MindMargin: An Article-Adjacent Commenting Platform

Daniel Haehn
School of Engineering and
Applied Sciences
Harvard University
Cambridge, MA USA
haehn@seas.harvard.edu

Sharon Zhou
Harvard College
Cambridge, MA USA
zhou12@college.harvard.edu

Krzysztof Z. Gajos
School of Engineering and
Applied Sciences
Harvard University
Cambridge, MA USA
kgajos@eecs.harvard.edu

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Abstract
Commenting systems are popular throughout many websites. Reading and writing comments can support passive consumption of media by increasing active user engagement in many ways. Information exchange, personal reflection, and lively discussion are only some possible outcomes. We explore how user engagement can be increased by proposing a new commenting system and interface, MindMargin. In contrast to traditional commenting systems where comments are featured below the article, MindMargin presents comments adjacent to its reference media. Users can post and navigate comments and replies on a horizontal infinite scroll. This exposes users to a diverse array of opinions as they read since comments in our system are anchored to relevant areas of the article.

Author Keywords
Comments; anchored; commenting systems; opinions.

ACM Classification Keywords
H.5.2. [Information Interfaces and Presentation (e.g. HCI)]: User Interfaces

General Terms
Comments, Opinions

Introduction

~~*Motivation*~~

Many websites support the ability to give content-related feedback in the form of comments. Such websites include news pages, media sites, online shops, blogs and social networks. Both adding new comments and reading existing ones can engage the user in information exchange, personal reflection and lively discussion. To the reader, comments offer additional and corrective evidence as well as alternative views. Because of their diversity, comments have the ability to impact the readers opinions and motivate the reader to perform actions beyond the scope of the article, such as sharing the article, voting, purchasing a product, making choices, and participating in a cause.

The traditional format of articles online presents comments beneath their associative content. This may seem appropriate at first because interactions with an articles comments are secondary to the readers primary task of reading the article itself. However, this vertical structure impedes the reader's ability to view comments alongside the reference media. In fact, the traditional format forces readers to pass the entirety of the content before reaching the comments section. Commenters must either complete the primary task of reading the article or bypass parts of the article to reach the same comments. Even in multi-page articles such as those on The New York Times, the commenting system sits beneath each page, but includes comments from the entire article, not its associative page. Separate from the content, the traditional commenting system lacks a method of referencing specific sections within an article.

We present **MindMargin**, a commenting system that motivates people to view the world differently.

MindMargin most notably has a horizontal commenting interface that appears adjacent to the article and allows for direct textual reference through comment anchoring. From our initial evaluation, we propose that this alternative commenting system can challenge a readers existing opinions by presenting them with relevant comments at appropriate points in the article.

Related Works

~~**Existing Annotation and Commenting Systems**~~

Previous research on annotation and commenting systems has focused primarily on enhancing reader comprehension [6] [3] [9] [7]. The systems proposed in these studies are able to accomplish this through improving commenter communication. For example, the Brussell system [6] gathers information across news platforms and online references in order to answer reader-generated questions to unfamiliar or confusing phrases in online news articles. The Reflect system [3] seeks to reproduce the listening component of offline conversation in the online setting by allowing readers to summarize and provide feedback on other readers comments. The NB PDF Annotation Tool [9] targets teacher-student and student-student communication in the classroom by providing a means to annotate specific portions of a text to generate discussion. Another study [7] also examines textual annotation in an academic setting, in which students who are provided with annotations from their instructor and peers demonstrate more critical thinking, and less superficial summarization, than those who were not exposed to the system. Research on improving facilitation of communication in all the above systems suggests that stand-alone articles are limited in scope and that readers can reap much more intellectually from texts when presented with outside views and resources alongside their reading.

There have also been myriad studies on the disturbance-invisibility tradeoff of annotation and commenting systems as well as the effectiveness of anchoring annotations [8] [1] [7]. [8] defines disturbance as moving or occluding the article, or the primary text, with secondary text, or comments. The study shows that increased disturbance also leads to increased guidance and aid to the user, suggesting that close anchoring can be simultaneously effective and distracting. This is supported by [1] that concludes that popup interfaces, while effective in attracting user attention, ultimately prove ineffective in retaining the user to return to the site and motivating the user to engage in the secondary task of commenting on an article. The academic annotation study [7] notes that effective textual conversations take place in annotation-based discussion environments. However, the study also points out the difficulty in designing a usable and effective interface for annotation, exploring the four leading annotation interfaces, including footnotes, interlinear commentary, sticky-note annotations, and marginal comments, and concluding that the marginal interface is superior in minimizing distraction and enhancing visibility. The study continues to examine existing marginal interfaces, such as an infinite expanding margin with an annotator occupying a column of space, a set of expanding text boxes, and the traditional fixed single-column margin. These annotation interfaces displayed boxes around the reference text to indicate where it was anchored. Combining these ideas in an effort to maximize visibility while minimizing disturbance, we have chosen to anchor MindMargin comments with a faint dotted line corresponding to the y-coordinate of their textual reference, but avoiding any disturbance on the the article content.

