

Analyzing Bias of Comments on Political News Articles to Facilitate Transparent Online Communities

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ABSTRACT

Comments on the news articles can affect people's perceptions and behaviors. However, little is known about how people determine the degree of bias (DoB) of comments on political news articles. To address such bias issues, current platforms of news articles offer criteria to sort multiple comments on the news articles. However, little is known about whether the DoB of comments is reduced when publishers offer various criteria for sorting comments. We conducted surveys to identify how people determine DoB of comments on the news article, and how bias varies depending on how comments are sorted. The findings of this study revealed that there was a significant difference among the DoB by comments. Future work remains to develop an algorithm generating unbiased comments by using existing comments on political news articles and their DoB.

Author Keywords

Bias; Degree of bias; Comments; Top comments; Sorting criteria; Online communities; Online news; Political news

CCS Concepts

•Human-centered computing → Social network analysis; Reputation systems;

INTRODUCTION

From the widespread of the Internet, online news articles are rapidly replacing traditional paper newspapers [12]. Most online articles have a comment section, so the number of people viewing comments in online news is also increasing. The public uses the online news comments section to interact with the news, express their opinions, and see what others are saying [10]. News article bias affects people's consciousness, including voting [4]. Thus, the use of artificial intelligence to quantify the bias of the news articles has been suggested [5]. Similar to the news, existing studies have shown that biased comments have influenced people's bias and even suggest the possibility that comments may affect our behavior [6]. In fact, in 2018, there was a case in which a user called *Druking*

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attempted to manipulate public opinion by using a click macro to support a specific political party [1]. However, little is known about how people determine the degree of bias (DoB) of comments on political news articles. To reduce the gap, we aim to answer the following research questions:

- RQ1. Which characteristics of comments influence the DoB of comments on a political news article?
- RQ2. What causes the difference in DoB of comments?
- RQ3. Which characteristics of the person reading the comment affected the perceived DoB of the comment?

To answer these RQs, we conducted surveys to identify how people judge the bias of comments, and which factor affects the DoB of the comments. There are two contributions of this paper. First, the findings of our study suggest criteria for assessing a bias that did not exist. Second, the findings of this study reveal opportunities for minimizing the impact of bias when people read comments of online news articles.

RELATED WORK

Prior studies [3, 6, 8, 9, 13] investigated top comments, which means comments that place at the top of the comments section. Three studies [8, 9, 13] found that top comments influenced who read them, while two studies [3, 6] developed models for evaluating comments based on specific criteria. First, previous studies [8, 9, 13] identified the phenomenon where top comments influenced the emotions and perceptions of readers. Kim and Choi [8] verified that the top comments trigger an emotional transfer. Their research question was: does the top comment cause emotion transfer? They found that the extremes and involvement of the top comments affect the transfer of emotions. Kim and Choi [9] also found out how an individual's perception of top comments affects emotional transfer. Their research question was: 1) how do anonymous online bring about emotional transitions? 2) how does the content of the top comment lead to an individual's emotional transition? 3) how does the number of likes in a top comment lead to an emotional transition? They found that emotional transfer is influenced by an individual's perception of top comments, and therefore top comments play an important role in the formation of opinions on the online. Lee and Kim [13] identified the impact of online top comments on consumers' perception of product quality. They found that: 1) the content of online top comments has a significant impact on consumers' perception of product quality, especially when the quality difference between products was not large; 2) the ratio of up-vote

Patterns	Categories	Quotes
The political orientation of the commenter is revealed	The comments reveal political orientation	<i>The word ‘Moon jea-ang,’ which reveals a particular political disposition, is biased (P74)</i>
	The comments show a friendly attitude toward certain politicians or political parties	<i>This comment is that the biased person wrote down the commitment of the candidate he supports (P14)</i>
	The comments emphasize a particular expression	<i>Because comments highlight specific words (P48)</i>
	The content of the comments is a direct condemnation to certain politicians	<i>Blaming the President (P46)</i>
The content of the comments is illogical	The comments reveal antipathy toward a particular object	<i>Shows hostility toward Kim Jong-un using profanity (P72)</i>
	The content of the comments is illogical	<i>Despite it is a personal opinion, it is written as if it is a public fact (P10)</i>
The content of the comments is irrelevant to the article	The content of the comments is irrelevant to the article	<i>Comments promoting a political party regardless of the content of the article (P59)</i>
	The commenter did not comment in a neutral position	<i>It is clear that commenters think that the United States is superior to North Korea (P51)</i>

Table 1. Summary of the results from open-ended questions. The word *Moon jea-ang* is a swearword that compares South Korean President Moon Jae-in to disaster.

and down-vote played a controlling role. On the other hand, prior studies [3, 6] developed models for evaluating comments based on specific criteria, such as diversity, up-vote counts and author reputation. Northcutt et al. [11] developed algorithms to diversify top comments. They developed a new model that selects comments that are more diverse, comprehensive, and less redundant than the existing comment sorting algorithm based on the number of up-vote counts/reply counts. Sousa et al. [3] suggested a fuzzy system for estimating the importance of comments. They developed a fuzzy system with three inputs: author reputation, number of tuples $\langle \text{feature, quality word} \rangle$ and percentage of correctly spelled words, and one output of the degree of how the comment is important.

