VTEXT: A Tablet Based ETextbook Framework

Emerging Technology Research Strand

John Cristy
Joseph G. Tront
Bradley Department of Electrical & Computer Engineering
Blacksburg, VA, USA
jcristy ATT vt.edu

1. ABSTRACT

The VTEXT framework is designed to provide many of the desired features of an e-textbook in such a way that it provides pedagogical value rather than just convenience for students. Many so-called e-textbook solutions available today provide few features beyond those possible with hardcopy textbooks. The VTEXT framework is built as an add-in to Microsoft's note-taking program, OneNote. The add-in provides features which facilitate the use of OneNote as a reader and as an educational tool while leaving in place OneNote's strengths in note-taking, collaboration, and search.

This paper discusses the user experience, describes the evaluation of the VTEXT framework, and discusses results and feedback from user testing. The evaluation will consider factors such as usability, student learning performance, and satisfaction. The main areas of interest for the evaluation include effective note-taking in the e-text, rehearsal skills, facilitation of collaboration, ease of use for the student, improvements in integrating lectures and individual study, and the general utility of tools included in the plug-in such as the Bluetooth Scanner which allows pictures to be inserted into the e-textbook and notes from an Android device. These results will be used to generate suggestions for further improved work in this area.

2. PROBLEM STATEMENT AND CONTEXT

Computers, particularly tablet computers, provide a potential new platform for delivering textbook content to students. Shepperd et al. found in 2008 that students who tried the e-textbook, in their case simply the same as a paper copy but in digital form, spent less time studying although they performed as well as the students using a paper copy [8]. They also found that while students found the e-textbook easy to use, they did not find it convenient nor would they use it again or recommend it to a friend. However, based on their findings as well as those of an earlier study by Aust, it seems likely that computer screens are not fundamentally more difficult to study on then paper and using computers may increase the efficiency of studying [1]. While these studies seem positive, the results of a more recent study by Daniel seem to suggest that electronic formats are not more efficient, though again not detrimental to performance [2]. Daniel found that e-textbooks tended to cause more multi-tasking and therefore longer study periods, while Shepperd found a reduction in weekly averages.

While the previous research found that simple e-textbooks are nearly equal to paper copies, other research shows the potential for feature-rich e-textbooks to be much greater. Guess reports findings that note-taking and highlighting were the major features that students were interested in [3]. Snowhill also identified note-taking as an important feature as well as multi-media, full text searching, reference linking, convenience, and portability among others [9]. A discussion at WIPTE 2010 identified many of the same features as desirable as well as text-to-speech, collaboration, internal and external searching, and individualized tutoring and assessment [10]. Work by Kiewra [4] and Martinez [7] also demonstrates the importance of note-taking for student achievement and the effect of difficult platforms on proper note-taking. This problem is best solved on digital systems by allowing free-form notes, including a variety of possible inputs, such as typing, pen, audio, and video. However, while there is agreement on useful features, there has been little testing of the affects of feature rich e-Textbook platform use on student performance.

One of the earlier featured e-textbook candidates tested in college classrooms was the Kindle DX. In 2008, a pilot study was performed at many schools across the country. The study at Reed College found that the Kindle DX provided a usable form factor, legible display, long battery life, convenient delivery mechanism, and paper savings [6]. However, there were few pedagogical improvements. The Kindle DX suffered flaws such as missing PDF capabilities such as annotation and highlighting, difficult distribution of reading materials beyond the course text, poor image display due to low resolution and lack of color, slow changing between pages and books, difficulties for the visually impaired, and cumbersome note-taking.

The Kno tablet was a promising full featured e-textbook hardware and software solution [5]. There were originally two systems proposed, one with a 14.1 inch touch screen and the other with two of the screens hinged together. This form factor would have allowed a paper book like experience with the benefits of a computer. The hardware also allowed for Bluetooth devices such as a keyboard to connect to the system. The software for textbooks included many features such as note-taking, highlighting, and search that would have made the Kno fit many of the requirements of a fully featured device. There was even a planned SDK for developers to extend the system including Google Documents, now Drive, and Microsoft Office Live support. Unfortunately, the project was cancelled in April 2011 in favor of a software only approach. The current Kno software is web-based and includes annotations and highlighting, however, no pen support. There is also no easy, built-in way to view two pages at one time as the two screened tablet would have allowed.

