

# A Page Navigation Technique for Overlooking Content in a Digital Magazine

Yuichiro Kinoshita, Masayuki Sugiyama, and Kentaro Go

Department of Computer Science and Engineering,  
University of Yamanashi, Kofu, Yamanashi 400-8511, Japan  
ykinoshita@yamanashi.ac.jp, masayuki.sugiyama@ttmuh.org,  
go@yamanashi.ac.jp

**Abstract.** Although electronic book readers have become popular in recent years, page navigation techniques used for these readers are not necessarily appropriate for all kinds of books. In this study, an observation experiment is conducted to investigate how people read paper-based magazines. Based on the findings in the experiment, the authors propose new page navigation techniques specialized for digital magazines. The techniques adopt the operation of flipping through the pages. A user study confirms that the techniques are useful for overlooking content in a digital magazine and able to support readers to find articles that meet their interests.

**Keywords:** Digital book, electronic book reader, overlooking content, page navigation, turning pages.

## 1 Introduction

Electronic book readers or tablet devices, such as Amazon's Kindle [1] and Apple's iPad [2], have become popular in these years. With the increasing population of the users, the variety of digital books has also been increased. The varieties are generally divided into two types: independent books and magazines. In the cases of independent books, such as novels and comic books, readers usually start reading from the first page and turn over the pages one by one since they have a single consecutive story. On the other hand, magazines usually consist of many individual articles. Readers do not necessarily need to read from the first page. For this reading style, the conventional page navigation techniques may not be appropriate.

Several devices and techniques have been proposed to realize improved page navigation. Chen et al. [3] discussed navigation techniques for their dual-display electronic-book reader. Flipper [4] is a digital document navigation technique inspired by paper document flipping. TouchMark [5] is navigation techniques that use physical tabs to enable page thumbing and bookmarking. The techniques also preserved physical affordances of paper books. Meanwhile, Smart books [6] added context-awareness to electronic books. Although these devices and techniques achieved efficient page navigation, their applicability to magazine reading has not been discussed well. Also, most of the devices and systems are not specialized for digital magazine reading.

In this study, an experiment is conducted to observe how people read and interact with paper-based magazines. Based on the findings in the experiment, the authors propose new page navigation techniques specialized for digital magazines.

## 2 Observation Experiment of Magazine Reading

### 2.1 Methods

In order to find features of magazine reading, an observation experiment was conducted using a paper-based fashion magazine. For the purpose of comparison, the same experiment was also conducted for a novel and a comic book, which are usually with a single consecutive story. Ten university student in their twenties participated in the experiment. The participants sitting on a couch were asked to hold a magazine or book with their hands, as shown in Fig. 1, and read it for two minutes as their usual. Their reading behaviour was video recorded. After the reading, they were asked to respond to a questionnaire. An interview was also conducted based on their questionnaire responses.



**Fig. 1.** Observation experiment environment

### 2.2 Results

In the beginning of the magazine reading, eight out of ten participants looked at the table of contents. These participants also flipped through the pages. This implied that most participants tried to overlook the whole content in the magazine to find articles with their interests. For the novel and the comic book, all the participants started reading from the first page and did not flip through the pages.

During the experiment, nine participants found articles with their interests in the case of the magazine. To the question of ‘How did you find the pages with your interests?’, seven participants responded that they found them by flipping through the pages. Only one participant found them using the table of contents. This implied that the table of contents did not work for grasping articles in a magazine. In the cases of the novel and the comic book, four and nine participants found pages with their interests, respectively. Unlike the magazine, all the participants responded that they found the interesting pages by turning over the pages one by one. The result suggested that the way of reading magazines was different from that for novels or comic books.

In terms of the question of ‘How did you judge if the pages meet your interests or not?’ for the magazine, four participants responded ‘by looking at large headlines’

while other four responded ‘by picture images.’ On the other hand, in the cases of the novel and the comic book, all the participants who found pages with their interests responded that they judged a page after reading the beginning of the story. The process was also different between magazines and novels or comic books.

From these findings, we propose page navigation techniques to overlook content in a magazine with the operation of flipping through the pages.

