An Intelligent Interface for Organizing Online Opinions on Controversial Topics

Mingkun Gao, Hyo Jin Do, Wai-Tat Fu
Department of Computer Science, University of Illinois at Urbana-Champaign
Urbana, USA
{mgao19, hjdo2, wfu}@illinois.edu

ABSTRACT

An enormous amount of posts and comments are shared in online social forums, which often organize these online social opinions based on semantic contents. However, for controversial topics, people with different attitudes and stances often have very distinct perspectives, reactions, and emotions to the same post. Organization by semantic contents often encourages selective exposure to information, which may exacerbate opinion polarization. To address this problem, we design a novel interface that allows people to better understand and appreciate people with different stances in social forums. Our interface was developed to allow interactive visualization and categorization of original posts about a controversial topic with crowd workers' reactions and emotions from different stances. We evaluated the interface using Reddit posts about US presidential candidates. Results demonstrate that the interface can mitigate selective exposure and help users to adopt a broader spectrum of opinions than the traditional Reddit interface.

ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

Author Keywords

Interface Design; Social Opinion; Selective Exposure;

INTRODUCTION

Increased information access has enabled the public to use online social platforms to express their opinions. Most of these platforms use various forms of semantic contents (e.g., [8, 13]) to index and categorize these social opinions. This kind of organization, to a large extent, treats social opinions as other information sources such as news items or articles. While it is useful for information access, it is not designed to facilitate the understanding, exchange, and appreciation

of public social opinions by users. For example, Reddit[1], a popular social forum where people express their opinions about different topics, presents posts to users mainly based on semantic features. When reading one post, users need to read through hundreds of comments to appreciate the wide spectrum of reactions and emotions embedded in an arguably random. There is clearly a need to improve organization of social opinions by going beyond semantic contents.

We focus on two characteristics that are essential for better organization of social opinion platforms. First, in addition to knowing the social topics, people are often curious about the opinions of others on these topics, such as why and how other people think positively or negatively about the topics, what are the "dominant" or "mainstream" opinions, how likely someone from different backgrounds may agree or disagree with these opinions, what are the alternative opinions and who expressed these opinions, etc. Second, social opinions, especially those on topics that are controversial (e.g., presidential election), often have polarizing emotions and reactions from people who have opposite stances. Showing these reactions not only will help users get a better sense of the general sentiment of the public, but also help them selectively attend to those that are more relevant to them. Another important consideration in the design of such platform is to mitigate selective exposure to information, or at least not to exacerbate polarization of opinions [3, 18, 19, 20]. In fact, previous research has found that structures that help people easily see opposing views, or highlight different aspects of the issues can mitigate the otherwise pervasive selective exposure phenomenon [18, 21]. On the other hand, the lack of such organization, often nudges people to attend only to those that are consistent with their own views.

To overcome the drawbacks of existing online social opinion platforms, we design and evaluate a prototype of an intelligent social forum interface that allows people to more easily visualize, and thereby potentially better understand and appreciate people with diverse attitudes and opinions on controversial topics. The interface provides interactive visualization of social opinions with reactions of various stances as well as a clustering summarization of overall reactions based on emotion labels. We derived a set of design principles and performed a user study evaluating the interface using a set of controversial

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[1]https://www.reddit.com

posts about the 2016 US presidential candidates and obtained promising result.

In this proof-of-concept study, reactions and the corresponding emotion labels for posts were collected from Turkers on Amazon Mechanical Turk (AMT)[2]. A subset of these labels (and reactions) from Turkers can be used as training samples to cluster posts and reactions automatically, and incremental inputs can refine the accuracies of these clusters over time. The longer-term goal is to develop an intelligent social opinion platform that can scale up to larger forums by incorporating it to text and emotion analysis techniques with actual posts' comments.

RELATED WORK
Hoque and his colleagues designed systems [10, 11, 12] to help users gain insight from long and staggered asynchronous online conversations by applying topic segmentation [7] and topic labeling [23] on the Fragment Quotation Graph [13], and users could revise the model by providing feedback to the system. The current interface could be complementary to these approaches by exposing peoples' reactions from different stances to users for controversial topics, which are known to influence the selection process as much as semantics [18].

