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Designing, translation – learning and evaluation of a Greek/English writing to Braille

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Designing, translation – learning and evaluation of a Greek/English writing to Braille

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Abstract: *The "Greek/English Writing to Braille" translation software helps users during the conversion of every Greek writing (either toneless or polytonic) to Braille, as well as British or Ancient Greek writing to Braille. The translation is completed automatically, eliminating the mistakes risk even for an experienced Braille user. Software's operators can also print the translated Braille texts, using the appropriate Braille machinery. There also the potential of self-learning, which concerns the second part of the software, by learning Greek and English writing to Braille using a PC instead of the manual typewriter that has been used up till now. The operator works out the Greek or English scripts on the software textboxes, typing a variety of combinations of Braille writing, while the software automatically displays the text directly to Braille form. The software also offers the ability to type Braille combinations and automatically appears Greek text. Finally, it is proposed for a self-teaching practice for the Braille writing.*

Keywords: *software, compile, learn, integrate, reduce vision, Braille*

JEL Classification: *I21, I29*

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1 INTRODUCTION

The "Greek/English writing to Braille" translation software can be very powerful means (tool), since it can complete translation automatically, eliminating the mistakes risk, which exists even for the most experienced Braille writing users. In this context, the present paper aims to present the criteria that have taken place during the creation of this program, in order to make it known both to the scientific community and any other interested party (Valachis et al., 2008; Martos et al., 2014).

It is generally accepted that the use of an educational technology or application has been an important part of the modern educational systems (Harris & Reid, 2005). These technologies however, represent just a small percentage of the teaching practices, in relation to the use of corresponding traditional teaching practices or methods (Scheithauer& Tiger, 2012). In particular, the role of new technologies in education and its forms have at least the above two dimensions, according to Scheithauer, Tiger & Miller (2013):

(a) They form a new learning object, which aims to acquiring basic skills that generally influence the educational practice as well as the forms of individuals' employment.

(b) They are a new learning tool which differentiates the way of access to knowledge and learning processes, shaping new frameworks.

Thus, the main and direct benefits of this process are the learning outcomes for every learner, and therefore, the main question being explored is the way these learning outcomes correlate to the use of new teaching methods, compared to the methods used in traditional teaching (Jewett, Bain & Ennis, 1996). On the other hand, the production time of a book in Braille language is considerably higher than the one printed in any regular language, with the production cost parameter being the main obstacle (Harrison, Cooch &Alsup, 2003).

2 TRANSLATION OF GREEK AND ENGLISH WRITING TO BRAILLE

People with vision loss learn to read by necessity, using the sense of hearing and touch, a fact that helps new technologies create the appropriate software (Lemarié et al., 2008). Organized and civilized societies are obliged towards disabled people, and those living in such a society, that in these days is able to present plenty of applications, inside the educational context for people with severe vision issues,

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should help towards this direction (Sigala & Christou, 2007; Hoy & Miskel, 2005). In general, everyone should help in their own way, so that scientific research could be carried out, which then will result in a practical exploitation (Massof, 2009).

The present software has been created to enable teachers who work in integration classes including persons with vision problems, process web information or the one from a text processor (e.g. word) and quickly convert them safely to Braille writing. This offers users an opportunity to translate texts in polytonic form and then read them in Braille writing, including even texts in ancient Greek language. It should be also mentioned that this is software which could be used in Special Education.

The ultimate goals of such an effort are the improvement of the effectiveness of the education systems, within the context of a learning society strategy (Athanasoula – Reppa et al, 2008). In general, translations can be multi-purposed, since a translation or can be the field for drill & practice activities. In the end, it greatly favors those who teach children with visual impairment, it helps Primary and Secondary Education teachers (in order to obtain a certificate of sufficient in Braille knowledge), can be used in Special Schools (Mai, 2004; Roe, 2014) where integration classes with vision-disabled kids are running and finally, can be used in Schools for Blinds or Diagnostic, Support & Differentiation Centers (Kassotakis, 2003). In the last ones, trainers can quickly translate the texts and give them to trainees for practice because of the second part of the text translation exams etc. It should be also emphasized that the "Greek/English writing to Braille" translation software is a specialized one, and aims to a limited audience, i.e. to a small group of people. However, there is software with similar capabilities, with each one of them introducing its own differences.

