

# NewsCube2.0: An Exploratory Design of a Social News Website for Media Bias Mitigation

Souneil Park<sup>1</sup>, Minsam Ko<sup>2</sup>, Jungwoo Kim<sup>1</sup>, Ho-Jin Choi<sup>1</sup>, Junehwa Song<sup>1</sup>

<sup>1</sup> Department of Computer Science  
KAIST, Daejeon, 305-701, Republic of Korea  
{spark, jwkim, junesong}@nclab.kaist.ac.kr,  
hojinc@kaist.ac.kr

<sup>2</sup> Department of Knowledge Service Engineering  
KAIST, Daejeon, 305-701, Republic of Korea  
msko@.kaist.ac.kr

## ABSTRACT

We present NewsCube2.0, a social news website aiming to mitigate the effects of bias on socially contentious news issues. For contentious issues, news producers actively try to shape readers' cognition of the issue according to their viewpoints and interests through various types of articles. Also, they take advantage of various framing methods. NC2.0 enables users to collectively create a framing spectrum for a contentious issue. It aims to help readers easily understand at a glance the standpoint from which each article views and interprets the issue in contrast to others from a global perspective. As such, NC2.0 helps readers understand the issue from a plural of viewpoints and formulate their own balanced views, free from a specific biased view.

## Author Keywords

Media Bias, Participatory Bias Mitigation, News Distribution Service, Framing Spectrum.

## ACM Classification Keywords

H5.m. Information interfaces and presentation, H.4 Information Systems Applications: Communication Applications.

## INTRODUCTION

The bias of the news media often turns journalism into subjective propaganda. News producers actively *frame*<sup>1</sup> reality in favor of their political, ideological views, or business interests. They select different facets of the reality, cover these facets in different tones, and present them in different styles. Bias is more explicit and frequent in the coverage of contentious, political or socio-economic issues such as the Iraq war [6], the Sunshine policy<sup>2</sup> [8]. As such, it often causes a sharp increase in political polarization, misunderstanding of critical issues, and a significant impact on elections. However, it is difficult for ordinary readers to critically analyze and detect the bias. They mostly passively perceive news through restricted channels, often times through a single channel. Advanced news production and

delivery models are required to break the vicious cycle of the bias.

In this paper, we present NewsCube2.0 (NC2.0), a social news website aiming to mitigate the effects of bias on socially contentious news issues. In NC2.0, users collectively create a *framing spectrum* for a contentious issue. It forms and gives a global view on the diverse framing of a number of different producers to a common issue. It helps readers easily understand at a glance the standpoint from which each producer views and interprets the issue in contrast to others from such a global perspective. As such, they can understand the issue from a plural of viewpoints and formulate their own more balanced views, free from a specific biased view.

Our attempt to bias mitigation was initially made in [9]. As the first effort, we targeted the most common type of news articles, i.e., straight news articles. Getting hints from the structural characteristics of straight news, namely, the inverted pyramid structure, we could provide a computational framework for aspect-level browsing [10], which reveals the difference in the selected facts among articles on a common event.

NC2.0 deals with various types of articles and different forms of framing methods beyond straight news articles and selection of facts in the articles. For socially contentious issues, news producers actively try to shape readers' cognition of the issue according to their viewpoints and interests. They cover the issues with their opinions and interpretations through various types of articles, e.g., columns and editorials, blog posts. In doing so, they take advantage of various framing methods; the framing can be embodied through selection of information, selection of writing style, selection of presentation style. Due to the irregularity and complexity of the types of articles as well as the framing methods, it seems very difficult to approach the bias problem with purely computational methods.

NC2.0 attempts to harness collective knowledge to structure the framing spectrum. The readers have high potential to understand and evaluate the different framing of the articles when their participations are cleverly aggregated and coordinated. As for contentious issues, many readers potentially have motivation to actively evaluate interested articles and share the results. NC2.0 notices such

<sup>1</sup> To frame[3] is to "select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation and/or treatment recommendation"

<sup>2</sup> The unification policy of South Korea

motivation and transforms it to collaborative construction of the framing spectrum.