An important goal of an intelligent social opinion platform is to mitigate selective exposure, which has been widely studied in previous work [4, 5, 6]. Their research shows that people tend to seek information which is supportive to their previously formed decisions or beliefs. Selective exposure may lead people to make biased decisions and even aggravate the polarization in society [9, 19, 20]. Researchers studied the conditions for coexistence of different online political opinions and suggest to provide exposure to weak ties and visualize the common ground [9]. Tools, such as browser widget showing users' weekly feedback for political lean and their reading behaviors, have been deployed to motivate users to explore political more diversely [19]. The current study follows this research direction and tests ways to help visualize the spectrum of emotions and reactions in controversial social topics.

DATA
In the current prototype, we used Reddit posts about *Donald Trump* and *Hillary Clinton* as data. In election, many expressed opinions as supporters of either candidate, but seldom (if any) both. Opinions about the two candidates also tend to be highly polarized – there is a wide spectrum of opinions, reactions, and emotions about each candidate in a large number of posts on Reddit, making the dataset ideal for the current study. We first crawled posts about each candidate from Reddit submitted before Mid-March 2016. Next, we filtered out posts with profanity and selected 50 posts based on popularity (using Reddit score + num. of comments) for each candidate. We also performed pilot studies to ensure that most posts had readable textual content (*e.g.*, not just an external link) and had similar length, relevant to the topic, and in general understandable to people with a general level of reading skill.

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[2]https://www.mturk.com

Next, we collected reactions to the selected 50 posts using workers recruited from AMT crowdsourcing platform. In each Human Intelligence Task (HIT), we presented two posts. One was about Donald Trump and the other was about Hillary Clinton. First, we asked Turkers to select their preferred candidate between these two. After they read each post, they were asked to select one or more explicit emotion tags among 17 emotions [2]. Meanwhile, Turkers also needed to describe their reactions using at least 25 words after they finish reading each post. To reduce Turkers' reaction bias, each Turker read posts in a randomized order. Ultimately, 1,000 Turkers participated into our study with a reimbursement of $0.40 per HIT from June 8th 2016 to June 19th 2016. We collected reactions and sets of emotions from 10 Donald Trump supporters and 10 Hillary Clinton supporters for each post on average to avoid opinion bias caused by the amount of responses in different sides. However, the number of overall selected emotion tags in different sides may be uneven for each post since the number of emotions to select was totally at each participant's will.

INTERFACE DESIGN AND IMPLEMENTATION

Design Principles
Our goal is to increase exposure to diverse opinions to users. Based on results from previous studies [1, 8, 10, 11, 14, 15, 16, 17, 19, 20, 21, 22], we derived our design principles (*DP*) below:

1. **Show people's different stances for each topic**: The interface should split people's reactions based on different stances. That would help users to know what reactions are generated from people in different stances.

2. **Provide users with reactions to each topic in different granularity**: Users should be able to view others' reactions in different levels of generalization. We provide users with high level emotional cluster labels and the corresponding reactions.

3. **Provide the degree of controversy of each topic**: Users should be able to infer how controversial a topic is, which allows users to easily prioritize their selection depending on their goals.

4. **Provide social opinion filters for different stances and emotional reactions**: To facilitate the exploration of social opinions with different stances and (emotional) perspectives, users should be able to filter social opinions based on emotional reaction labels in different stances (rather than semantic labels as in traditional interfaces).

Visual Encoding and Implementation
We implemented our interface with 50 Reddit posts about each candidate and the corresponding responses (emotion labels and reactions) collected from Turkers.

Figure 1 shows the overview of the system. For presidential election, we set two stances: Trump supporters and Hillary supporters. By using different colors, we split reactions generated by people with different stances. Green is for Trump supporters and purple is for Hillary supporters. For each post, we list the dominant emotions which received votes above
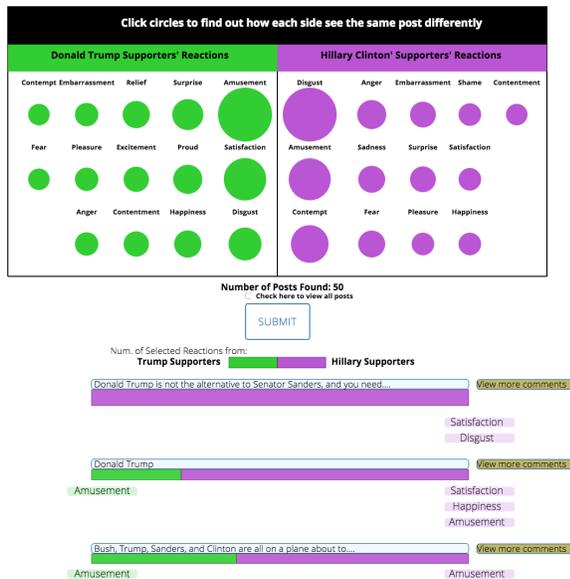
Figure 1. A snapshot of the overview of the system. We provide emotion labels from each side below each post. If the user put the mouse over an emotion label, the actual reactions collected from Turkers for the emotion will pop up and the user could read these reactions (DP-2)

threshold (4) from Turkers. The threshold is the turning point between picking out significant emotions and covering most of the emotions, including insignificant ones. Users can view the different stances for each posts (*DP-1*) and know how controversial a topic is (*DP-3*) by comparing the length of the green bar and purple bar below each post. The length of bar indicates how many supporters on the corresponding side made emotional comments on the post.

