IDEAL: a Dyslexic-Friendly eBook Reader

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ABSTRACT

We present an ebook reader for Android which displays ebooks in a more accessible manner for users with dyslexia. The ebook reader combines features that other related tools already have, such as text-to-speech technology, and new features, such as displaying the text with an adapted text layout based on the results of a user study with participants with dyslexia. Since there is no universal profile of a user with dyslexia, the layout settings are customizable and users can override the special layout setting according to their reading preferences.

Categories and Subject Descriptors

H.5 [**Information Interfaces and Presentation**]: User Interfaces—*Screen design*; K.4 [**Computers and Society**]: Social Issues—*Assistive technologies for persons with disabilities*

General Terms

Design, Experimentation, Human Factors

Keywords

Dyslexia, Assistive Technologies, Readability, Text-to-Speech, eBook Reader, e-book, Android

1. INTRODUCTION

Previous work with people with dyslexia [2, 6] proved that changes in the presentation of the text might alleviate some of the problems that they encounter when reading a text. Since ebooks readers provide the possibility of adapting the layout of the book to the users needs, here we present the first ebook reader application, which has an option for displaying the ebooks for people with dyslexia. The guidelines for developing this option are based on (1) data collected from a set of experiments carried out with a group of 22 participants with dyslexia [6], and (2) the use of the think aloud technique with 14 of those participants using a beta version of the reader. To the best of our knowledge, there are no similar applications which offer an adapted layout to users with dyslexia when reading ebooks in mobile devices.

Moreover, there are three reasons motivating the decision to develop a dyslexic-friendly option in the IDEAL eBook

Reader: (1) the increasing growth of ebook usage in the last years, for instance, in January 2011 the Association of American Publishers reported that ebook sales increased by 115.8 percent [1]; (2) the fact that people with dyslexia represent a relatively large group of people, for example it is estimated that from 10 to 17.5% of the U.S.A. population has some level of dyslexia [3]; and (3) the use of accessibility practices for user with dyslexia is beneficial for all, since dyslexic-accessible practices can alleviate difficulties faced by all users including other users with disabilities [4].

2. RELATED WORK

Among the mobile applications for users with dyslexia there are: spell checkers such as *American Wordspeller & Phonetic Dictionary* which converts phonetic spelling to proper spelling; applications that exploit speech recognition such as *Dragon Search and Dragon Dictate* to search and dictate email or messages; and software that uses text-to-speech for reading texts to people with dyslexia such as *Web Reader* or *CapturaTalk*.

Although people with dyslexia are encouraged to modify the settings of ebook readers to facilitate their reading [2], to the best of our knowledge there is no application which adapts automatically the text layout with dyslexic-friendly parameters. Our application also includes standard features for users with dyslexia such as text-to-speech technology and the spelling of words out loud.

3. IDEAL EBOOK READER

The IDEAL eBook Reader is an ebook reader for Android devices developed by Accessible Systems of India.[1] This application displays ebooks that have been formatted according to ePub, a free and open ebook standard by the International Digital Publishing Forum (IDPF). Epub is a globally adopted set of rules that define how an ebook should be constructed. When ebooks follow this standard, they can be displayed with the same convenience and accessibility on a wide variety of platforms and devices. This way we bring accessibility to mainstream reading environments so users do not have to stay with special DAISY books and devices. We explain below the general features of the IDEAL eBook Reader:

(a) It adjusts the text to maximize the utilization of the screen, without exceeding the screen boundary even with a large font-size (see Figure 1a and 1b).