To facilitate collaboration, NC2.0 provides *frame structuring tool* as a browser add-on. The key to the tool is twofold: first, it aids participants to analyze an article with regard to various framing methods by giving a guideline for the analysis. Second, it helps the readers intuitively coordinate the position of the article in the framing spectrum. It loads and presents the framing spectrum of the covered issue. NC2.0 also employs *automatic issue bootstrapping*. It automatically detects contentious news issues, and creates an initial structure of the framing spectrum which participants can further build upon.

## BACKGROUND AND RELATED WORK

Many studies have shown the inherency of bias of news companies [4][5]. They argue that media bias is rather an inevitable structural problem of the news industry than a temporary phenomenon. A survey by the American Society of Newspaper Editors [13] revealed that 78 percent of the public believed that there was bias in news reporting. The impact of media bias on distorting social awareness on critical public issues and collective decision making process, such as elections, has also been reported. Kull et al. [6] reported misperceptions of the public specifically on the Iraq war, e.g., links between Iraq and al Qaeda, and their relation to individuals' primary news source. Gerber et al. showed how media bias affected voting in elections through empirical studies [2].

Following [9], the solutions to the problem can be viewed at two different points, i.e., production vs. post-production stage. While the production stage approaches try to avoid the creation of bias, the post-production stage approaches deal with the created biases of produced contents. News producers have established Journalism ethics and standards, and developed alternative reporting formats such as point-counterpoint or roundtable discussions. However, the approaches entirely depend on the efforts of individual journalists or require significant changes in the news production process. These approaches have not succeeded in resolving the problem. Media bias is still widespread [13].

The post production approaches are classified to bias correction, bias diagnosis, and bias mitigation, which NC2.0 takes. Though not focused on news issues, Wikipedia makes trials to correct bias through collaborative review. However, correction of bias is intrinsically difficult as it is hard or impossible even to clearly define what an unbiased news is.

Many researches in mass communication try to diagnose bias in news articles. They attempt to examine and explain the bias of produced news articles. However, the scale of analyses is limited as they are conducted by a few experienced researchers. The studies are mostly confined to a single issue, and the scope of analyzed articles is limited to those of a few big news outlets.

Bias mitigation takes a practical approach while admitting the prevalence of biases. The approach attempts to reduce the effect of the biases on readers' experience rather than to clearly prove or correct them. NC2.0 attempts to provide users with tools for active interactions with which they easily discover and experience diversity of existing biased views over an issue. It supports users themselves to develop their own balanced views. Importantly, it utilizes mass collaboration to cover many contentious issues. It rapidly collects and organizes news articles revealing different viewpoints.

NC2.0 is also related to the efforts on social news websites, e.g., digg.com, reddit.com, which are gaining much attention recently. Current social news websites aim to support users to share or recommend contents of their interest. They collect contents from participants and present them in the order of popularity, e.g., number of votes. NC2.0 gives an important new direction, i.e., media bias mitigation, to these services.

## NEWSCUBE2.0 DESIGN

NC2.0 aims to expose different viewpoints of the media through the framing spectrum. The framing spectrum relatively orders news articles regarding their viewpoints to a contentious issue. It helps readers intuitively perceive the difference of the viewpoints, and compare and contrast different viewpoints.

NC2.0 is designed to address the key issues in supporting the evolution of the framing spectrum, i.e., initial structuring, collaborative extension, and conflict resolution. First, NC2.0 creates an initial structure of the framing spectrum and help participants understand the point of dispute. Second, it supports participants collaboratively extend the created spectrum by submitting and coordinating new articles over it. Third, NC2.0 provides interface support for resolution of conflicts arising while organizing the framing spectrum. We first present the service interface of NC2.0 and describe the approaches taken for these issues.

### NewsCube2.0 Service Interface

Figure 1 shows the service interface of NC2.0 for a selected news issue. The design goal of this service interface is to support readers to quickly understand the selected issue, and lead them to compare different framing of the issue. For this, the service interface includes three main components: context section, framing spectrum, and contrast section.