~~**Exposure to Diverse Perspectives**~~ Politically charged

studies on user interface, not specific to commenting systems, also emphasize the significance of considering views that exist beyond an articles scope [4] [5] [2]. The Balancer system [4] indicates to readers of online news how politically skewed their source of news is based on their choice of news outlets, and recommends other sources to counterbalance the bias in their reading. NewsCube [5] proposes a similar recommending system by classifying aspects, suggesting articles with contrasting aspects, and allowing readers to browse by aspect. ConsiderIt [2] presents a pros and cons board for a variety of political issues, on which users can list their opinions. Because the board displays both pros and cons, including an equal length of pre-populated ones on the side, users are more inclined to balance their lists with both pros and cons. With access to a wider variety of perspectives, and presented in a manner that encourages political balance, readers are urged to consider alternate opinions and as a result, to adapt, strengthen, or clarify their own. Ultimately, both ConsiderIt and Balancer aim to depolarize readers opinions by exposing them to diverse perspectives.

As aforementioned, [7] introduces students to other points of view through peer and teacher annotations anchored to the text. The study reveals that exposure to external, divergent thinking leads to more critical responses that reflect active, independent thinking. Critical analysis and active thinking were found to aid in shaping the opinions of readers with both within-subjects and between-subjects methodologies. The study also shows that this independence in thinking among novice readers, in particular, manifests itself in the strong opinions these readers develop when exposed to the annotation system. While [7] studies the comparison between the existence and the absence of an annotation system that offers alternate perspectives, our research

seeks to identify how the placement of such a system–horizontally or vertically–impacts and challenges readers views through the increased exposure to diverse viewpoints.

Hypotheses
We test MindMargin against the vertical commenting interface, and propose two hypotheses regarding their comparison:

1. MindMargin will encourage readers to define or refine their opinions, prompting new readers to develop a stance on an issue and encouraging readers with existing views to consider alternate views. MindMargin will accomplish this by exposing readers to a greater number of opinions and consequently compelling readers to think more independently and sharpen their opinions.
2. MindMargin will compel readers to have a more positive impression of the comments by displaying comments anchored to relevant references in the text.

Contributions
This project includes the following novel contributions:

- A horizontally structured user interface for anchored comments on websites
- Insights into how comments can challenge readers perspectives through
    1. Exposure to a diversity of comments
    2. Exposure to relevant comments at specific textual locations

Approach

We implemented two commenting systems ~~as classical client/server web applications.~~ The first commenting system is MindMargin with anchored comments on a horizontal infinite scroll next to the reference medium. The second commenting system is a traditional vertical interface. ~~Users interact with the clients as a front-end system using a web browser. The clients communicate with the server back-end using AJAX to a) request existing data or b) persist new data. The server reads and stores data in a relational database~~.

~~*Front-end*~~
The client interfaces consist of clean user interfaces to avoid design clutter and distraction. Figure 1 shows the MindMargin system in action. The application is split into two sides: The reference media on the left and and an adjacent commenting system on the right. The commenting system displays comments in a horizontal infinite scroll. Thus, an unrestricted amount of comments can be linked to the reference media. Navigation within the infinite scroll component can be performed via mousewheel interaction (either left/right or top/down scrolling with the same effect) or by adjustment of a slider on the bottom of the right split screen.

Comments are anchored to the horizontal reference point of the media by thin dotted lines. If a comment has replies, a dropdown button appears on the comment's footer. Lighter in color, replies to comments appear vertically under their comment when the button is clicked. This arrangement optimizes horizontal real estate by reserving horizontal space for parent comments. Finally, while navigating through the infinite scroll, the reference medium remains fixed on the left for quick reference against referential comments and replies.

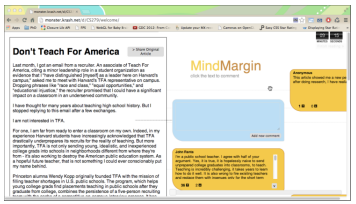

Figure 1: The MindMargin system consists of a web client (shown here) and a server side back-end.

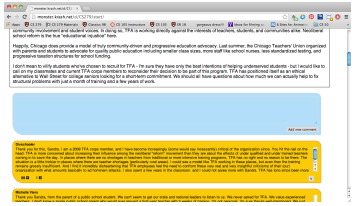

Figure 2: The traditional comment system with a vertically ordered design.