3. METHOD EMPLOYED

VText is an e-textbook platform built as an add-in for Microsoft OneNote. The goal is to provide the tools and capabilities desirable in an e-textbook as identified by previous efforts while allowing OneNote to remain one of the most fully featured note-taking programs available today. By doing so, the add-in, along with OneNote, can improve both individual study and the

lecture experience. VText also considers the role of publishers and authors by including mechanisms in addition to those included by default by OneNote to import various formats of material without losing capabilities. This project also intends to perform a formal analysis of the benefits of a fully featured e-textbook compared to simple e-textbooks and paper copies.

Because OneNote is not intended for textbook display, some changes had to be made to meet users' expectations for interacting with textbooks. The add-in adds controls, gestures, and screen configurations that allow users to flip through the pages with simple motions and easily choose how their screen real estate should be used based on the size and style of their device. To allow this, a control is added to allow a user to automatically have two windows open side-by-side or top-to-bottom, or simply only one window containing the contents of the book. It is also possible to have these two separate windows synchronized so that when one changes the other is also changed allowing a book like manner of flipping through pages or unsynchronized allowing the two windows to display content from different sections or different books entirely.

To ease the flipping of pages while preserving screen real estate taken up by the default OneNote UI, two mechanisms have been added to support those on both standard laptops and tablets. For those on standard laptops, two buttons can be added to the screen to allow easy flipping back and forth between pages. This works in both synchronized and unsynchronized modes by offering one or two sets of buttons, respectively.

For those on tablets, gestures can also be used. Simply moving a finger, pen, or the mouse left or right along the bottom of the window will flip the page backwards or forwards through the book. Which input devices can trigger the gestures is configurable by the user in the settings.   While this gesture is in addition to the standard OneNote gestures, OneNote provides the ability to pan and to adjust the zoom by default.

VText provides two more gestures to allow for quick navigation and bookmarking. By moving a finger from the top left corner of the window in a diagonal direction down and right, a page will be pinned. To view the pinned pages, a user simply drags their finger from the top right in a diagonal direction down and left. This will bring up a window with a list of all pages that have been pinned allowing a user to quickly return to the page or remove it from the saved list. These functions can also be controlled through the Ribbon interface for those without touch or pen enabled. Figure 1 shows the gestures provided by VText.
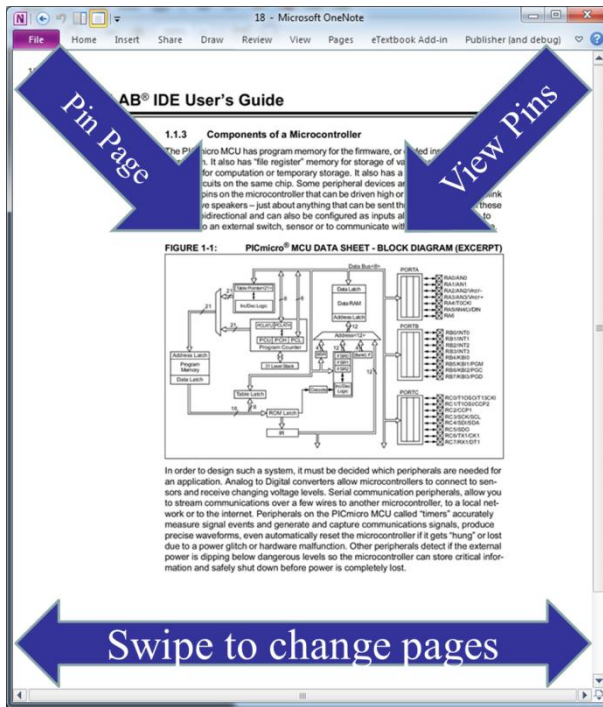
Figure 1 VText's Gestures

