

CrowdForest : A Visualization Tool for Opinion Sharing based-on Semantic Figurative Metaphors

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ABSTRACT

The large number of social platforms developed enable users to express their opinions and access information more freely. However, their algorithmic strategies can have a high possibility of exacerbating a filter bubble or echo chambers which may evoke distinctive emotions response with others. Herein, we present a new online visualization tool for opinion sharing, called CrowdForest, which allows users to visualize their opinions, interacting with others based on semantic figurative metaphors driven by sentiment analysis.

CCS CONCEPTS

• **Human-centered computing** → **Visualization systems and tools.**

KEYWORDS

Opinion discussion, Sentiment analysis, NLP interface, Semantic Figurative Metaphors

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1 INTRODUCTION

The various online social platforms available allow people to express their opinions regardless of time and place. Owing to the enormous amount of information presented, most online social platforms have adopted a recommendation system or text analysis enabling people to share their opinions more frequently and obtain access to the content they want. One of the most frequently used strategies is a collaborative filtering method, which recommends content based on similarity measures between users.[8] This strategy results in homophily, a principle in which contact between similar people occurs at a higher rate than that among dissimilar people. Although utilizing these strategies are useful for information access, it can create echo chambers and filter bubbles, resulting

in a political polarization.[1, 9] In addition, most of the user interfaces on social platforms display the participant's opinions with sequential pattern(e.g. YouTube comment system), making it difficult for people to review thier overall thoughts in real time. Social opinions, particularly those on controversial topics, often incur polarizing emotions and reactions from people who have an opposite stance.[10] In this paper, we propose CrowdForest, a novel interface used as an interactive data visualization tool of opinions, which was constructed to create a sustainable deliberation of opinions among individuals. In the development of this tool, we focus on using semantic figurative metaphors displayed as the elements of an ecosystem. While using the tool, when people express their opinions, their opinions are displayed on the interface, which is analyzed based on machine learning.

2 RELATED WORK

2.1 Deliberative Opinion Visualization Tool

Because as exploratory visual analysis with interactive tools can help the analysts obtain an overview of the topics and opinions, several researches in the field of human computer interaction are being carried out.[4, 6] From this perspective, Siamak proposed on an online opinion deliberation system called an "Opinion Space" where users can inform each other and adjust their opinions over time using a clustering algorithm.[4] At IUI 2017, Gao, et al. tested several interfaces which categorize and visualize the original posts according to the users' emotions and reactions to mitigate a selective exposure.[5] In the current study, we followed this research direction, assuming that people tend to evoke their emotions while interacting with others and expressing their opinions in semantic figurative metaphors visualization approach.

2.2 Semantic Figurative Metaphors

A metaphor is a mapping of knowledge regarding a familiar domain in terms of its elements and their relationships with each other to the elements and their relationships in an unfamiliar domain.[7] It can assist analysts perceive reasons about data, providing multiple complementary views of information.[2] A semantic figurative metaphor is a visualization method for a data representation, giving users an emotional response by helping data storytelling in the contents. To increase the effect of semantic figurative metaphors, 1)visual cues should be detailed to make people understand the concept, 2)All metaphors should be considered the author's intention.[3]

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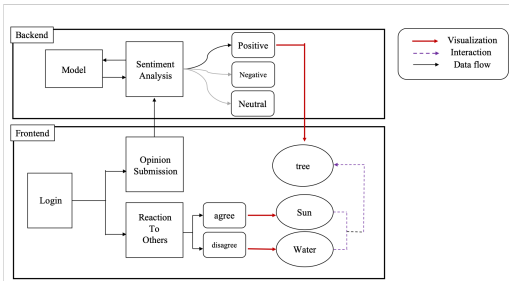


Figure 1: Flowchart of the system. In the backend section, the pre-trained model analyzes the user input text, and the results as visual cues are returned to the frontend section.

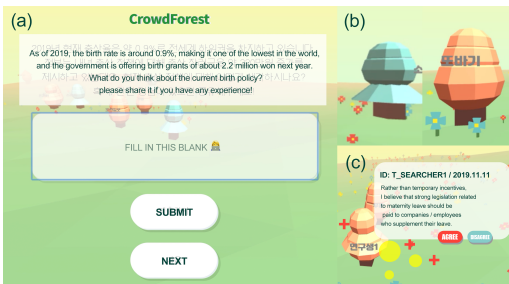


Figure 2: A screenshot of the CrowdForest. (a) The submission section that users can remain their opinions. (b) The tree visualization according to the result of analysis. (c) The sun animation effect when other users agree with the opinions.

3 CROWDFOREST

As illustrated in Figure 1, the designed tool consists of two sections. The first section describes the model training for a sentiment analysis, and the second section provides a visualization of the opinions at the front side of a website.

3.1 Data Preprocessing and Sentiment Analysis

We collected editorial textual data regarding a low fertility policy from Korean news websites over a 3 year period, which contained concrete claims and perspectives making the data easy to use as the ground truth. The collected data were labelled as one of three classes: positive, negative, or neutral. In addition, we excluded unwanted textual data such as emojis and names, which can be considered noise during the training.

We trained a recurrent neural network on the classes of a preprocessed dataset. We adopted pre-trained Korean word vector models for a high accuracy. In addition, the dataset was divided into training, validation, and testing datasets at a ratio of 6:3:1. Through this process, the model potentially distinguishes among the pros, cons, and neutrality regarding the user inputs.

3.2 Visualization and Implementation

We chose a natural ecosystem as the overall underpinning of the integration of the semantic figurative metaphor. The ecosystem

contains a number of symbiotic relationships. For example, trees grow with the help of the sun, wind, or water, and trees provide sustenance for insects and other creatures. We attempted to construct an opinion interface by applying this ecosystem domain as a metaphor. As illustrated in Figure 2, these visualization elements were developed through 3D modeling and an animation technique.

When users access the website, they can see a list of specific policies and navigate other results of a visualization like Figure 2. If users log onto the web page, they are able to participate in the discussion and or respond to other user opinions regarding the policies. For example, as indicated in Figure 1, if users agree with each other, their reaction is visualized as a sun, which can interact with other visual cues.

4 CONCLUSION AND FUTURE WORK

The proposed system, called CrowdForest, tries to solve the issue of cyber polarization based on semantic figurative metaphors. Utilizing machine learning algorithms, CrowdForest automatically evaluates user opinions and visualizes them. The system tries to mitigate the negative emotional response of users with other people who have a different insight. In future work, we aim to improving the metaphor design system and the interface design more persuasive. Also, we have in plan to take more user tests, because the more people use it, the greater the effectiveness of the tool as a social platform.

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