

PREPARING ENGINEERING CONTENT FOR A KINDLE E-READER

Faculty Paper

Innovations In Engineering & Engineering Technology Education and Curriculum Development
or Web-based Learning

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Abstract

E-book readers, such as the Kindle, are becoming more popular due to their reduced size and weight, wide availability, low cost, and ease of transferring material. While only a limited number of engineering texts are currently available for the Kindle, a Kindle can display pdf files, which in principle would allow the display of a variety of engineering content. However, when a pdf file is viewed on a Kindle, the text and figures often become so small that they are unreadable. While the Kindle can enlarge portions of a viewed page, but scrolling across and up and down the enlarged page becomes problematic.

In this paper, I will discuss several methods to prepare engineering content for the Kindle.

Introduction

More and more of our students are beginning to use e-Books and read them on e-Readers. In a recent informal survey of University of Hartford Engineering and Engineering Technology students, about 20% of the students surveyed currently use e-Books. While most of these students read their e-Books on their computers, about 1/3 of the students currently using e-Books and read them on various e-Readers including Kindle, Nook, Sony, etc. When asked if the books, handout, and supplementary materials were available in a format that could be read on an e-Reader, roughly 2/3 of the students surveyed said that they would purchase an e-Reader. Therefore, it appears that, in the not to distant future, as publishers issue more and more of our texts in an e-Reader format, students will purchase e-Readers and it will be important for the faculty to develop content for the students' e-Readers.

The pros and cons of using e-Readers in the classroom has been discussed in other arenas [1] and will not be repeated here. However, that being said, it is up to an instructor to judge the usefulness of an e-Reader in ones classroom when compared to Tablet Computers and other devices.

The creation of purely textual content for a e-Reader has become relatively straightforward with software like Calibre [2], although due to the differences among the readers, many commentators

to the Chronicle of Higher Education blog on teaching recommend the used of pdf files. There are even several how-to-do books to self publish your textual material on an eReader [3], [4]. However, in reviewing these guides, none are particularly helpful in preparing highly mathematical content, images, or even transferring PowerPoint slides to the Kindle. Most documents that Engineering faculty hand out are highly mathematical and often have figures and drawings.

The Kindle

The Kindle is an eReader marketed by Amazon. There are several versions and sizes. Some have only a Wi-Fi connection, while others also have a 3G connection. The Kindle used for this work has a 4-3/4 by 3-9/16 screen with both Wi-Fi and 3G connections. In addition to displaying its native mobi eBook files, the Kindle also directly displays pdf files.

Most eBooks that are downloaded are in mobi form. Except for the possibility of not being able to directly display the correct page number, since the Kindle reformats the viewed page based upon the text size chosen by the reader, the Kindle can easily reproduce textual material.

When using pdf files, the default option on the Kindle is to shrink the page to the Kindle's page width. However, not all pdf files are shrunk in this way, especially those containing figures. In most cases the figures are cut off. While the Kindle has a magnification option, since the only magnification options are positive, the problem is further exasperated. This is especially noticeable with powerpoint files that contain figures. While rotating the Kindle display from the portrait mode to the landscape mode is possible, the aspect ratio of the Kindle display, as described below does not totally rectify the situation.

With a screen size of 3-9/16 by 4-3/4, the calculated aspect ratio of the Kindel is 1.33. While it would seem naively that the display of full page images in the landscape view would be possible, considering the aspect ration of various page/text sizes in the table below shows a pattern.

Table I - Aspect ratio

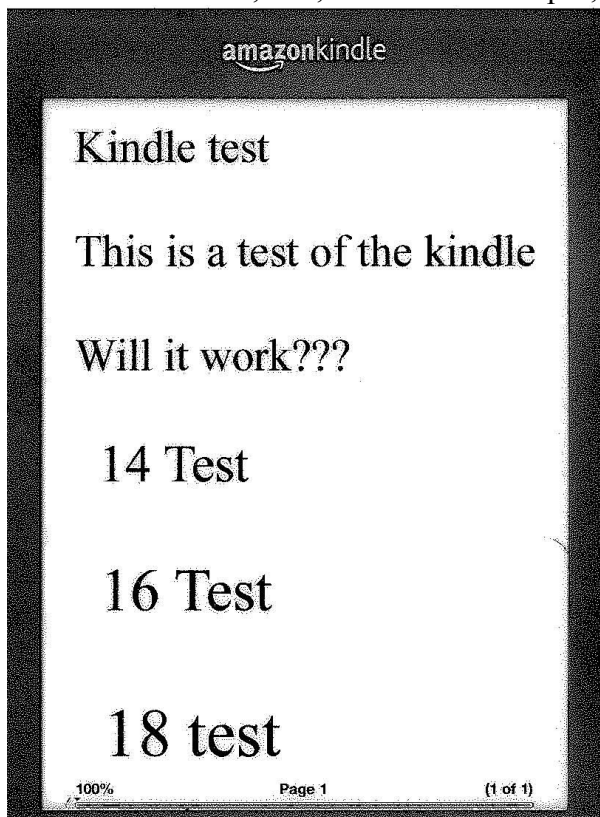
	Page Width	Page Height	Aspect Ratio	Equivalent Kindle Page Width
Kindle	3.5625	4.75	1.33	
Letter paper	8.5	11	1.29	3.68
Letter 3/4" margins	7.0	9	1.36	3.49
Letter 1" margins	6.5	9	1.38	3.44
Couch [5]	5.25	6.75	1.29	3.68
Ingle/Proakis [6]	5.5	6.75	1.22	3.89