While OneNote already provides a mechanism for searching the contents of handwritten notes, images, and text inside any book, VText adds a mechanism to search the web using popular search engines such as Google, Yahoo!, and Wikipedia for any text content in the books quickly and easily. This feature, shown in Figure 2, can be accessed by selecting the desired search terms and right clicking (a press and hold on a touch screen) then selecting "Search the Web" or by clicking the button added to the Ribbon interface by the add-in.
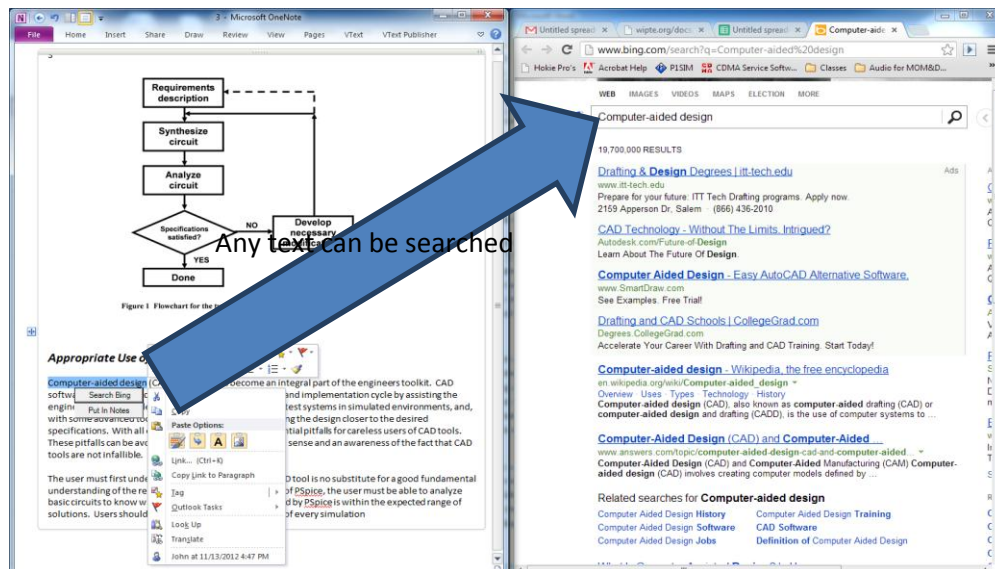

Figure 2 Example of the Search the Web Feature

VText adds the ability to aggregate important text from a chapter into a notes page. To add a note to this notes page, a user selects the text, right clicks, then selects "Add to Notes." The selected text is then automatically copied to the notes page located at the beginning of the chapter or book. This should allow students to easily see sections they felt were important when reading the book or excerpts they felt they needed to review further.

By utilizing the features of OneNote, a student will have access to all of their notes on all of their devices. This can also be used to share notes from lectures and readings with other students. The add-in includes a mechanism to allow all students to synchronize the page they are viewing with their instructor allowing them to seamlessly follow along with discussions in the text. VText also enhances the lecture experience with a mechanism to quickly insert pictures, for instance of a chalkboard or handwritten notes if a tablet is unavailable, directly into the student's digital notebook from an Android device via Bluetooth. These abilities have potential to improve collaboration between students both in and out of the classroom.

While OneNote allows for a document to be printed into OneNote, essentially putting an image of the entire document on just one page, VText can import Rich Text Format (RTF) and Portable Document Format (PDF) documents preserving text as text and images as images as well as preserving one page from the document as one page in OneNote. This allows the content to be more easily selectable and therefore more easily copied to other notes, used in external programs, such as search engines, and converted to voice.

3. RESULTS AND EVALUATION

VText has attempted to meet the features and requirements listed by previous research. While the use of OneNote as a base has been beneficial in developing this e-textbook platform, the design control of some features lost by using such a framework has caused some development problems. Nonetheless, VText has come together to the point where it is ready for testing and evaluation. The intention is to evaluate the effectiveness of both VText and feature-rich e-textbook platforms by using it as a tool in an introductory programming course in the spring of 2013.

The evaluation will test the central idea that the use of VText will improve learning while also encouraging use of e-textbooks. To assess improvements in learning, the evaluation will consider the effectiveness of note-taking, facilitation of collaboration, improvements in integrating lectures and individual study, and the general utility of various features, such as the Bluetooth scanner. This will be accomplished through surveys which will assess the opinions of students and faculty. Students will be asked if believe they are spending more time reading, reading more effectively, interacting with other students and professors more often, and if they believe they have a more complete understanding due to the use of VText. Faculty will be asked to make similar assessments as well as to evaluate improvements, both perceived and objectively, in student understanding, participation, and performance.

To evaluate the usability of VText, a baseline will be established to consider student willingness to try e-textbooks, ease of learning use of the new medium by asking about technical background, and time and effort students have spent in the past learning from traditional books. From this, the evaluation will try to determine if students are more willing to use e-textbooks after trying them, encouraged to continue use, and encouraged to study more often. Other questions and opportunities for feedback will be asked throughout the semester to determine what improvements can be made to the tool from a usability perspective.

The data provided by the students and faculty will be used to determine beneficial improvements for the tool from both an operational and pedagogical perspective. This evaluation will be used to determine the direction for VText as well as advise future e-textbook development.

4. References

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