Broadcasting Systems,
¹⁻²Tashkent University of Information Technologies named after Muhammad al-
Khwarizmi, Tashkent, Uzbekistan

Khabibullo Nosirov³

³Professor, Department of TV and Radio Broadcasting Systems, Tashkent
University of Information Technologies named after Muhammad al-Khwarizmi,
Tashkent, Uzbekistan

<https://doi.org/10.5281/zenodo.7514864>

Abstract. In recent years, one of the most emerging trends is to develop various electronic smart gadgets in order to create a comfortable opportunity for the blind and visually impaired. For example, smart watches, smart cane, smart glasses and similar modern technologies. This paper presents the development of Braille-based external USB keyboards for the blind and visually impaired that can be connected to computers and smartphones.

Introduction. According to the WHO report [1], globally, at least 2.2 billion people have a near or distance vision impairment, and these numbers are expected to increase in the coming decades. These billions of people who have a near or distance vision impairment need modern mobile devices in their daily lives. Mobile devices (especially smartphones) greatly help them to perform various tasks in their daily life. In recent decades, various researches have been conducted to develop various modern smart devices for blind people [2-8]. One of the most critical aspects in developing devices for the blind is that the device to be designed is based on Braille, which the blind can understand. Braille is a system of raised dots that can be read with the fingers by people who are blind or who have low vision [9]. Braille was invented by the French educator and inventor Louis Braille. The Braille system is specialized a reading and writing system for use by people who are visually impaired [10]. The rest of the paper is devoted to developing external USB Braille keyboards for computers and smartphones.

Development of electronic “Braille keyboard” for smartphones.

This section of the paper is devoted to developing an external USB Braille keyboard for smartphones. The development process of an external Braille keyboard for smartphones consists of the following hardware components [11]:

- a) ATmega32U4 microcontroller;
- b) Buttons (push-button);



c) USB type B Micro Male cable

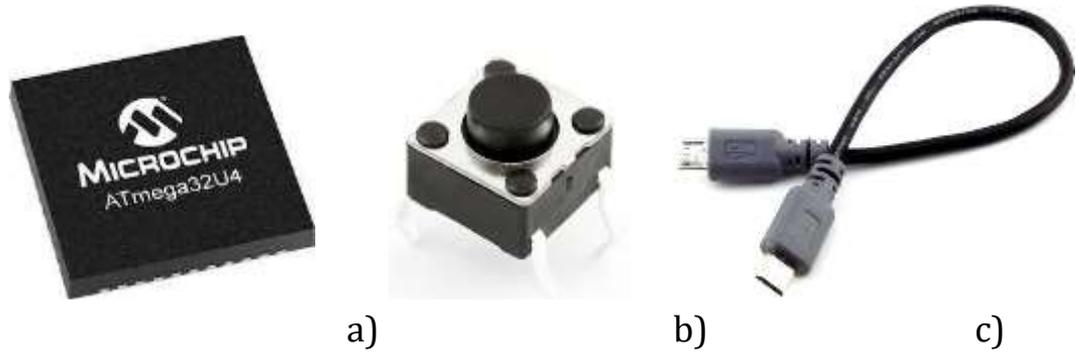


Fig. 1. Essential components for developing an external USB Braille keyboard for smartphones



Fig. 2. Proposed external USB Braille keyboard for smartphones: a) The real view of the proposed keyboard; b) The state of the proposed keyboard connected to the smartphone (Android)

Development of electronic “Braille keyboard” for computers.

This section of the paper is devoted to developing an external USB Braille keyboard for computers. The development process of an external Braille keyboard for computers consists of the following hardware components [10]:

- a) Microcontroller (ATmega32U4);
- b) buttons (SMD Tactile Switch);
- c) USB type A Male cable.

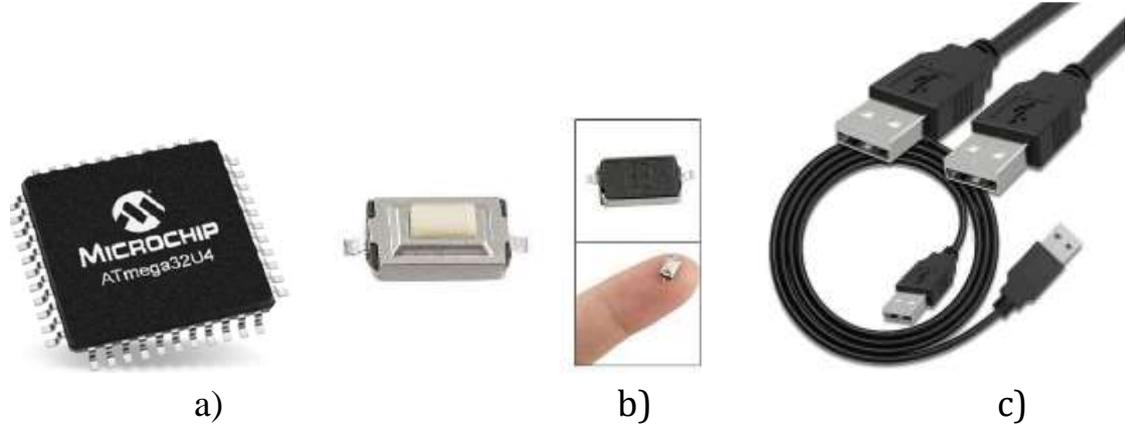


Fig. 3. Essential components for developing an external USB Braille keyboard for computers