As can be seen from the table above, when displayed on the Kindle, a Letter-sized page is wider than the pagewidth. In the landscape mode, for PowerPoint, this results in the slide being truncated and the second piece displayed as the top part of the next Kindle Page. Thus, it is important that one create a Kindle page that takes this aspect ratio into account when viewing the

page. The aspect ratio of two common textbooks shows this effect directly. When the aspect ratio is less than the Kindle screen aspect ratio, the lines will extend beyond the screen width. For a pdf file, the Kindle will truncate them and display that part of the page as the next page.

Developing Content with Open Office – Swriter

In developing textual content (with essentially no mathematics, such as handouts, for a Kindle that can also be displayed in similar format on a PC or other reader, it is straightforward to use a Word Processor. For this work, I use Swriter, the word processor in OpenOffice. By setting the page size to the Kindle screen size (3-9/16” by 4-3/4”) and the margins to 1/4” all around, one creates a document, that, when saved as a pdf, can be directly displayed in single page format on



the Kindle. There is no page overlap. A direct mapping of font sizes is not possible, however it was noted that if the font size was chosen to be too small, the Kindle's magnification of the pdf file would have to be used. In this case, the line length would become wider than the Kindle's screen, thereby causing the user to scroll to read a line, rendering use of the Kindle to be inconvenient. In the figure to the left, the page size was adjusted as above. The font sizes began with 12pt and were increased to 18pt. In a subjective test, the readability of the upper 3 lines of text, which are Times New Roman 12pt was considered acceptable by most viewers. The number of characters per line were considered to be sufficient to convey information and be readable.

Left – Figure 1 – Kindle content created by Swriter

Slides with Open Office - Impress

Impress is the Open Office presentation program which is functionally equivalent to PowerPoint. Like any of its OpenOffice counterparts, it can directly generate pdf files of a presentation.

While, in principle, one would think that all one has to do is to choose the page size. Since presentations are generated in the Landscape Mode it would appear that the width should be the Kindle screen length and the height, the Kindle Screen width. Then, by rotating the page using the Kindle screen rotate function, one should be able to display the slides in the Landscape View. However upon trying this, one finds that the slide still extends over 2 Kindle pages.

The situation is that when displaying pdf pages, the default mode of the Kindle is to format the

page such that the page width of the pdf is the same as the Kindle Screen width. When one changes from Portrait to Landscape view on the Kindle, the Kindle does not reformat the pages, but keeps the original fit-to-width pages thus causing the overlap. As a temporary fix, I realized that one must create a presentation using Impress, whose the page size the screen size, and save it as a pdf. The pdf file is then opened with Adobe Acrobat, all pages are rotated 90 degrees counter-clockwise, and the file is saved. The resulting pdf file when loaded to the Kindle will come out in the Landscape format with no page overlap or scrolling.

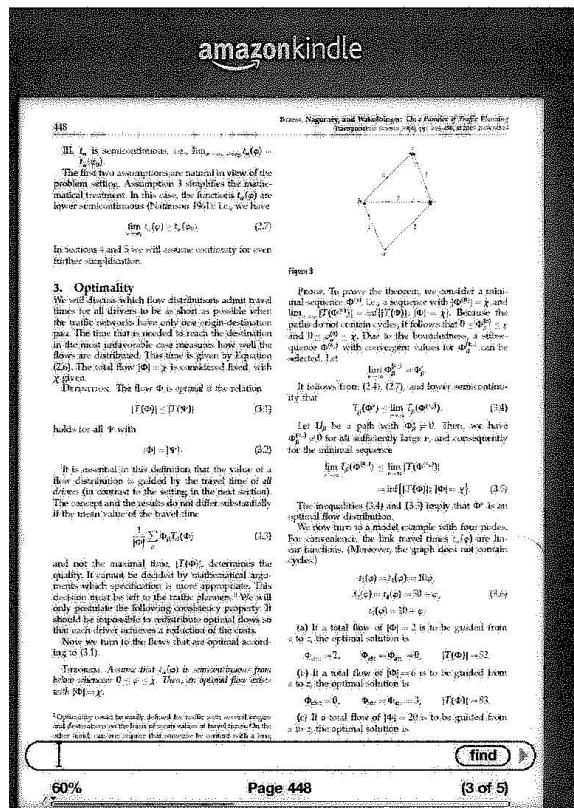
Although the aspect ratio of the presentation created for the Kindle is not the same as typical presentations, if one views the pdf file on ones computer, puts in into the full screen mode, the pdf may readily be displayed on a computer and projected without noticeable effects.