Even though we discard some unrelated features on Reddit interface (*e.g. upvotes and downvotes*), we use the thickness of the bar under the post title to show how many comments the post has on Reddit. In Figure 1, the bubbles on the top panel represent emotion types of reactions to each stance. The radius of each emotion bubble is positively correlated to the number of that emotion existing in that stance for all posts. Here, users could click the emotional bubble to select emotions and search for posts based on their curiosity for specific emotional reactions generated by people in different stances (*DP-4*). The system will return posts with the corresponding emotional reactions. Users can read reactions (collected from Turkers) for different emotions in a pop up window by putting the mouse over the corresponding emotion label listed below each post. This provides users with different levels of granularity of people's reactions (*DP-2*).

USER STUDY

Participants

8 participants were recruited from the Midwest of the United States (age range 18 to 34, five females). They held a balanced sample of potential users regarding familiarity with the traditional Reddit interface: two stated that they use Reddit almost every day, three said seldomly (one day per week), and three said they do not use Reddit. Moreover, participants showed the

diverse attitudes towards the presidential candidates, including four Hillary Clinton supporters, one Donald Trump supporter, and three neutral.

Procedure and Task

To compare between our interface to the traditional Reddit interface where users could browse posts' titles with the number of comments and select post to read in the actual Reddit platform, we provided a platform that a user could select between traditional Reddit interface in a controlled setting and our interface. A within-subject design was used for this study with the user interface as the within-subject factor. We changed the order and contents (*e.g. posts about Hillary Clinton or posts about Donald Trump*) for each interface to reduce the carryover effect. After a short tutorial which helped participants understand the meaning of each interface component, a prestudy questionnaire was given on Reddit, and their opinions on reading controversial posts. Next, we asked the participant to freely explore the posts according to their own interest within 10 minutes. After reading each post, they were asked to answer open-ended questions that ask about the reason why they chose the post and summarize overall opinions (or reactions) of other people. Participants then performed short usability questionnaire on a 5 point Likert scale regarding the usefulness, ease of use, enjoyable, effectiveness, discovering diverse opinions, and satisfaction. After exploring the two interfaces, we conducted another short questionnaire that asks about components of our interface in 5 point Likert scale. For the last task, recorded interviews were administered regarding the overall preference, helpfulness of interface to explore diverse opinions, interface components, and suggestions. The interviews were transcribed, and the user behaviors were logged throughout the experiment.

Results

Based on the result of pre-study questionnaire, all participants agreed that they wanted to know how controversial the post is when reading online opinions, which supports the need of our interface.

Mitigating Selective Exposure

In average, 2.75 posts were read in Reddit interface and 3.25 posts were read in our interface. More posts were read in our interface than the Reddit interface. This is consistent with our idea that our interface facilitates users to find and read a post. After a user read one post, we asked why they chose the post. Based on their answers, we discovered common motivations of reading posts: 1) posts shown on the top, 2) posts that are simply curious when reading the title, 3) posts with topics that interest the user, 4) posts related to their prior knowledge/opinion/stance, 5) posts selected because of their curiosity of others' reactions.

Motivation Type	1	2	3	4	5
Reddit (%)	27	27	27	14	**5**
Our Interface (%)	15	35	8	12	**30**

Table 1. Distribution of different motivations to choose posts on Reddit and our interface.

Table 1 shows the distribution of different motivations to choose a post on different platforms. Comparing with Reddit, the percentage of the Type 5 motivation (curiosity of others' reactions) was promoted significantly from 5% to 30% through our interface. The result clearly demonstrates that our interface helps users to explore others' opinions that is otherwise difficult, if not impossible, to do using the traditional interface.