Because Braille writing is toneless, the software offers users the ability to translate texts from both the Greek and English polytonic writing into Braille writing. The translation software can be very powerful training tool, as the translation is completed automatically, eliminating the risk of errors, which exists even for an experienced Braille user (Argyropoulos et al., 2015).

By constructing the translation software, teachers can help people with impaired vision, read in a simple and easy manner. Teachers can learn and process Greek or English Braille writing environmental information, print them and give them to vision-impaired people to read them. This software offers the ability to translate every text received by those who see, either it belongs to the web or a Microsoft word-like document and paste it into the software's textboxes, using just a button. Then, it can be converted to Braille writing dots within a short period of time (Voudouri et al, 2009).

3 DIFFICULTIES DURING THE SOFTWARE'S IMPLEMENTATION

The software though, cannot be immediately used by vision-impaired students. It is only addressed to those trainees who see and can be used in case the texts are printed by a specialized Braille printer who prints the appropriate embossed dots on a paper surface. A problem emerged with diphthongs, where there is no total correspondence with letters in every character's pressed on the keyboard. Thus, two Greek characters are typed and the corresponding Unicode is taken for the translation which corresponds to a character, while the font will take into account the unique character from Unicode, and not the character from the Greek writing. Thus, the Greek Braille writing is presented distinctive to the diphthongs as well as the special symbols.

4 DESIGNING, DEVELOPMENT, METHODOLOGY AND EMERGING PROBLEMS DURING THE SOFTWARE CONSTRUCTION

Software's creation criteria are different in any case/country and there is not a commonly accepted set for all educational software programs, leaving them on each case and creators' choices. The contemporary international research of educational software is either qualitative or quantitative, empirical or even interpretive, stated or latent, totally or partially, dealing with the below three main areas (Christou & Sigala, 2002; Kapsalis & Theodorou, 2002):

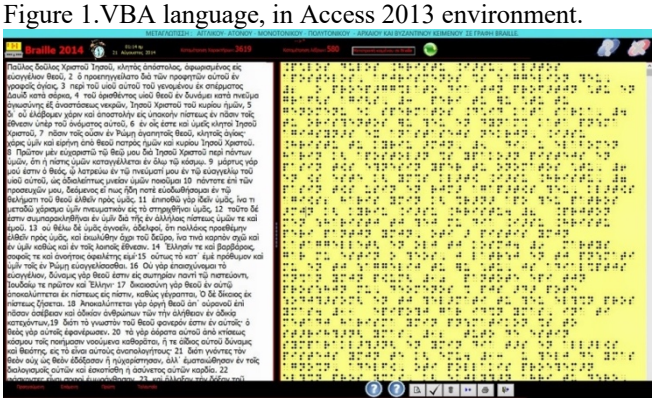
1. Production process
2. Phenomenology of the product, namely its content and structure
3. Its influence to the students

Evaluation objectives of the educational software, as a whole, are interpreting the necessity of the evaluation itself and define the methodology, the axes as well as the criteria on which it will be based.

5 SOFTWARE'S FUNCTIONALITY

Software is a powerful tool. Proof to this is the fact that a two-year pilot study/pre-study was carried out, which launched the software's structure and was accompanied by a printed instruction manual. Concerning the Greek writing, the software does not only translate the toneless text, but can also do this to the monotonic or ancient, thus giving a wide range of potentials to the teachers who will use it in the future. The software's text translation process is completed automatically in a short period of time, eliminating the error risk. Figure 1., below, shows an example in VBA language, in Access 2013 environment.

Figure 1.VBA language, in Access 2013 environment.



i. Translation software makes it possible to copy texts from any site in the web or from every word document, and

paste it into the software's textboxes. Using the Convert button, the whole text contained in the first text box is automatically translated.

ii. Inside the second form which contains the Braille language, it is possible to write a text in Greek language or paste it, while simultaneously displays the Braille match of each character.
iii. Inside a third form, it is possible to write or paste the text, while displays to the user a message about the characters that are not translated.
iv. In the two previous forms, the text is normally translated, passing any character that are not recognizable by the software or even small icons that do not correspond to Braille writing and are not contained in the Greek Braille font.

