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"Learn Braille": A Serious Game Mobile App for sighted Braille Learners

P. D. Hatzigiannakoglou* and M. T. Kampouraki

Department of Educational and Social Policy, University of Macedonia, Thessaloniki 54636, Hellas

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Abstract

A novel serious game for learning Greek and English Braille code is presented. Its novelty lies in that it offers its users the opportunity to learn and practice Braille and at the same time to test their knowledge through playing a game. As it is indicated by related research a good command of Braille code is a crucial factor that amends the quality of life of individuals with visual impairment; Therefore, it is meaningful that both their family environment and their trainers have a good command of Braille code. The software aims to help such people to acquire and maintain a level of knowledge of Braille code. The developed serious game is a mobile learning application and runs on mobile phones and other portable Android devices.

Keywords: serious game, Braille, sighted individuals, mobile learning.

1. Introduction

In order to gain access to educational material, people with blindness or visual impairment need to select among tactile, visual and acoustic methods or a combination of them. Blind and visually-impaired individuals, who know Braille, enjoy a much better quality of life compared to those who have poor or no Braille skills [1, 2]. The acquisition of Braille knowledge by people with blindness or visual impairment depends, to a great extent, on their educators.

In Greece, trainers and trainees learn to read and to write Braille code by attending courses organized by associations for the blind and the visually-impaired [3]. Trainees have access to two software-based educational tools for learning Greek Braille:

a) WinBraille and PerkiDuck, which are computer-based and are exclusively used to practice writing Braille.
b) "Greek Braille Code", which can run on Android devices and merely presents the Braille code.

In fact, there is practically no software for those who want to obtain certification in Greek Braille that would provide, apart from learning, both the practice and the self-assessment of their knowledge level. The proposed software, which involves all the above functions, can hopefully compensate for the objective shortage in Greek and English Braille training.

To make the self-assessment process more stimulating, two games were developed, one that helps the user evaluate one's reading skills, and another that tests one's ability to write Braille. While designing and developing the proposed software it became obvious that the majority of people who had attended Braille classes and formed the target group of the proposed application, were either undergraduate students or young graduates in the educational sciences. As a result of this observation, a decision was made to develop the software for Android mobile phones and tablets, since these devices are extremely common among people of the particular age group [4]. In support of this choice, an additional feature of that age group, is that they actually like using mobile devices for learning.

The rest of this paper is organized as follows. In Section 2, related work is presented. In Section 3, the design method is discussed. In Section 4, the thematic units and characteristics of the game are given in detail. In Section 5, the paper is concluded and future work is discussed.

2. Related Work

A stimulating factor that prompted us to create the software was the fact that meticulous bibliographic research yielded an extremely limited number of papers pertaining to Braille code educational software for sighted individuals. We located only five articles regarding Braille learning software for sighted people. The research was carried out on the following databases: Scopus, PubMed, ERIC until the 4th of October 2015, and the key-words used were "Braille sighted software", "learn Braille software", "computer-based Braille". We realized that all the related software (Tab. 1) were computer-based and offered training on English Braille code. In addition, none of the above software tools involved the general category of educational games.

3. Designing the game

Throughout designing and developing the proposed software, educators, trainees and persons with blindness or visual impairment were asked to express their opinion. Taking into consideration all the suggestions that they made to better serve their needs, the software was gradually improved and new functions were embedded into it. For example, an

* E-mail address: pxatzi@uom.gr
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individual with low vision proposed that the 6 Braille dots at the "Braille Code" window be numbered (Fig. 1), so that he could memorize them more easily.

One trainer mentioned that the trainees were facing great difficulty in reading text in Braille, particularly when it included double vowels (e.g. ει), which are depicted with one Braille cell in Greek Braille. For instance, the double vowel "ει" is depicted with dots (1, 4, 6). To solve this problem we enriched the vocabulary of the reading game with words containing at least one double vowel. However, we did not include double vowels in the "Hangman" game, in order to maintain the exact match of number of letters and appearing gaps.

Table 1 General characteristics of existing Braille-learning software tools for sighted people.