METHOD

Participant Recruitment

To recruit participants, we uploaded survey invitation messages to the KakaoTalk messenger¹'s group chat rooms, college students' SNS Everytime² and Twitter. Then, we sent an instant message via the KakaoTalk messenger to encourage survey responses. The inclusion criteria were individuals who are 18 and older and under 65, who had read the Internet articles in the political field within the last three months. A total of 81 people (28 females) participated in the experiment. The age ranged from 18 to 54 years, with a mean of 26.1 and a standard deviation of 8.68. After the survey, we reimbursed participants with \$4 worth gift card.

Data Preparation

To investigate the bias of news article comments on the Internet, we picked one of the Internet articles that met the following conditions and collected its five types of top comments. 1) articles in the political news section provided by the portal site NAVER³; 2) published between January 3rd and 8th in 2020; 3) the top comments have not been deleted for

all five comments sorting criteria; 4) none of the five top comments overlap; 5) the most viewed articles that meet the above five conditions. The five comment sorting criteria provided by NAVER are: *Number of Like*, *Latest Comments Order*, *Ratio of Like*, *Number of comment's reply*, *Old Comments Order*. *Number of Like* means that the comments were sorted by the number of like minus dislike. *Latest Comments Order* means that the comments were sorted in order of the latest updates. *Ratio of Like* means that the comments were sorted by the ratio of number of like and number of dislike. *Number of comment's reply* means that the comments were sorted by the number of replies. *Old Comments Order* means that the comments were sorted from oldest to latest. Two of the five comments criticized President Moon Jae-in, and one listed the election promise of opposition politicians. The other two threatened Kim Jong Un. The followings represent the indicators of the online news article used in this study: Newspaper: JoongAng Ilbo⁴; Article published time: January 5, 4:02 PM; Last modified time: January 5, 6:05; Comments on this article: 3,134; Views: 298,593; and Emotional display of news (i.e., original features of NAVER News): 8,001.

Study Procedure

We created a questionnaire that covers the following topics:

- Determine if a respondent is eligible to participate in our study, e.g., *Have you read the online news in politics in the last three months?*
- Participant demographics, e.g., *what is your age and gender? How often do you read online articles on politics? What kind of device do you usually read articles on the Internet?*
- Investigate the bias of internet comments, e.g., *How biased do you think each comment is? Why did you think so?*
- The political propensity of participants, e.g., *What do you think of your political orientation? What political party do you support?*

¹<https://www.kakaocorp.com/service/KakaoTalk>

²<https://everytime.kr/>

³<https://www.naver.com>

⁴<https://joongang.joins.com/>

Sorting criteria	Mean	Standard Deviation
# of Like	5.00	1.57
Ratio of Like	4.20	1.65
# of Comment's Reply	4.80	2.01
Latest Comments Order	5.74	1.46
Old Comments Order	4.90	1.67

Table 2. The DoB of comments by sorting criteria represented by 7-point Likert-scale.

All surveys were conducted via the Google Survey link included in the invitation message and were initiated with the consent of the respondents at the beginning of the survey. The survey lasted about 5-10 minutes. To determine how biased each comment was, we used a question using a 7-point Likert-scale, asking participants to determine the *bias score* for each comment. (1 - highly impartial, 7 - highly biased.) Then we asked participants to describe why they judged the bias in the comments so. Finally, to see if the bias varies depending on the political orientation of the participants, we asked the political orientation of the participants and the political parties they support. Participants choose from 1 to 7 political orientations (1 for very conservative, and 7 for very progressive).

Data Analysis

We defined the degree of bias (DoB) of each comment as the mean of the *bias scores* from survey results. First, we performed the Levene test for all 10 pairs that could be made by selecting two of the five comments (e.g., *<Number of Like, Old Comments Order>*) to test for homogeneity of variance. Then, we applied independent two-sample t-test for homoscedastic data, and Welch's t-test for homoscedastic data to determine whether or not the DoB of the two comments is significantly different. Finally, to determine whether DoB is affected by participants' characteristics, we calculated the Pearson correlation coefficient on participants' characteristics including age, frequency of news reading, and political bias. To analyze the qualitative responses from the survey, we performed an open coding [7] approach. First, the response whose meaning is unknown is excluded. Also, since we wanted to know why people thought comments were biased, the results of those who judged that comments were not biased ($\text{bias score} \leq 4$) were excluded. Then, the rest of the responses were grouped together with similar meanings. These classified groups were labeled and grouped again. The above process was repeated two more times to determine the cause of the bias of the comment.