Because there are no polytonic characters in the Greek Braille font, the translation result takes place after all of the characters are accompanied by tones, tilts, decimal points, etc., which correspond to the toneless character. Each one of them has its own unique Unicode, namely, a number. In fact, the conversion/translation is based on numbers and thus, the desired result was obtained. The font used for compilation is the BRLTTF.ttf (Braille form) and the software contains:

- Form with the creator's Curriculum Vitae
- Examinations document finder and documents for translation practice
- A timer for the translation time counting
- Calendar for reminders, receiving and sending emails (Gmail, Hotmail) through the software
- Digital clock
- Word and letter counter

Inside the two Text Boxes there is a Resize capability, (size change) which can be used by everyone to reform the text and make it easier to be read. Finally, the code used is the VBA (Visual Basic for Applications) as well as the Braille one.

PRACTICAL EXPLORATION OF THE SOFTWARE'S FUNCTIONALITY

Software was given to Creative Employment Center "Education" which teaches students that will take the exams in Braille writing and knowledge certification. The software was distributed to 12 teachers to use it at their homes, as a Braille self-teaching tool. In this center, training, preparation and examinations take place using the manual typewriters, as the examinations at the Educational Center for Blinds Rehabilitation.

The center's management, after using the software stated that is very pleased of the capabilities it offers, thanks to the significant help in text translation speed or the quantity of them that can handle in a short period of time. Trainees could now practice in translation and learning of the Braille writing at their homes, just using a PC. They also showed a significant improvement in both knowledge and reading, succeeding in many exams, compared to another group who did not share the two software and thus, did not achieve the same results.

Concerning the time schedule of the software's total application, it requires an excellent preparation from the teachers as well as its gradual introduction to the Special School Units, after the examination of its weaknesses. It will initially take a reasonable time to create an institutional framework concerning the introduction of such innovation to the education. It also takes time assimilate a new way of functioning, thanks to the manual method that has been used for decades. It will also take time to create the appropriate facilities that can support the equipment needed,for example, the special printers converting conventional texts into Braille scripts. It is estimated that these procedures should start before the end of a school period so, at the beginning of the next one they can be applied and tested in a few school units or special schools, with visually impaired students.

At the end of the testing period, estimated in about a year (a full school year period or even a second one), most of the plan's imperfections should be already identified and it should be applied at the following year, in every school or at least to a vast number of them. Finally, after the surveys' results about its total application, school and faculty principals should send the aggregated reports with every target achieved, the application's effectiveness, the cooperation levels and every variable taken under measure, in order to apply changes.

STRATEGIC OBJECTIVES AND ACTIONS TO BE TAKEN

The strategic objectives of this software's creation are presented below and include the understanding of the software's functionality, to speed-up the text translation process, the students' facilitation concerning their efforts on an underdeveloped section and finally, the widening of their work volume.

There are also a few progress indicators. Teachers will perform a self-assessment using a Likert scale from 1 to 5, concerning their speed against the older manual way and what kind of facilitation they have seen on the new software and the satisfaction it offers. A rating of a judge will also take place, using again a Likert scale from 1 to 5. Finally, the students' progress rating in the long-term, will be a major indicator of the success of the software.

The above indicators have target prices. The self-assessment of the teachers would be great if it reaches rating 4, after the first 2 months of the software's use, while the satisfaction could consider being successful, if it reaches or transcends an average rating of the teachers participating. The judge's rating would be also great if it reaches the same rating, at the same period. The final and most significant part of the target prices is the students' rating, which would be great if shows improvement in the long-term.

The kind of actions to be taken in order to achieve these targets, include a detailed guide with pictures, so teachers can easily see what happens and follow the exact steps or solve every difficulty by their own. However, at the beginning is scheduled a training course by experienced staff, so teachers maintain a basic level to build on. It is also scheduled to run repeated procedures concerning the software training and its evaluation. Finally, as for the students, they will also repeat their exams, while their exercises will increase in volume.