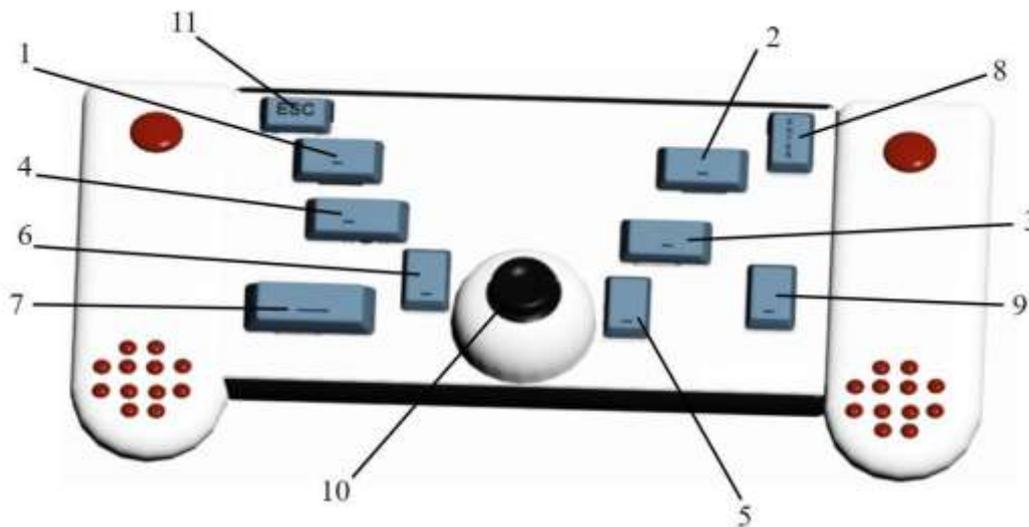


Fig. 4. Proposed external USB Braille keyboard for computers

According to Fig. 4, each number means components of the proposed braille keyboard for computers [10]: 1) The first button of the 6-dot Braille-based keys and the most used function for combinations; 2) The second button of the 6-dot Braille-based keys and the function used for combinations is the BACKSPACE function; 3) The third button of the 6-dot Braille-based keys and the function used for combinations; 4) The fourth button of the 6-dot Braille-based keys and the function used for combinations; 5) The fifth button of the 6-dot Braille-based keys and the function used for combinations; 6) The sixth button of the 6-dot Braille-based keys and the function used for combinations; 7) The SPACE function of the computer keyboard was created mainly as a convenience for exchanging messages; 8) The ENTER function of the computer keyboard was created mainly as a convenience for exchanging messages; 9) Extra button for typing; 10) The joystick fulfills the task of a computer mouse; 11) ESC function of the computer keyboard.

Conclusion.

In conclusion, this paper presents electronic Braille keyboards that have been developed for the visually impaired, which can be connected to a computer and a smartphone. These keyboards are developed for providing the blind with low-cost gadgets. In future research, we plan to develop a Braille display for the blind and visually impaired.

References:

1. "Blindness and vision impairment," WHO, 2022. [Online]. Available: <https://www.who.int/newsroom/fact-sheets/detail/blindness-and-visual-impairment>
2. S. S. D. Kameswari, D. Harika, and D. K. Sahu, "Braille Keyboard for Blind People," *Int. J. Recent Technol. Eng.*, vol. 8, no. 1, pp. 156–159, 2019.



3. M. Amrulloh, A. Fauzi, and K. R. Kawuri, "Development of Wireless and Portable a Self Learning Braille Device Based on Android Smartphone," no. 36, pp. 4–9, 2018.
4. K. Nosirov, S. Begmatov, and M. Arabboev, "Display integrated mobile phone prototype for blind people," in International Conference on Information Science and Communications Technologies: Applications, Trends and Opportunities, ICISCT 2019, 2019, pp. 1–4.
5. J. A. Lordson Benhurr, C. Tawadia, M. Mohatram, N. Joseph, and M. A. Razzak, "Pocket Braille Keyboard – Reader using Braille Back Service," J. Student Res., pp. 1–6, 2017.
6. S. Sultana, A. Rahman, F. H. Chowdhury, and H. U. Zaman, "A novel Braille pad with dual text-to-Braille and Braille-to-text capabilities with an integrated LCD display," 2017 Int. Conf. Intell. Comput. Instrum. Control Technol. ICICICT 2017, vol. 2018-Janua, pp. 195–200, 2018.
7. B. Šepić, A. Ghanem, and S. Vogel, "BrailleEasy: One-handed Braille Keyboard for Smartphones," Stud. Health Technol. Inform., vol. 217, pp. 1030–1035, 2015.
8. K. Dobosz and M. Szuścik, "OneHandBraille: An alternative virtual keyboard for blind people," Adv. Intell. Syst. Comput., vol. 659, pp. 62–71, 2018.
9. "What is Braille?", American Foundation for the Blind, 2017. Available: <https://www.afb.org/blindness-and-low-vision/braille/what-braille#>
10. M. Arabboev, S. Begmatov, Z. Rakhimov, K. Gaziev, and K. Nosirov, "Design of an External USB Braille Keyboard for Computers", CAJOTAS, vol. 3, no. 11, pp. 145-150, Nov. 2022.
11. M. Arabboev, S. Begmatov, and K. Nosirov, "Development of Software for an External Braille Keyboard for Smartphones", CAJMTCS, vol. 3, no. 11 pp. 60-65, Nov. 2022.