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[1]http://www.accessiblesystems.co.in
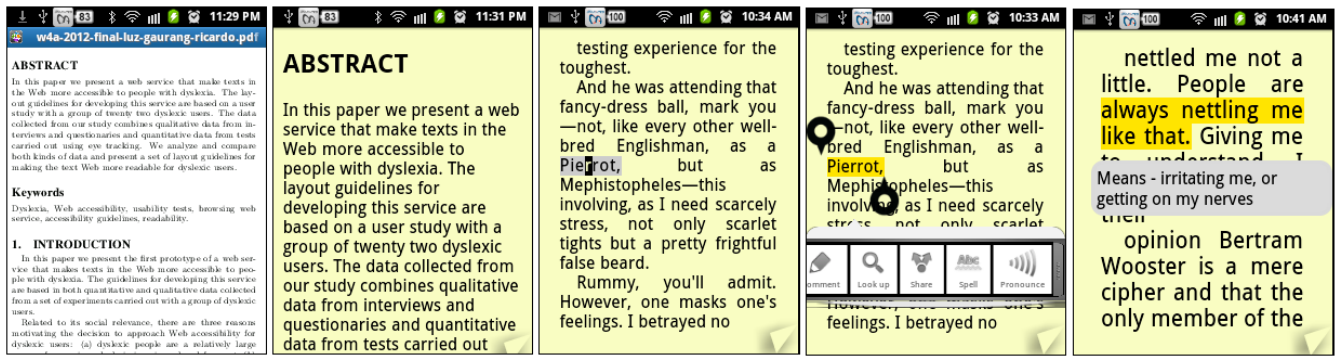
| a) Original PDF | b) DysWebxia Option | c) Word Spelling | d) Highlight Options | e) Making Notes |

Figure 1: Examples of screenshots of the IDEAL eBook Reader (from b to e).

(b) It allows the user to customize and store how the ebook will be displayed. This includes font style and size, colour (background and font), brightness contrast, font size, and the character, line and paragraph spacing. For user with dyslexia there is an option called DysWebxia which sets all the parameters to our dyslexic-friendly guidelines (see Figure 1b).

(c) It displays the table of contents of the ebook allowing the navigation to specific places within the ebook.

(d) It supports text-to-speech technology that enables users to listen to the ebook content as an audio book. The tool is compatible with a wide range of text-to-speech engines, and hence multiple languages are also supported. The text being read out loud is highlighted to make it easier to follow the reading. Control of the speech is gesture based, that is, the user can select the piece of text to be read. It is possible to read even word-by-word or letter-by-letter if the user wishes (see Figure 1c and 1d). In this way, a person with dyslexia can learn how to read new words.

(e) It allows the user to write a comment over a phrase (see Figure 1e).

When the IDEAL eBook Reader starts, you can open an ebook from your phone memory, or you can download one from online sites such as Project Gutenberg or Feedbooks. Once an ebook opens, the user can set the dyslexic-friendly option or customize the text layout. To start and stop speech, we double tap the screen; to move to the next paragraph, we swipe the finger across the screen from right-to-left; and to move to the previous paragraph, we swipe the finger across the screen from left-to-right.

4. USER STUDY

The parameters that the IDEAL eBook Reader uses for displaying the text adapted for people with dyslexia are based on a previous user study [6]. To that previous study we added the results of the application of the think aloud technique.

Twenty two native Spanish speakers with a confirmed diagnosis of dyslexia took part in this study. We used two semi structured interviews, one questionnaire, one reading test recorded by the eye tracker, and the think aloud technique. The recordings of the eye tracker provided the quantitative data regarding the readability of the text layout while through the interviews and questionnaires we gather the data regarding the user preferences [6]. Finally, we presented a beta version of the IDEAL eBook Reader to 14 of the participants, using the think aloud technique. They tried the application and proposed improvements to the interface. The parameters that our study took into consideration were grey scale in the font, grey scale in the background, color pairs (background/font), font size and character, line and paragraph spacing.

5. FUTURE WORK

The use of complicated language has been extensively pointed out as one of the key problems that people with dyslexia encounter. However, all the existing applications at the moment, including ours, only modify its design but not its content. Future work include the enrichment of the ebook reader by adding new reading assistance features, such as graphical schemes [5], addressing the complexity of the language in the text.

6. REFERENCES

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