6 SOFTWARE FOR LEARNING GREEK AND ENGLISH WRITING TO BRAILLE WRITING

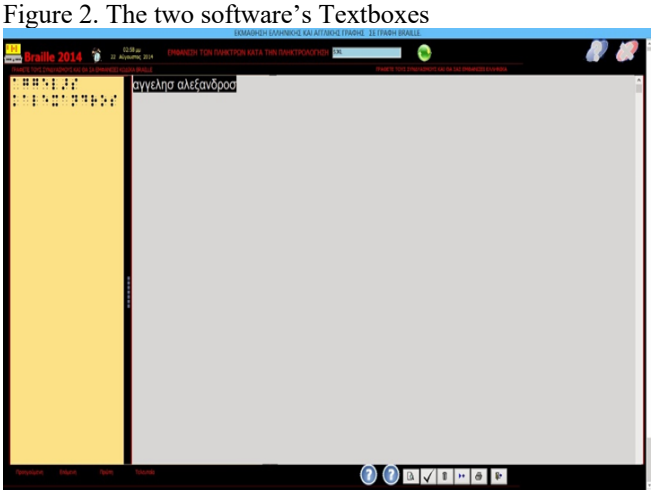
The second software offers the capability of learning Greek and English writing to Braille writing, using a PC and not the manual typewriter, as it happens till now. The user simply selects on the software's form, on which text box wants to practice Greek and English scripts, by typing in the first Textbox 1, Braille combinations and then, the software displays the text in Braille writing. In the second Textbox 2, the software offers the ability to type Braille combinations and the software displays Greek (Figure 2).

The keyboard has been disabled, except of the keys needed for the Braille writing combinations. More specifically, F, D, S, J, K and L are functional as well as the space bar, the backspace, Enter and the Escape key. In case of an incorrect typing, besides the activated keys, the software alerts with a "beep" sound. In case a wrong combination is typed, which does not exist in a board, the system alerts again with a "beep" sound. In case the user chooses a key combination that they cannot be followed by another character (i.e. fjk), then it is automatically translated.

The software additionally contains tables, where every Braille combination is placed, while possible error combinations were created concerning the corresponding translation in the table. It could also be created with code however, the creators chose the possible error combinations which are based on factoring, where each combination corresponds to others, depending on the letters (i.e. for Y, 5 keys are required to be used in a series and the wrong combinations will be 120). In this way, the fastest typing of a combination is achieved so, an illusion of the simultaneous key typing combination, is created. In essence, however, the possible error combinations are typed.

Because Access has not the same and flexible interface in a Textbox, in contrast to the Microsoft word environment, it has limitations. Text10 contained in the learning form, displays combinations either typed in Textbox1 or Textbox2, though inside both of them a simultaneous typing of the combinations can be typed.

Figure 2. The two software's Textboxes



EXAMINATION METHOD USED

Concerning the learning process, a text from previous exams was distributed to teachers as it is recommended by KEAT instruction manual. This one contained 4 Sections, as described below:

In the 1st Section, teachers typed a few words containing diphthongs while also being of an increased difficulty, because diphthongs in Braille writing do have distinct combinations and are difficult to be typed letter-by-letter.

In the 2nd Section, teachers were tested in numbers translation (to Braille form), symbols and dates.

In the 3rd Section, teachers were tested in an English text. This trial was not of a high difficulty.

In the 4th Section, teachers were tested in the text «Imaret - At the show of the clock», p. 18 by Giannis Kalpouzos, Metaixmio Publications. A 20' period had been given to them in order to type all four Section, as it is proposed by KEAT, to obtain the Braille Writing & Reading Certificate.

7 TECHNIQUES AND PROGRAM CODE - PROBLEMS ENCOUNTERED DURING THE SOFTWARE'S DESIGNING

The VBA code used timers, in order to keep the character in memory for 2 seconds, and after that the next character can be typed. The Form Timer Interval indicates how fast the code is running under the Timer. The Timer - VALUE-TIMER >, is the time it takes to run "if" in Timer. This allows the time setting, that has to be spend for the next key to be typed, and which can be changed in the future. In case the Timer Interval =1000 is inserted, and the action > 0, this means that always the action will be > 0. It was practically not in plans for the "if"to be canceled, though this will check the Timer every second. Problems encountered during software's creation, were in the first Textbox2, in the combinations' typing as well as the appearance in Greek. By typing in Textbox1, there are no problems with the code displaying, whereas in the Greek typing program there are exceptions concerning a few symbols that have the same conversion.