- Context section: The context section aims to efficiently contextualize the selected issue. The presentation of the section is based on the narrative structure of news [8], whose identified elements are background (scene), main agent(s), action, agency (how the action is done), implications. The narrative structure is known to act as a cognitive model when a reader understands the reported situation. The section selects and presents the articles which gives information related to the elements.



Figure 1. NewsCube2.0 service interface

- Framing spectrum:** The component aligns groups of articles over the framing spectrum. The color gradation of the background helps users perceive the change of viewpoints. Each segment composing the spectrum represents a group of articles registered to that position. It presents the title of a member article. In Figure 1, the framing spectrum organizes the articles on the issue “The announcement of the government’s four major river restoration project”. The title of the left-most segment which reveals a negative view is “the project eventually aims for the Grand Korean Waterway”. It argues that the announced project is equivalent to the Grand Korean Waterway project, which was cancelled due to the strong opposition of the public. The segment at the center reveals a less negative view whose title is “Resolving distrust is the first key for success”. The title of the right-most segment is “Opposition for opposition’s sake should be stopped”.
- Contrast section:** The contrast section enables users to focus and contrast specific segments. When a user selects a segment, the contrast section reveals contrasting viewpoints. It shows the articles registered to the two segments: the selected segment, and the segment with opposing views. For each article, the section gives awareness on the framing methods used in the article. The framing methods are annotated by the participants. The contrast section in Figure 1 shows the left-most segment and the right-most segment. To make connection with the bias spectrum view, the border of the two selected segments is colored into red and blue.

#### Automatic Issue Bootstrapping

NC2.0 automatically constructs the initial structure of the service interface. It detects a contentious issue, creates the initial structure of the framing spectrum, and organizes the context section. This reduces the burden of participants and

enables them to participate just by adding new articles to the created framing spectrum.

To identify contentious issues, NC2.0 monitors the editorials of news providers which show different ideological characteristics. The selection of the news providers is based on media frame analysis researches [8]. In editorials, news producers select an issue and explicitly reveal their viewpoints. An issue is likely to be contentious if it is selected by multiple news providers. NC2.0 continuously collects editorials and performs topic similarity analysis, i.e., TF-IDF combined with cosine similarity, to identify the commonly covered issue.

The initial structure of the framing spectrum is created by seeding two articles with opposing views. We use editorial of two representative news providers which show contrasting ideological characteristics. From the seed articles, the participants make sense of the opposing viewpoints of the argument, e.g., whether they are pro vs. con, liberal vs. conservative, etc.

The context section is organized with the articles covering the elements of news narrative. First, it detects news agency reports which are redundantly published in many news providers. News providers frequently use these articles to deliver basic facts of an event such as the main agent(s), their action, and agency. NC2.0 also detects articles focused on the elements, background, and implication. For this, we create a list of vocabularies related to background, and implication based on the researches on news taxonomy [7]. NC2.0 selects the articles whose title includes a vocabulary in the list.

#### Collaborative Spectrum Extension

NC2.0 harnesses mass collaboration to extend the framing spectrum. The participants can submit variety of articles such as straight news articles, blog posts, columns and editorials. They also collaboratively organize the structure of the spectrum, i.e., the position of articles in the spectrum.

The Frame Structuring Tool is implemented as a simple browser add-on (Figure 2). Participants can load the tool by a single mouse-click while browsing any news articles. Through the tool, they can easily submit new articles and collaboratively extend the framing spectrum.

To support analysis of articles, the tool guides on the framing methods that are frequently used in news articles. It gives a categorized list of the methods, and enables the participants to check each method they found in the submitting article. The participants can also annotate free text comments to explain the detected methods. The listed methods act as detailed criteria for frame analysis, also as a common guideline which restrains participants from arbitrary operationalization and analysis of framing.

The provided category gives a comprehensive view to various framing methods used in news production. We synthesize the framing methods used at news gathering,

writing, and editing, based on the studies of journalism and communication [1]. These include the methods realized through *selection of information*, which are commission, omission, and source selection; through the *style of writing*, such as labeling, word choice, and tone; and through *presentation*, such as space allocation, photo selection. We do not claim these as a complete checklist but propose them as a practical guide supporting analysis of readers.