We have also implemented a metric to distinguish between popular and regular comments that appear separately. For greater visibility, popular comments are displayed directly adjacent to the article in the MindMargin interface and directly under the text, or first, in the traditional layout. Upvotes and downvotes indicate and impact comment popularity. ~~We also consider comment time to determine individual comment relevancy and the order in which they appear. This is because new comments are at a temporal disadvantage in garnering votes compared to their older counterparts. Comments posted within the last 60 minutes are labelled as popular, regardless of their vote number. This prevents new comments from losing visibility, especially when a large number of comments exists. We define our metric for popularity as follows:~~

~~Comments are marked popular if $c_{popular} > 8$. This metric was included in both commenting systems.~~

our implementation of

Figure 2 shows the traditional vertical commenting system. The reference media appears first and on top of the commenting system that follows below. Navigation within the article as well as within the comments can be performed via top/down scrolling. The organization of replies and up- and down-voting is similar to the MindMargin prototype.

~~The front-ends of both prototypes were written in JavaScript using the popular jQuery and jQuery UI libraries. A model-view-controller pattern was chosen to structure the application code base. The user interface itself were created to adjust responsively to any window size.~~

~~*Back-end*~~

~~The server component of MindMargin and the traditonal system was written in PHP and communicates with the front-end and a relational database. Communication with the front-end is ensured by providing a REST API which can be called via AJAX. The entity model of the client is replicated on the server. Data is read and stored using a custom and fully generalized object-relational mapper. We chose MySQL for our database with a table each for users and comments.~~

~~Throughout the implementation, we followed an iterative approach to programming our software. The developer team was small. All developed code is released under the BSD open source license on github.~~

Experiment

Here we describe our experiment. We performed a blind user study on young adults. Participants were randomly associated to either MindMargin or the traditional commenting interface.

Participants

106 online participants landed on our page for our user study and evaluation, of which 46 proceeded to begin and complete the study (30 female). Participants were recruited online through social media nad college listservs. Participants were college students, aged 18 to 25, and 68 percent from the local university. The reading frequency of news articles among participants ranged from daily to almost never.

Experimental Conditions

The two conditions in our study were MindMargin and the traditional vertical interface, seeded with 39 existing comments from a news article. We selected a recently published article from the Opinion Section of The Harvard Crimson, titled Dont Teach for America. We chose this article on the basis of its opinionated nature and its relevance both in recent news and to our anticipated

participant pool. The article already had over fifty comments, from which we selected the top 39 as ranked by Disqus, the existing commenting system in The Harvard Crimson, to be used in our study. The same comments were used in both conditions. In the traditional vertical interface, they appeared in the identical order as ranked in the original article. In MindMargin, we anchored them to the article based on textual references, specific phrases, quotes, and relevant content in each comment. The comments were nevertheless written in, and intended for, the traditional vertical interface.

Design and Setup

We employed a between-subjects test, with participants assigned randomly to one of the two conditions (19 MindMargin). In order to reproduce the conditions under which one would normally read a news article, we chose to recruit participants online and self-select themselves into reading the article of interest. In order to motivate our participants to actually read or skim the article, instead of skip it, we chose not to use monetary or other time-sensitive incentives. Instead, we chose to design the experiment around the survey question, "Do you (really) think like a [college] student?" We then asked participants follow-up questions to verify that they read the article, which included both the overall stance of the article and two pieces of supporting evidence used in the article. Participants were then asked to complete a post-experiment questionnaire and were not permitted to refer back to the article once provided the questionnaire.

Procedure

Participants were given an initial questionnaire asking basic demographics and reading frequency. Before given the article, they were also asked to provide a username or pseudonym, or to remain anonymous. During the reading of the article, participants were allotted 10 minutes. After 2 minutes, they were permitted to proceed. The 2-minute delay was to ensure reading of the article, but did not seem to prevent fast readers from proceeding as the average reading time was 3 minutes 47 seconds. In the follow-up questionnaire, reading verification questions were first asked of the article. Participants were also asked their personal stance on the article, whether they liked the article, and whether they agreed with the article. They were also asked to self-report whether they read the comments in the article and to provide two adjectives that described either their reaction to the comments or a description of the comments.

Results and Discussion

In this section, we report the findings of our user study that compare the proposed MindMargin interface against the traditional vertical commenting system. Overall, we observed a decrease in polarized views among readers who had seen or read the article previously and an increase in opinion polarization among unfamiliar readers. We also found an increase in readers' positive impressions of comments when using MindMargin. We were able to accept both of our hypotheses.

Hypothesis 1

Our first hypothesis predicted an increase in personal reflection when using MindMargin. Exposure to a range of diverse and controversial comments should result in the rethinking and revising of ones own opinions. All participants were asked their stance, from Strongly For TFA to Strongly Against TFA, on a Likert scale. Using data from participants who reported to have read the comments (see above), we computed the percentage of participants who claimed a strong stance on the article. Of those assigned to the MindMargin interface, only 16%

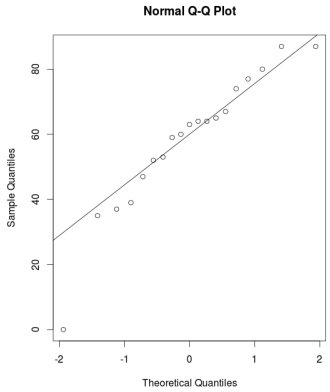

Figure 3: The personal stance distribution for MindMargin participants (normally distributed according to the Shapiro-Wilk normality test with $alpha = 0.05$, $p = 0.1306$).