The software is a personal/individual effort about the thinking and learning philosophy of the able-to-see writing, while it is a new way of self-teaching. In the form where 2 Textboxes are used, named Textbox1 and Textbox2, the first (Textbox1) can contain writing with 64 Braille combinations and displays in Braille writing, while in the second (Textbox2) Braille combinations are written and Greek is displayed.

The problem was in the Textbox2, because the Braille system contains just one Greek sigma letter. The blinds do not recognize the two sigma (final sigma «ς» and inda-word sigma «σ») of the Greek alphabet. The philosophy behind the innovation at this point, is that Braille-trained scholars write Greek with Braille combinations and the software displays the «σ» at the word endings, thus automatically corrects it to «ς».

Another problem encountered was the case in which writing in combinations in Textbox2, every letter is displayed in Greek non-capital letters, while the first one of every new sentence should be converted to capital, instead of lowercase. In addition, after every dot, the first letter should be performed as capital. All these problems were solved with the use of code. There is also a problem that may be solved in a latter update. Specifically, in a text which contains i.e. the word "etc.", the software converts it to "e.T.C." There may certainly be a few minor issues that have not yet be perceived

however, it is possible to develop and upgrade the software by inserting audio, so that it can be useful to the vision impaired as well. Concerning the letters' appearance or the special symbols, there are also a few exceptions like the ones below:

- Symbols «*» and «x» are displayed in Greek 1,6 the same with diphthong (αυ).
- Symbol "= 1,3,4,6"is the same with (ξ).
- Smaller than"< 2,4,6"is the same with diphthong (υι).
- Larger than"> 1,3,5"is the same with (ο).
- Symbol opening "{1,2,3,4,6"is the same with (ψ).
- Symbol closing"} 1,3,4,5,6"is the same with (υ).

So, during writing Braille combinations in order to display Greek, the above are excluded, because the system cannot recognize the correct choice. Indicatively, there are some elementary techniques mentioned:

A) Memorization techniques

Numbers and letters of the English alphabet should be observed, from a to j, as well as the 4-6-8-0 numbers and the δ-φ-χ-ω Greek letters, memorizing the corners. The numbers are the same as in English writing, the punctuation marks appear on the bottom of the hexastigm. A motive is devised, with which the hexastigm dots decoding is able, either as an image or a number. Every person finds a way by himself, doing homework and practice, and at the seminars these techniques also can be achieved. Simple memorization techniques and playful activities or approaches have been designed, which develop the trainee's Braille-specific matching skills, using symbols used by normal vision people.

B) Outcomes

This software can directly help viewers, as a new self-learning method of translating Greek or English writing to Braille writing. It goes without saying that indirectly, it can help those who cannot see.Its major objective, to help teacher speed-up their duties and offer students a much larger quantity of exercises has been successful and looks like it can definitely satisfy the users. Undoubtedly, the software can reach higher levels of functionality and support users in multiple ways, however the first step has been done and the development keeps on.

8 CONCLUSION

The software presented in this paper, is addressed to those without vision impairment, and considered being a tool for learning and self-teaching of the Braille writing. They can also help those with vision problems, supported by the ones with normal vision. Their use outcomes in teaching efficiency is great, proving a satisfying degree of responsiveness, considered also as suitable and quite usable software. A more general estimation is that the use of a quality educational software can help teacher's work and fill the gaps in a specialized-printed Braille book functionality. The teacher, using the software helps imagination, while the educational software and teaching courses can complement and mobilize senses.

Greek and English writing in Braille is also the core of teaching or can be the field for drill and practice. It should be therefore mentioned that it is software that can be used in Special Education. On the other hand, teacher who is called upon to implement an ICT-based teaching, faces unsurpassed obstacles, such as laboratory availability, lack of technological infrastructure in the classroom, outdated equipment, stifling scheduling of the school lessons and often, the lack of technical support.

A few suggestions for the future innovations could be those referred below, like the examination of the application of Bold, Italics and Underline features on documents or the description of a text or picture in Braille writing by a visually impaired user. Modeling the visual representation of document printing, could be another feature of the software, as well as the translation (to Braille) of a picture, so that the useful information carried are not lost through the translation. A research could be also performed about how a visually impaired user can draw or "see" a picture and which Braille combinations, besides the existed 63, can be integrated in a hexadecimal extension.

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