We found that the users with the neutral stance showed different behavior of using the filtering panel against the ones who support one of the candidates. Specifically, neutral users selected emotions only from one side (e.g. only Clinton supporter's happiness) or the same emotions for both sides (e.g. Trump supporter's happiness vs Clinton supporter's happiness). On the contrary, all the supporters were interested in contrasting emotions expressed by the opponents (e.g. Trump supporter's sadness vs Clinton supporter's happiness). Interestingly, all supporters looked for positive emotions expressed by the opponents and negative emotions expressed by those who were supporting the same candidate. For example, Clinton supporters were interested in posts that Trump supporters were proud and Clinton supporters were sad. This partially support our expectation that our interface mitigates selective exposure as people are motivated by the cues to read opinions for both sides.

In addition, we asked all participants the following questions: 1) whether our interface help users to explore posts supported by people in diverse stances; 2) whether the emotion clusters help users to get insight across different opinions. For the first feature, all participants agreed that our interface makes it better to seek for posts supported by people in different stance. P2 said: "*I can easily find which are the controversial posts and which are not. Controversial posts are more interesting to me. So I think that is a good feature.*" P4 said: "*I could know what's pro-Trump or pro-Clinton before I click on it.*" For the second feature, 6 out of 8 participants agreed that cluster posts based on emotional reactions helped them to gain global insight for a topic in a short time. P8 said:"*I really liked it. It's easy to use. It's nice to have visuals.*"
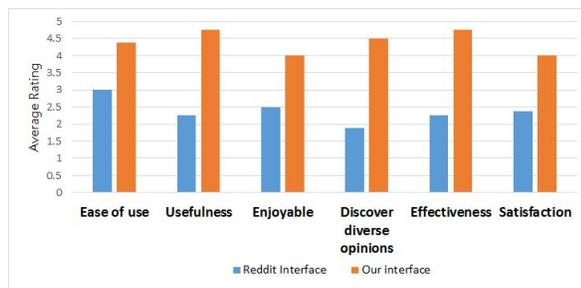
Usability Improvement

Figure 2. Comparison of average ratings between interfaces based on the usability measures. Longer bars indicate better rating and our interface have higher ratings compared to Reddit.

The results of usability questions given to the participants are shown in Figure 2. People found our interface easy and useful for browsing posts *(usefulness)*, enjoyable to use *(enjoyable)*, and effective in helping them complete the tasks *(effectiveness)*. Most importantly, participants agreed that our interface

enabled them to discover diverse opinions *(Discover diverse opinion)* than Reddit that may lead to global insight of controversial topics. Overall, participants were more satisfied with our interface than the counterpart *(satisfaction)*.
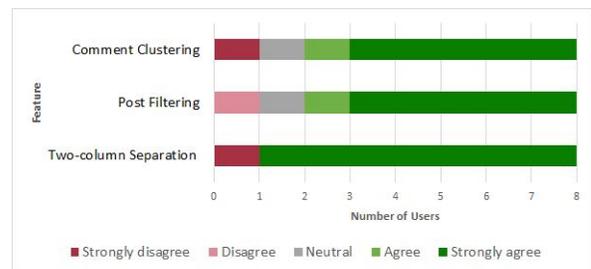

Figure 3. Evaluation for specific interface features in our interface. Most of the users agreed that each feature is useful.

Furthermore, Figure 3 shows the result of evaluating key visualization features in our interface. We found that the two-column design of separating different supporters was the most useful to find the other side's opinion. Also, the feature of filtering the posts and clustering the comments based on the emotion labels were reported to be useful when analyzing the post. As the response to which interface they prefer, 6 of 8 participants showed a clear overall preference to our proposed interface compared to the Reddit interface.

DISCUSSION

What is the role of online forums in a society? People post their opinions to openly discuss and get feedback from others who may or may not share the same views or beliefs, in ways that allow people to understand and appreciate each others' values. From this perspective, online social forums should be designed to enable users to develop and share their own view while browsing and understanding the collective opinions and reactions of others. Thus, an online space that promotes appreciation of diverse opinions and understanding of various emerging social issues can play a crucial role for healthy online communications and thereby facilitate societal agreement. With the same goal, our research motivates users to explore opinions from different stances and thereby help them to interact with online social opinions on controversial topics in ways that we believe can facilitate understanding and reduce selective exposure and opinion polarization. Our experimental results demonstrated that people proactively searched for opinions and reactions of opposite stances using our interface. We plan to extend the current interface so that it can automatically categorize new posts as a user type, such that the user can receive immediate feedback on how their posts are similar to and different from existing ones. We expect that this will further mitigate selective exposure and help users explore more diverse opinions and acquire a more balanced view of a social topic.

ACKNOWLEDGMENTS

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