### 3 Proposed Page Navigation Techniques

#### 3.1 Basic Page Navigation

Likewise the conventional page navigation, the proposed techniques use tapping and swiping operations. Readers are able to turn over a single page by tapping on the left/right side of the screen or swiping on the centre of the screen using a single finger, as shown in Fig. 2(a). By tapping on the centre of the screen, a slider is shown on the bottom of the screen. The slider allows readers to roughly specify a page to which they want to move.

#### 3.2 Continuous Multiple-Page Flipping

The results of the observation experiment showed that flipped through the pages enabled readers to overlook the whole content in the magazine. The proposed technique adopts the operation of flipping over multiple pages in addition to the aforementioned basic page navigation. By swiping with two fingers, as shown in Fig. 2(b), continuous multiple-page flipping starts. Users are able to stop flipping by tapping on the centre of the screen. The flipping speed is determined by the amount of swiping; long swiping makes the flipping faster and short swiping makes it slower.



(a) single page flipping



(b) continuous multiple-page flipping

**Fig. 2.** Page navigation in the proposed techniques

The page flipping speed is also changed by a weight assigned for specific pages. The flipping speed becomes slower when weighted pages are appeared. In the observation experiment, large headlines or picture images were keys to find pages with readers’ interests. The weight was therefore assigned to pages with large headlines or images. The page weights increase readers’ awareness to weighted pages and help them to see whether or not the pages meet their interests.

## 4 User Study

### 4.1 Methods

In order to investigate how the proposed techniques affect readers' page navigation, a user study was conducted for 12 participants. All of them were university students and familiar with electronic book readers. The study was conducted in the same environment used in the observation experiment. Three digital magazines were prepared from different categories: fashion, foods and gadgets. These magazines were presented to the participants using three types of applications running on Apple's iPad. Two applications were based on the proposed techniques, with and without the page weights. The other application was Apple's iBooks [7]. The combination of magazines and applications was switched per participants. The order of presentation was also balanced across participants.

**Task 1.** In the first task, the participants were asked to grasp the articles through a magazine in two minutes. After the reading each magazine, a paper-based task was conducted to examine how much content the participants have grasped. A paper form consisting of 45 article titles or headlines and 20 images was presented to the participants. Two-third of them were appeared in the magazine but the remaining ones were collected from other magazines. The participants selected all of recognizable headlines and images on the form.

**Task 2.** After Task 1, the participants were allowed to read magazines freely. This task observed the process to find pages that meet their interests and investigated how the proposed techniques affect their magazine reading on electronic book readers. The participants read each magazine for ten minutes. After each reading, the participants evaluated one of the applications through a questionnaire that used a five-point Likert scale and free form responses.

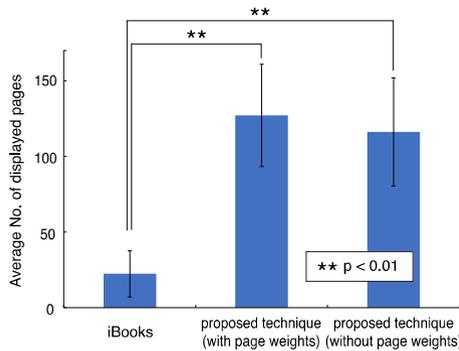
### 4.2 Results and Remarks

**Task 1.** In the reading with the proposed techniques, nine out of 12 participants used the continuous multiple-page flipping to overlook the whole articles. Some participants used the single page flipping in combination with the multiple-page flipping while other participants used the multiple-page flipping from beginning to end. In the case of iBooks, nine participants used the thumbnail function. For all the applications, three participants read the magazines only with the single page flipping and used neither the continuous multiple-page flipping nor the thumbnail function. The results of these participants were therefore excluded for the subsequent analyses.

