BirdsEye: Breaking Out of the Twitter Echo Chamber With a Multi-Robot Interface

Shengchen Zhang*
shengchenzhang1207@gmail.com
College of Design and Innovation, Tongji University
Shanghai, China

Zixuan Wang*
zixuanwang@tongji.edu.cn
College of Design and Innovation, Tongji University
Shanghai, China

What does social media without the echo chambers look like?

The answer... It's **robotic & tangible!** | Rotate and flip to browse. | Link to see the ongoing discourse. | Regroup to reconfigure your feed.
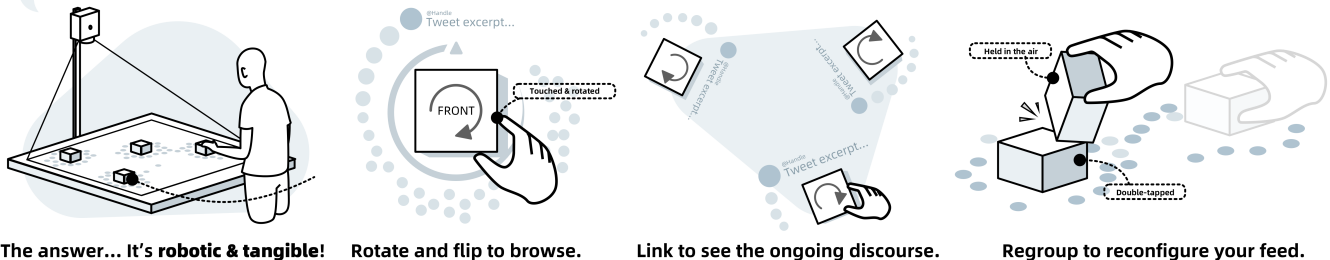
Figure 1: BirdsEye helps users break out of the social media echo chamber by enabling them to explore the complete discourse. It gives control back to the users by helping them interact with and reconfigure the recommendation system.

ABSTRACT

Social media sites are an increasingly popular place for news and public discourse. However, the current algorithmic recommendation is creating echo chambers. By utilizing a projector and toio robots, we present a new way of browsing social media content that gives the user a birds' eye view of all the different viewpoints regarding a topic and enables the user to interact with the algorithm. The user can cluster, browse, link, and regroup social media posts using intuitive interaction with the robots by moving, flipping, joining and tapping the robots. By directly interact with different viewpoints and the clustering algorithm, our application can help the user break out of the echo chamber and gain a comprehensive view on a topic.

CCS CONCEPTS

• **Human-centered computing** → **Haptic devices**; *Social recommendation*; • **Information systems** → *Social networking sites*.

KEYWORDS

human-robot interaction, tangible interfaces, robotic interfaces, social media, echo chambers

*Both authors contributed equally to this research.

1 MOTIVATION

Social media sites are an increasingly popular place for news and public discourse. These platforms, such as Twitter[1] and Weibo[2], use recommendation systems to create a personalized feed for each user [5]. While solving the problem of information overload [4], the approach creates an echo chamber that limits the users to similar posts they tend to like, which may result in social polarization and extremism [1, 2].

We aim to devise a new way of enjoying social media content without creating echo chambers. Our idea builds on the following premises:

- By providing a complete overview of the current discourse, people can bypass the echo chamber effect and get a more balanced view.
- Control can be given back to the user by creating an engaging way to directly interact with the recommendation system.
- Interacting with a tangible, multi-robot interface can help people understand and tweak machine learning models (their feeds) by making the intangible tangible[3].

Our work builds on existing research on multi-robot tangible interfaces for manipulating data, such as ShapeBots[7] and Zooids[6]. We contribute to the literature a new way to visualize and interact with social media data and the underlying machine learning model.

[1]https://twitter.com
[2]https://weibo.com

2 CONCEPT

Our concept revolves around using the toio robots[3] as the embodiment of a clustering-based recommendation system. Instead of filtering the posts to create a linear timeline, the system presents a bird's eye view of the ongoing discourse. The robots act as "shepherds" on a two-dimensional tabletop, each herding a cluster of posts with similar content and sentiment (positivity-negativity) by attracting them (Figure 2). These robots can be rotated, flipped, joined together, pushed apart, and stacked to manipulate the machine learning model and the data.

All posts related to the current topic are shown on the tabletop, characterized by the poster's avatar. The attraction forces between robots (representing clusters) and posts are proportional to their similarity. Overall, the interactive area gives a complete overview of the ongoing discussion.
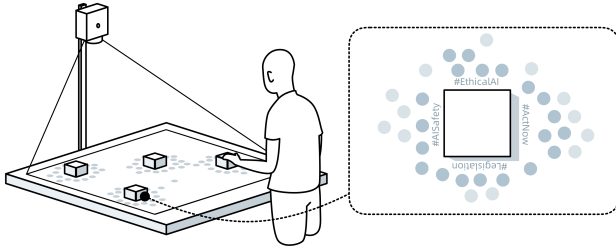
Figure 2: The setup of BirdsEye. It consists of an overhead projector, a large tabletop with a matted interactive area, and multiple toio robots.

3 INTERACTING WITH BIRDSEYE

The following paragraphs describe the main interaction modes of BirdsEye. In the future, more interaction methods can be expanded.