RESULTS

Participant Demographics

The survey results revealed that 78 (96.3%) participants used their smartphones when reading political news articles on the Internet. The second most popular device was the laptop, which was used by 26 participants. In terms of the way that participants read political news articles on the Internet, the most common way people use to read news is through the News tab on the portal site (86.4%). Otherwise, less than 38% of respondents said they read the news using other methods. Regarding the frequency of reading online news articles in politics, the average frequency of reading political Internet articles was four days a week, with a standard deviation of 2.22. In terms of the frequency of reading comments on online

news articles in politics, when viewing online news articles, the average frequency of reading comments was 7.7 out of 10, with a standard deviation of 3.15. Regarding the political parties that participants support and political orientation of participants, the *Democratic Party of Korea* is a party supported by the most participants. 41 (53.9%) participants responded that they were not sure about which party they supported. Five participants who answered both support a political party and select *Not Sure* were excluded.

Results of a Survey on Bias of Comments

We identified three main causes of bias on the comments from open-ended questions(see Table 1). We also calculated the DoB of the top comment according to each comment sorting criterion (see Table 2). The largest sorting criterion for DoB was *Latest Comments Order*, followed by *Number of Like*. The lowest DoB sorting criterion was *Ratio of Like*. The t-test was applied on all 10 pairs that could be made by selecting two of the five comments (see Table 3). C1 and C2 indicate what the two comments are. The number means: 1) Number of Like; 2) Latest Comments Order; 3) Ratio of Like; 4) Number of comment's reply; 5) Old Comments Order. The order of C1 and C2 was determined so that the DoB of C1 was greater than the DoB of C2. Most significant factor is the biggest reason that C1's DoB is larger than C2's DoB (see Table 3). Seven of the ten combinations were significant. The most significant cause of comment bias was that the comment revealed antipathy to a particular subject. As a result of correlation analysis between political orientation and DoB, C1($r=-0.32$, $p<.05$), C2($r=-0.47$, $p<.05$), C4($r=-0.22$, $p<.05$), C5($r=-0.26$, $p<.05$) showed weak correlation and C3($r=-0.18$, $p\text{-value}=0.115$) did not show a significant correlation. There were no significant correlations with other factors, such as age or frequency of news reading.

DISCUSSION

As shown in Table 5, the $p<.05$ in 7 of 10 cases indicates that the DoB difference of comment is significant. The DoB in the comments was determined not by a single factor, but by a variety of factors. The most significant factor affecting DoB was that comments were resentful of specific targets. The DoB is dependent to the content of the article because the DoB was large when the content of the comments was not related to the article. Therefore, it is not possible to determine the DoB by the content of the comments alone. It might be necessary to identify the relevance to the content of the articles. Correlation analysis results show that the DoB is not affected by factors other than political orientation. This means that the DoB can be broadly applied. In particular, we revealed that DoB is high when the comments reveal hostility toward a particular target or when the content is irrelevant to the content of the article. Similar to this result, Choi [2] revealed that the best comment takes a conversational strategy that says something that is not related to the content of the article or takes a disrespectful attitude to the person involved in the topic of the article. Thus, our findings are consistent with existing findings reported by Choi [2].

CONCLUSIONS

The goal of our study is to find out the reasons for the bias in the comments. We surveyed the differences in bias depending

C1	C2	t-score	p-value	Most significant factor	# of participants
2	3	-3.11	0.0000	<i>The comments reveal antipathy toward a particular object.</i>	44
2	4	3.16	0.0001*	<i>The comments reveal antipathy toward a particular object.</i>	44
2	5	0.69	0.0008	<i>The comments reveal antipathy toward a particular object.</i>	44
1	3	0.39	0.0019	<i>The content of the comments is illogical.</i>	26
2	1	6.3	0.0022	<i>The comments reveal antipathy toward a particular object.</i>	44
5	3	3.36	0.0078	<i>The content of the comments is a direct condemnation to certain politicians.</i>	26
4	3	3.41	0.0402	<i>The comments show a friendly attitude toward certain politicians or political parties.</i>	21

Table 3. Results of two sample t-test of DoB. An asterisk (*) of the p-value means that the Welch's t-test was applied. In other cases, the independent two-sample t-test was applied. Most significant factor is the category that has the biggest difference in the number of people per category when comparing the two comments. Number of participant is the number of responses of Most significant factor. Of the total 10 combinations, only seven with significant p-value were shown.

on how the comments were sorted. Then, the results of the narrative survey were analyzed through open-coding to see how people judge the bias of comments. Our research may potentially help news readers find biased comments from others. Our research can also be helpful when making policy, as people will know the unbiased intent of the policy. Hamborg et al. [5] stated that studies in the computer and social sciences can be more efficient by automating content analysis. Therefore, our research will also help such studies by automating bias analysis in news comments. Also, website managers may use the criteria determined by our initial results when they need to regulate any politically biased comments left in the comments section of a political news article. It is difficult to generalize the difference in DoB depending on comment sorting criteria because only one comment was used for each comment sorting criteria. Also, bias can be seen in comments in other areas than politics. So our study has a limitation that it only studies comments in the political field. The next step in our research is to develop an algorithm that can quantify the DoB of comments from our findings and develop a comment sorting system based on DoB. Our final goal is to develop an algorithm that generates new unbiased comments from existing comments of news articles.

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