Authors	Platform	Language	Serious game
G. Kapperman and J. Sticken [5]	Windows-based	English	No
G. Kapperman, A. Heinze, B. B. Hawkins and S. Ruconich [6]	Windows-based	English	No
M. C. Scheithauer, J. H. Tiger and S. J. Miller [7]	Windows-based	English	No
B. C. Putnam and J. H. Tiger [8]	Windows-based	English	No
M. C. Scheithauer and J. H. Tiger [9]	Windows-based	English	No

The persons in charge of the local association pointed out that the software should be flexible enough to allow the trainees to practice according to their personal needs and, at the same time, follow the Braille course curriculum. Such useful remarks were adopted by offering more personalized learning to the trainees, who have the opportunity to make their own combinations and, thus, select the object of their practice (Fig.1). At the self-assessment games the Braille course curriculum was followed. We added a menu through which trainees can select the letter group they are taught in class in order to play the "reading" or "hangman" game.

Finally, people who had previously been trained on Braille proposed that the swipe screen up/down be faster and the speed of the system response be increased, particularly at the practice windows. Moreover, a feature they considered as essential was that whenever a number or a capital letter appears on the screen in Braille, the number sign or the capital sign has to appear as well (Fig. 1).

4. The game

The serious game comprises three thematic units: Braille code learning, practicing, and self-assessment. The learning unit consists of two windows, the "Braille code" window (Fig. 1), where the user sees all Greek and English letters, numbers, punctuation marks and double vowels in Grade I Braille, and the "Write in Braille" window (Fig. 2), where one can type Braille and see the corresponding visual characters. At this stage, it is possible for the user to insert all Braille cells involved in the "Braille code" window.

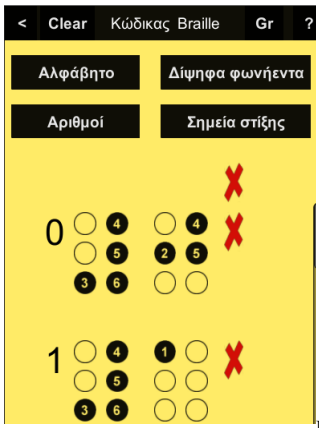

Fig. 1 "Braille code" window.

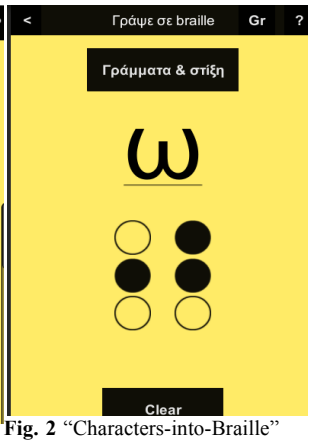

Fig. 2 "Characters-into-Braille" practice test for the Greek alphabet.

In the "Practice" unit, a user is able to test his or her knowledge in Braille. This unit consists of two windows, too: "Characters-into-Braille" and "Braille-into-characters". Before starting any of the two games of knowledge, the user must choose from the "Braille code" window the characters he or she likes by touching the x icon next to each Braille cell (Fig. 1). One may make any combination of Braille cells that one likes. In the "Characters-into-Braille" window the user practices writing Braille. One sees visual characters and tries to create the corresponding Braille cell (Fig. 3). To request a random order of appearance of the characters, one must touch the dice icon.

In the "Braille-into-characters" window, the user practices reading Braille. One sees a Braille cell and has to type the corresponding right visual character (Fig. 4). Respectively, the user can modify the order of appearance of Braille cells by touching the dice.

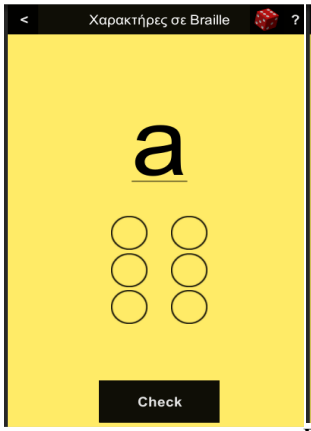

Fig. 3 "Characters-into-Braille" practice test for the English alphabet

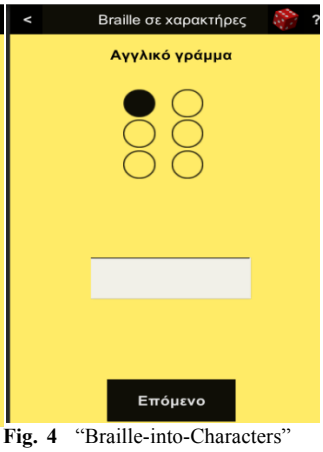

Fig. 4 "Braille-into-Characters" practice test for the English alphabet

In the thematic unit of "Self-assessment" two educational games were created for the user, to test his or her knowledge in reading and writing Braille. Before starting any of the two games, the user must choose from the menu (Fig. 5) the letter group he or she wishes to test his or her knowledge in. The selection of letter groups is consistent with the Braille course curriculum. There are five letter groups available for writing and six for reading. The additional letter group in reading is the set of words that contain double vowels. Lessons at the