The tool presents the framing spectrum to enable the participant to coordinate the position of the submitting article. It automatically retrieves and shows the framing spectrum of the covered issue from the service interface of NC2.0. The covered issue is identified using topic similarity analysis technique. Using the spectrum, participants compare articles and their framing methods. They can decide the position of the article in the spectrum by comparing it with a small number of articles. The article may be located to the same position with an existing segment or a new position.

### Conflict Resolution in NewsCube2.0

As interpretation of framing methods involves subjectivity in nature, conflicts may arise between participants while structuring the framing spectrum. There can be two types of conflicts in NC2.0: disagreement on the order of articles in the spectrum and that on the framing methods used in the articles.

Designing a conflict resolution process is a complex issue which requires careful observation on various aspects of the conflicts. For example, the resolution process may focus on arbitration between the participants if their opinions show slight difference. Otherwise, the resolution process may rather focus on choosing a certain opinion. Important aspects of the conflict include, the diversity of opinions related to a conflict, the degree of difference between the different opinions, and their rigidness.

Rather than to develop a specific resolution process, NC2.0 is currently designed to observe these aspects through deployment. Thus, the service interface is made to give awareness on a conflict, and to enable users to express their opinion. It highlights the articles whose location or framing methods are under a conflict. When a user clicks the article, the interface visualizes different opinions, e.g., recommended locations, expressed by other participants. Users can express their opinion while considering others' opinions.

## PILOT STUDY

### Participants and Procedure

We recruited 18 participants (11 males and 7 females) for a pilot study. All of them were students in the age range 20–30 years, and used the Internet as their primary news source. For diversity of participants, we recruited students from different majors, computer engineering (7 participants), information science (4 participants), and journalism (7 participants).

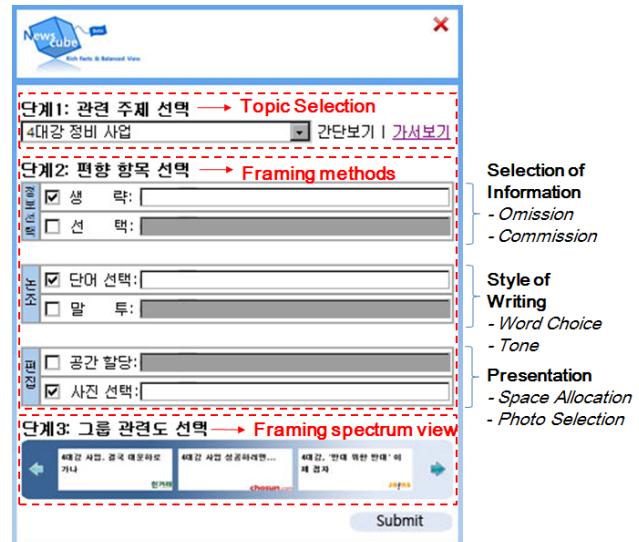


Figure 2. The Frame Structuring Tool

We conducted an instruction session about the website with the participants. We also gave two days of practice period to help them get used with the website. They were then allowed to use the website and participate whenever and wherever they preferred during the pilot study.

The pilot study was conducted for two weeks. Various contentious issues that arose during the corresponding period were updated in the website. Example issues include “Bill Clinton’s North Korea Trip”, “strike of Ssangyong Motor workers”, and “conflict on the media legislation”, to name a few. The participants shared contents related to the issues through the website during the pilot study period. We conducted a semi-structured interview to gather feedbacks after the pilot study.

### Observations

#### Usefulness of Automatic Issue Bootstrapping

We observed the effectiveness of automatic issue bootstrapping for supporting the users to participate. Many participants said that NC2.0 covered the issues of public interest in a timely manner. They also commented that the articles of the context section and the seed articles of the framing spectrum gave sufficient information required for participation. They could make sense of what the important issues are and the opposing arguments around the issue.

#### Necessity of framing spectrum management methods

The pilot study revealed that additional management methods are required to maintain the readability of the framing spectrum. According to our observation, the length of the spectrum is an important factor which influences the readability of the spectrum. When the length of the spectrum goes beyond a certain degree, the participants tend to have difficulty in interpreting it and lose motivation for contribution. It is necessary to reorganize the spectrum in such cases, e.g., by merging near segments.

