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INFORMATION DIFFUSION MODEL OF SNS AND VISUALIZATION METHOD

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ABSTRACT

The dissemination of social media has led to the explosion of fake news, other misinformation and disinformation, which significantly impacts society. They are sometimes based on information transmission by individuals, groups, and organizations. In order to analyze the influence of information diffusion, it is necessary not only to visualize the spread from a bird's eye view but also to examine the characteristics of local information propagation and the impact of the behavior. In this study, we developed a multi-agent information diffusion model of social networking service (SNS). We investigated a visualization method that simultaneously grasps the local information diffusion by individuals and the overarching information spread by multiple user clusters. This method facilitates the recognition of the information diffusion within a group and the final dispersal status in addition to the condition of information dissemination by each individual.

1 INTRODUCTION

With the popularization of social media, information has diffused widely and in real-time, and not only correct information but also false information, such as fake news spread, which significantly impacts society. In the case of blowing up and the diffusion of fake news, the origin of the incident may be the transmission of a single social networking service (SNS) user, indicating that the actions of individuals can affect society as a whole. A method has been proposed to visualize the hierarchical structure of Twitter user network communities in a bird's-eye view of each hierarchy (Sakaki et al. 2019). In this method, they constructed a bird's-eye view of the entire Twitter network by combining the community extraction of Twitter users and the feature word extraction method to visualize information diffusion in clusters.

However, individual information transmission on SNS greatly impacts the whole. It's crucial to visualize information propagation from a top-down perspective and analyze the influence of characteristics and behaviors in local information diffusion. Therefore, this study proposes a visualization method that can simultaneously grasp local information dissemination by individuals and overarching information diffusion by multiple layers in a multi-agent simulation of information dispersal.

2 SIMULATION MODELS AND VISUALIZATION METHODS

We created a multi-agent simulation model using SNS users as agents. In this model, SNS users are associated with multiple preferred communities at the first level, with each community randomly assigning smaller communities from the second to the fourth level. During the simulation, users are categorized based on the lowest level of their belonging community, and they visually represent the community by forming circles with other users in the same group (Figure 1). When users receive information, they share it with their followers if the information's attributes match their community's. Each community includes an influencer user capable of disseminating information to a larger audience. When information is shared,

solid lines connect users to the recipients, indicating individual information transmission, with the quantity and direction of these lines providing a bird's-eye view of the information spread.

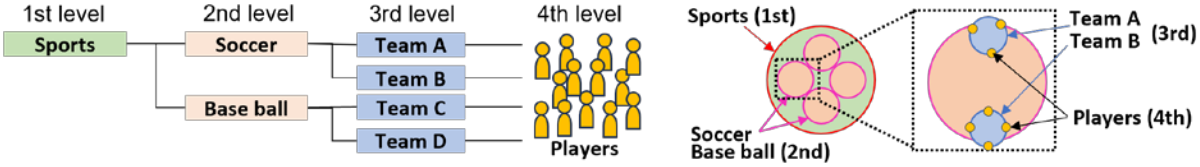

Figure 1: Layered structure of SNS users and example of visualization.

3 RESULTS AND WAY FORWARD

Figure 2 displays a simulation result of this model. Sixteen large circles represent the first-level information attributes, housing users exclusive to that level. Smaller circles within them represent users in subsequent levels. There are 5000 agents color-coded by their respective levels. Information was initially given to one user at 00:00 on the first day, and information diffusion occurred over the next 48 hours. Solid lines depict information communication among users, revealing the spread pattern.

At 14:00 in Figure 2, radial lines emanate from community No. 3, indicating influencer-driven spread within that community. At 19:00, numerous lines appear between No. 1 and No. 16 and No. 9 and No. 16, suggesting substantial information exchange between communities.

The final information dispersal status is shown at 23:00 on the second day. Green circles represent information diffusion within the first level, while orange circles represent dispersion in the second level. Darker circle colors signify broader information spread in each community, providing an overview of information diffusion and its target communities.

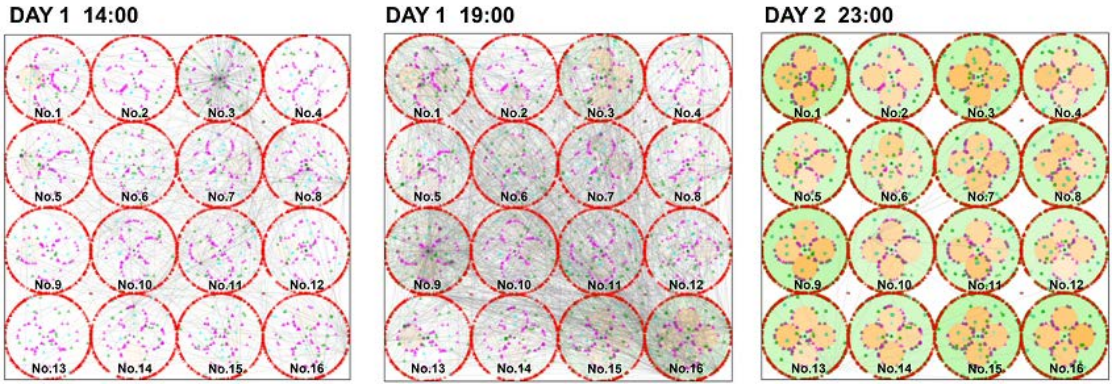

Figure 2: Transition of information diffusion by simulation.

4 CONCLUSION

In this study, our model could reproduce the information spread situation mainly among general users and visualize information diffusion locally and from a bird's eye view on SNS, comparing the information diffusion by this model with the example of large-scale distribution on Twitter (Yamashita et al. 2018). On the other hand, the model shows a discrepancy from the actual situation in the simulation of rapid information diffusion by the media and influencers. In the future, we aim to refine the model to elaboration, quantitatively assessing its effects.

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