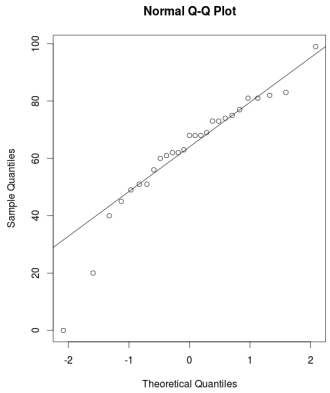

Figure 4: The personal stance distribution for traditional interface participants (normally

reported to be either Strongly For TFA or Strongly Against TFA. In contrast, 26% of the participants using the traditional commenting system reported either extreme stance. The distribution of the Likert values is also normal for MindMargin and a U-shaped curve for the traditional commenting system. We performed a Shapiro-Wilk normality test ($alpha = 0.05$) on both distributions. MindMargin rejects the null-hypothesis with $p = 0.1306$ and therefore is normally distributed. The traditional prototype accepts the null-hypothesis with $p = 0.0205$ and is therefore not normally distributed. We created Normal Q-Q plots for both (figures 3 and 4).

This reveals that despite no increase in the rate of reading comments, the MindMargin interface was able to encourage users to consider other opinions and viewpoints. This suggests a greater user engagement with the comments with the MindMargin interface. Therefore, we have **accepted Hypothesis 1**.

Hypothesis 2
Our third hypothesis predicted an overall increase in positive impressions on comments when using the MindMargin interface. We asked participants who read the comments to input two adjectives in free-text describing either their reaction to the comments or a description of the comments. We then classified these adjectives using a three-bin classifier (Positive, Negative, and Neutral). Positive was assigned to positive reactions to comments, such as interesting, well thought-out, and engaging. Negative was assigned to negative reactions to comments, such as annoying, useless, distracting. Neutral was assigned to descriptive input about the comments, such as long and subjective. Finally, a few outliers, such as trolls and whatever, were removed.

We observed a drastic change of impressions when using MindMargin. As seen in figure 6, the majority of participants using the traditional commenting system described the comments as negative (68%). In contrast, when using MindMargin, the majority of participants described the comments as positive (48%) or neutral (48%) as seen in figure 5. Outliers were also observed only to occur in the traditional commenting system. We have therefore **accepted Hypothesis 2**.

In addition our quantitative results, we would like to quote qualitative feedback from a MindMargin user, suggesting actions he/she took beyond the scope of reading and commenting article: This article showed me a new perspective on TFA, which after doing research, I have realized I agree with. No feedback suggesting actions outside the scope of the article was received from participants with the traditional commenting system.

Conclusions

In this paper, we studied how commenting systems can increase user engagement with comments while reading articles. We report quantitative evidence supporting MindMargin as an interface that depolarizes existing views and establishes new ones by exposing readers to diverse opinions in the comments and that enhances readers' overall impression of existing comments on the article. The key difference between traditional commenting systems and MindMargin is that in the latter, comments are anchored to specific passages of the reference media and are placed on a horizontal infinite scroll. We developed two commenting systems, one using the traditional vertical interface and the other using the MindMargin interface.

Then, we performed a user study for evaluation. Our key findings include that being exposed to relevant comments

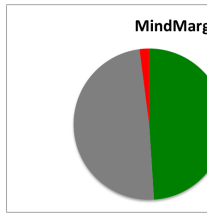

Figure 5: When us
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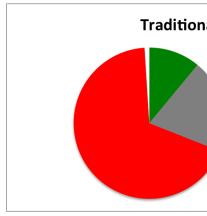

Figure 6: The majo
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during reading increases personal reflection. This results in 10% less extreme positions regarding the context of the reference article. Additionally, the overall impression of comments significantly diverges. 68% of users of the traditional commenting system report comments to be negative, while only 2% of MindMargin users report comments to be negative.

Future research will include a user study without already seeded comments as well as employ a within-subjects methodology. In addition, we plan to expand the participant pool to include participants of all ages and backgrounds. We would like to explore if MindMargin causes increased difficulty for readers to leave inflamed comments because they must choose an appropriate place to anchor their highly visible comment. Finally, we plan to pursue research on a commenting system like MindMargin, but for videos and music, that anchors comments to certain times or time-intervals within a given recording. Research into annotations on visual pieces, other than text, is also being considered.

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