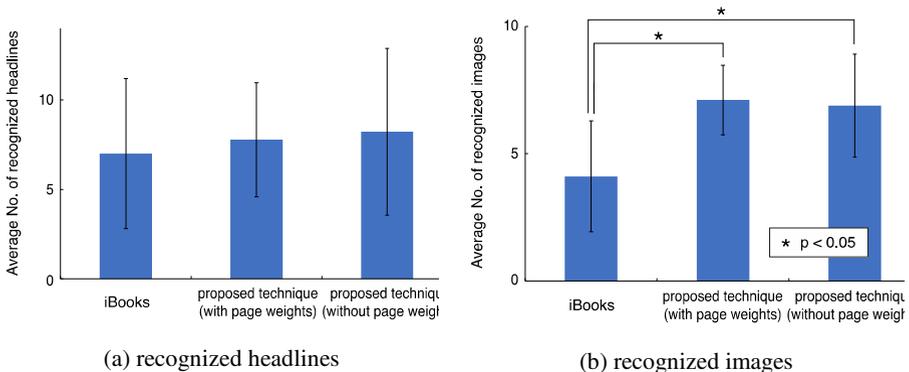
Figure 3 shows the average number of pages displayed in two minutes. The participants checked much more pages when they used the proposed techniques. Significant differences were observed between the proposed techniques (with and without the page weights) and iBooks ( $p < 0.01$ ). These results demonstrated that the proposed techniques have sufficient performance for overlooking the articles through a magazine. Figures 4 shows the average numbers of recognized headlines and images,

correctly selected on the form. In terms of the recognized headlines, no significant difference was observed between the applications. However, in the case of images, the participants recognized more images in the cases of proposed techniques. Significant differences were observed between the proposed techniques (with and without the page weights) and iBooks ( $p < 0.05$ ). This implied the techniques were especially useful for magazines consisting of many picture images.

**Task 2.** Depending on the applications used in the task, different processes were observed to find pages with readers' interests. In the cases of the proposed techniques, most of the participants used the continuous multiple-page flipping. When they found something interesting, they stopped the flipping by tapping on the screen and checked the previous and/or next pages using the single page flipping. After reading these pages, they started the multiple-page flipping again. When the page flipping was reached to the end of the magazine, they used the slider and moved back to the first page. In the case of iBooks, most of the participants used the thumbnail function and



**Fig. 3.** Average number of pages displayed in two minutes



**Fig. 4.** Average numbers of recognized headlines and images

selected a page from the thumbnails. After reading the page, they moved back to the thumbnail function and selected another page. They repeated these operations to find pages with their interests. In this case, the number of times they used the single page flipping was fewer than that observed in the cases of the proposed techniques.

In terms of the questionnaire, the average evaluation score to the statement of ‘The operation of was similar to paper-based books/magazines.’ was 3.6 for the proposed techniques while the score was 2.2 for iBooks. Here ‘1’ and ‘5’ correspond to strongly disagree and strongly agree, respectively. The proposed techniques provided paper-like operation and enabled users to flip through the pages for overlooking content in a digital magazine.

## 5 Conclusion

This study first conducted the observation experiment to investigate features of paper-based magazine reading. The result of the experiment led the authors to the following findings. First, most readers try to overlook the whole content in a magazine. Second, readers find articles with their interests by flipping through the pages. Third, large headlines or picture images are keys to find articles with readers’ interests. Based on these findings, a page navigation technique for digital magazines with the operation of continuous multiple-page flipping were proposed. The user study confirmed that the proposed techniques were valid for overlooking content in a digital magazine. The techniques will help users to find articles with their interests more easily.

Future studies will address the investigation of appropriate page flipping speed according to the page weights as well as the discussion about another approach to overlook content in digital magazines.

## References

1. Amazon: Kindle, <http://www.amazon.com/b?node=133141011>
2. Apple: iPad, <https://www.apple.com/ipad/>
3. Chen, N., Guimbretiere, F., Dixon, M., Lewis, C., Agrawala, M.: Navigation techniques for dual-display e-book readers. In: Proceedings of ACM SIGCHI Conference on Human Factors in Computing Systems, pp. 1779–1788 (2008)
4. Sun, L., Guimbretière, F.: Flipper: a new method of digital document navigation. In: ACM CHI 2005 Extended Abstracts on Human Factors in Computing Systems, pp. 2001–2004 (2005)
5. Wightman, D., Ginn, T., Vertegaal, R.: TouchMark: flexible document navigation and bookmarking techniques for e-book readers. In: Proceedings of Graphics Interface 2010, pp. 241–244 (2010)
6. Beer, W., Wagner, A.: Smart books: adding context-awareness and interaction to electronic books. In: Proceedings of the 9th International Conference on Advances in Mobile Computing and Multimedia, pp. 218–222 (2011)
7. iBooks, <http://www.apple.com/apps/ibooks/>