The heterogeneity of the submitted articles was another important factor. There were some types of articles which confuse the participants: the articles that are irrelevant to the main discussion points of the spectrum, the articles published at a different stage of the event. These types of articles make hard for the participants to compare the degree of bias. A method to remove or relocate such articles has to be developed.

#### *Design of different roles and corresponding interfaces*

We also observed that the interface has to consider the participants' different level of motivation. The level of motivation varied: while some participants actively share many articles and annotate them with various comments, some participants rarely contributed. In the interview, active participants said that they wanted to do more things, e.g., reorganizing the framing spectrum, relocating articles, etc. On the other hand, participation was not simple for those who rarely contributed. Comparing their articles with those in the framing spectrum and positioning them required more effort than they would normally put for sharing of news articles. In order to reflect the different level of motivation, different roles may be defined, e.g., editor, simple contributor, etc., and different interfaces may be designed for each role accordingly.

#### **CONCLUSION AND FUTURE WORK**

We have designed and implemented NC2.0, a social news site designed for mitigation of media bias. It supports participants to collectively organize a *framing spectrum* for contentious news issues. Users of the service can compare and contrast different viewpoints in the spectrum and develop their own views, free from specific biased view. Our pilot study revealed a number of challenges which should be addressed: the framing spectrum needs further management methods to maintain its readability, and the system has to consider the different level of motivation of the participants.

Another challenge of the system is continuous collection of data through mass participation. Our future work is to develop a system which uses existing data in the web. This would reduce the burden to collect massive data from the users of the system. An initial approach has been made in [11] by utilizing the comments of news articles. We are also studying for automatic methods which can contrast opposing views of contentious issues [12].

#### **ACKNOWLEDGEMENT**

This research was supported by Basic Science Research

Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (2010-0028631).

#### **REFERENCES**

1. Baker, B. How to Identify, Expose and Correct Liberal Media Bias. Media Research Center, 1994.
2. Gerber, A., et al. Does the Media Matter? A Field Experiment Measuring the Effect of Newspapers on Voting Behavior and Political Opinions. *Yale Economic Applications and Policy Discussion Paper* No. 12.
3. Entman R.M. Framing: Toward Clarification of a Fractured Paradigm. *Journal of Communication* 43 (4): 51-8, 1993.
4. Herman, E.S. et al. Manufacturing Consent: the Political Economy of the Mass Media. New York: Pantheon Books, 1988.
5. Herman, E. S. The Propaganda Model: A Retrospective. *Against All Reason*, 1: 1-14, 2003.
6. Kull, S., C. Ramsey and E. Lewis. Misperceptions, the media, and the Iraq War. *Political Science Quarterly* 118(4): 569-598, 2003.
7. National Korean Language Research Center, Writing Style of Korean News Articles. 1997.
8. Rhee, J. W. Testing the Framing Model of Public Opinion Process: News Frames, Interpretive Frames, and Framing Effects on Opinion. *Korean Journal of Communication*, vol. 49-1. 2005.
9. Park, S., et al. NewsCube: Delivering Multiple Aspects of News to Mitigate Media Bias. In *Proceedings of ACM Conference on Human Factors in Computing Systems (CHI)*. 2009.
10. Park, S., et al. Aspect-level News Browsing: Understanding News Events from Multiple Viewpoints. In *Proceedings of ACM International Conference on Intelligent User Interfaces (IUI)*. 2010.
11. Park, S., et al. The Politics of Comments: Predicting Political Orientation of News Stories with Commenters' Sentiment Patterns. In *Proceedings of ACM Conference on Computer Supported Cooperative Work (CSCW)*. 2011.
12. Park, S., et al. Contrasting Opposing Views of News Articles on Contentious Issues. In *Proceeding of the 49th Annual Meeting of the Association for Computational Linguistics (ACL)*. 2011.
13. Urban. C. Examining Our Credibility: Perspectives of the Public and the Press. American Society of Newspaper Editors, 1999.