Latex

LaTeX is considered the Gold Standard mathematical text processing program. Developed by Donald Knuth in the late 1970s as a way to typeset mathematics on a computer, it has gained almost universal acceptance. Because LaTeX use proportional fonts and auto-hyphenation, it's

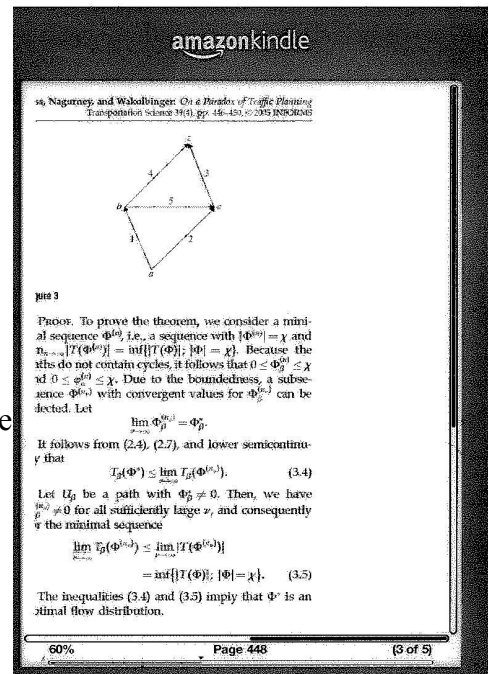
output looks like a typeset document. While the initial versions of LaTeX produced a dvi file output suitable for photo-typesetters, there is currently a dvi-to-pdf converter built into the LaTeX distributions. While the pdf files can be directly downloaded to the Kindle, the fact that the page size is chosen to be 8.5 x 11 with appropriate margins. When reduced by 42% to fit the Kindle, the text size becomes too small to be easily readable. On the other hand, when magnified by the Kindle's pdf magnification, the lines scroll of the edge of the kindle and make reading inconvenient.

A typical pdf page (in IEEE Conference format) is illustrated in the figure to the left. The figure to the right shows the



the same page expanded. Although it may seem that a column is just expanded, careful view will show that only part of a column can be viewed

To better create pdf files for viewing on a Kindle the page size had to be chosen to be the screen size similar to that



used in Swriter. Latex, however does not use absolute margins, rather one sets the upper margin, left hand margin and the textwidth. While not natural to those of us who regularly use WYSIWYG Word Processors, this choice of parameters is derived from how a typesetter sets up a page. With some experimental work with PCTex [7], it was found that the following parameters produced an appropriate looking page shown in the figure on the right below. When viewed by students, most agreed that the quality was acceptable.

Table 2 – LATEX Parameters

```

\setlength{\paperwidth}{3.5in}
\setlength{\paperheight}{4.75in}
\setlength{\hoffset}{-.9in}
\setlength{\voffset}{-.9in}
\setlength{\textwidth}{3.3in}
\setlength{\textheight}{4.in}

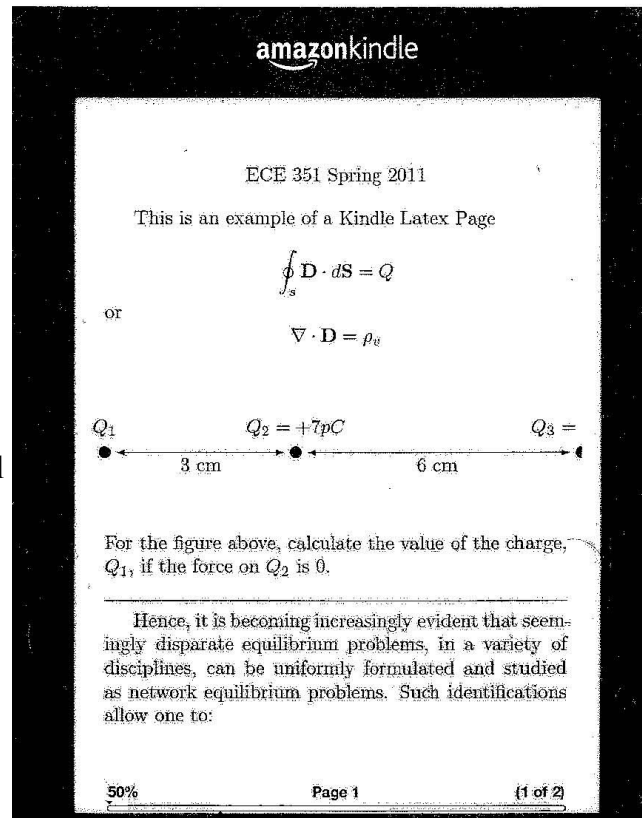
```

Summary

In this work we have outlined our initial trials of creating content for a Kindle. The work will continue to add use of Beamer presentations and other types of content to the Kindle.

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References

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