local association begin with the Greek letters α, β, κ, λ, ε and in every consecutive lesson 5 new letters are added. When, for example, the user attends the first class, he or she will choose group 1 (α, β, κ, λ, ε) and will play the "Writing" or the "Reading" game with the words «καλα», «καβα», «λαβα», «κακα», «αλλα», «ελαβε» etc. When the user comes to select the 5th group, then one can play "hangman" using the entire Greek alphabet. The same procedure applies to the English alphabet.

The writing game is the popular mind game "Hangman", where the user has to type the letters in Braille cell form. Red characters show wrong choices by the user. If the user types seven wrong letters, then one loses the game. To help the user comprehend the mistakes made, the correct word appears (Fig. 5) both in visual characters and in Braille. One can then see the score one achieved at the top right corner of the screen.

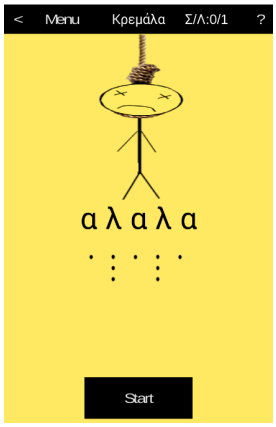

Fig. 5 The "Hangman" game.

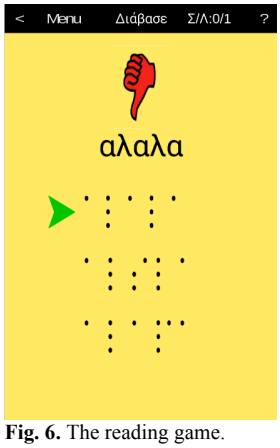

Fig. 6. The reading game.

In the reading game the user sees a word written in visual characters and three words written in Braille code (Fig. 6), out of which only one is correct. The wrong words differ from the correct word in just one character. For example, in Fig. 6 the first word below the word "αλαλα" is the correct one, while the remaining two are wrong. If the user selects a wrong word, he or she receives the corresponding acoustic error message and sees a green arrow that notes the correct word (Fig. 6).

5. Conclusions and future work

In the present communication, a novel software on Braille learning for sighted people is presented. The software is designed for Android mobile platforms and can be used for English and Greek Braille training. To evaluate the proposed software some trainees will be asked to use it during their training on Braille. In such an experimental study, we intend to quantify to what extent the use of our software might help them learn Braille in comparison with other trainees of the same class who will not use the software. Further, an investigation is under way on whether the subjects find the software handy and enjoyable and how helpful it may have turned out for their overall education.

The application is available for download on Play Store: https://play.google.com/store/apps/details?id=com.textware.braille.

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References

1. R.Ryles, Journal of Visual Impairment and Blindness. **90**, 219 (1996).
2. E.J.Rex, Journal of Visual Impairment and Blindness. **83**, 306 (1989).
3. http://www.maty.gr
4. http://www.pewinternet.org/files/old-media/Files/Reports/2013/PIP_Smartphone_adoption_2013_PDF.pdf
5. G.Kapperman, and J.Sticken, Journal of Visual Impairment and Blindness. **97**, 110 (2003).
10.).
6. G.Kapperman, A.Heinze, B.B.Hawkins, and S.Ruconich, Journal of Visual Impairment and Blindness. **90,** 252 (1996).
7. M.C.Scheithauer, J.H.Tiger, and S.J.Miller, Journal of Applied Behavior Analysis. **46**, 436 (2013).
8. B.C.Putnam, and J.H.Tiger, Journal of Applied Behavior Analysis. **48**, 466 (2015).
9. M.C.Scheithauer, and J.H.Tiger, Journal of Applied Behavior Analysis. **45**, 315 (2012