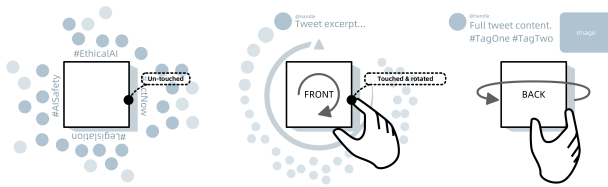### 3.1 Clustering and browsing

Figure 3: Browsing a cluster by rotating and flipping.

The interaction starts when the user places the robots into the interactive area. Tweets will be classified by these robots into several clusters based on content similarity and sentiments. The four sides of the robot each display a keyword within the cluster, characterizing the cluster for easier understanding (Figure 3, left).

The user can browse posts in a cluster by *rotating the robot*, similar to a timeline (Figure 3, middle). *Flipping the robot over* at any time will display the details of the current post (Figure 3, right).

3.2 Linking

Double-tapping robots on the side will link them together (Figure 4, left). These links can be broken by *pushing a robot far away from the group* (Figure 4, middle).

Linked robots will coordinate to highlight the discourse happening across multiple clusters. When one of the linked robots is *rotated*, the others will respond by rotating to display related posts in other clusters, thereby showing a more complete dialogue across the isles (Figure 4, right). The distance between the robots will also change based on the content similarity and sentiment of the posts.
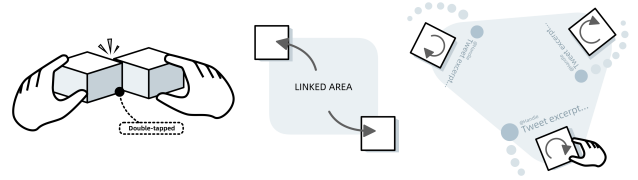
Figure 4: Linking multiple robots together to see the discourse happening across clusters.

3.3 Re-grouping

Picking up a robot and double-tapping the top of another robot will cause the *grouping* of their clusters. Posts from the former will merge into the latter (Figure 5, left and middle). The user can then choose to set aside the picked-up robot or place it back into the interactive area to create a new cluster (Figure 5, right).
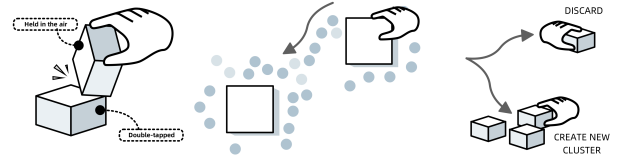
Figure 5: Re-grouping clusters.

4 IMPLEMENTATION

To demonstrate our design, we will collect tweets on *COVID-19 vaccination* to create a sample dataset. We will use the official toio Node.js API[4] in combination with front-end JavaScript to implement the interactions, which are within the possibilities of toio.

5 FUTURE IMPACT

Our work can potentially reduce the echo chamber effect though an engaging alternative to filtered feeds. This is also a step towards making machine learning algorithms more transparent and democratized by making the algorithm and data tangible.

---

[3]https://en.wikipedia.org/wiki/Toio

[4]https://github.com/toio/toio.js/

REFERENCES

[1] Pablo Barberá, John T Jost, Jonathan Nagler, Joshua A Tucker, and Richard Bonneau. 2015. Tweeting from left to right: Is online political communication more than an echo chamber? *Psychological science* 26, 10 (2015), 1531–1542.

[2] Matteo Cinelli, Gianmarco De Francisci Morales, Alessandro Galeazzi, Walter Quattrociocchi, and Michele Starnini. 2021. The echo chamber effect on social media. *Proceedings of the National Academy of Sciences* 118, 9 (2021).

[3] Magnus Høholt Kaspersen, Karl-Emil Kjær Bilstrup, and Marianne Graves Petersen. 2021. The Machine Learning Machine: A Tangible User Interface for Teaching Machine Learning. In *Proceedings of the Fifteenth International Conference on Tangible, Embedded, and Embodied Interaction* (Salzburg, Austria) *(TEI '21)*. Association for Computing Machinery, New York, NY, USA, Article 19, 12 pages. https://doi.org/10.1145/3430524.3440638

[4] Rahul Katarya and Yamini Arora. 2018. A survey of recommendation systems in twitter. In *2018 4th International Conference on Computational Intelligence & Communication Technology (CICT)*. IEEE, 1–5.

[5] Meen Chul Kim and Chaomei Chen. 2015. A scientometric review of emerging trends and new developments in recommendation systems. *Scientometrics* 104, 1 (2015), 239–263.

[6] Mathieu Le Goc, Lawrence H. Kim, Ali Parsaei, Jean-Daniel Fekete, Pierre Dragicevic, and Sean Follmer. 2016. Zooids: Building Blocks for Swarm User Interfaces. In *Proceedings of the 29th Annual Symposium on User Interface Software and Technology* (Tokyo, Japan) *(UIST '16)*. Association for Computing Machinery, New York, NY, USA, 97–109. https://doi.org/10.1145/2984511.2984547

[7] Ryo Suzuki, Clement Zheng, Yasuaki Kakehi, Tom Yeh, Ellen Yi-Luen Do, Mark D. Gross, and Daniel Leithinger. 2019. ShapeBots: Shape-Changing Swarm Robots. In *Proceedings of the 32nd Annual ACM Symposium on User Interface Software and Technology* (New Orleans, LA, USA) *(UIST '19)*. Association for Computing Machinery, New York, NY, USA, 493–505. https://doi.org/10.1145/3332165.3347911