D-Agree: Crowd Discussion Support
System Based on Automated Facilitation Agent

Takayuki Ito, Shota Suzuki, Naoko Yamaguchi,
Tomohiro Nishida, Kentaro Hiraishi, Kai Yoshino
Nagoya Institute of Technology, Gokiso, Showaku, Nagoya 466-8555, Japan
{ito.takayuki, nishida.tomohiro, yamaguchi.naoko}@nitech.ac.jp

Abstract

Large-scale online discussion platforms are receiving great attention as potential next-generation methods for smart democratic citizen platforms. One of the studies clarified the critical problem faced by human facilitators caused by the difficulty of facilitating large-scale online discussions. In this demonstration, we present our current implementation of D-agree, a crowd-scale discussion support system based on an automated facilitation agent. We conducted a large-scale social experiment with Nagoya local government. The results demonstrate that the agent worked well compared with human facilitators.

D-agree: Crowd Discussion Support System based on Automated Facilitation Agent
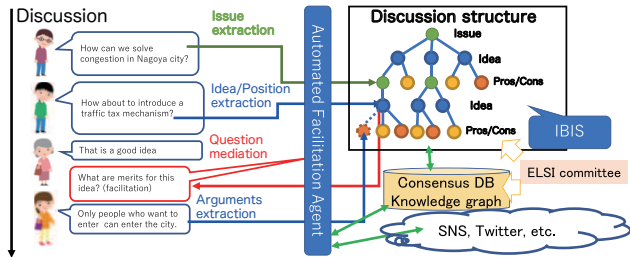
Outline

Figure 1: Outline of D-agree

Crowd-scale discussion platforms are receiving great attention as potential next-generation methods for democratic citizen platforms (Malone 2018). Such platforms require support functions that can efficiently achieve a consensus, reasonably integrate ideas, and discourage flaming. One system called COLLAGREE (Ito 2018) was employed for a large-scale experiment with Nagoya City, Japan. In their large-scale experiments, **human facilitators** promoted crowd-scale online discussions. They conducted more than 30 experiments and clarified the critical problems faced by

human facilitators caused by the difficulty of facilitating crowd-scale online discussions. Such discussions often have over a thousand opinions that are posted simultaneously. Many discussion threads become tangled with overlapping opinions. Such elements are characteristic problems for online discussions that are not seen in ordinary face-to-face discussion workshops.

Figure 1 outlines D-agree. D-agree is one of the web forum systems where participants can submit their opinions as texts. An automated facilitation agent extracts the discussion structure from the texts posted in discussions by people. We adopted IBIS (Issue-Based Information System) structure (Kunz and Rittel 1970) as an ideal discussion framework because our aim is to lead discussions through which people can clarify issues, ideas, and debate merits/demerits. IBIS effectively constructs such discussions.

Based on the extracted structure, the facilitation agent posts facilitation messages about the discussion so that the on-going discussion covers enough ideas, merits and demerits.

Automated Facilitation Agent

We developed automated facilitation agent software that observes the posted texts, extracts their semantic discussion structures, generates facilitation messages, and posts them to the discussion system. The software also filters inappropriate posts.

The facilitation agent consists of two parts: a discussion structure extraction/visualization mechanism and an observing and posting mechanism. To extract the discussion structure, we utilize argumentation mining technologies(Stab and Gurevych 2017) with BiLSTM , which first captures meaningful sentences and then important words that are IBIS components: issues, ideas, pros, and cons. After that, it identifies the relations among these IBIS components and unifies these relations and components into one discussion structure.

By using the extracted structure, the observing and posting mechanism posts facilitation messages. It has around 200 facilitation rules, which have been carefully collated after consultation with professional facilitators. By matching the rules and the obtained structure, facilitation messages are

generated.

Societal Experiment and Result

Our main objective is to gather opinions and discussions for a midterm draft of the Nagoya-city Next-Generation Comprehensive Plan, generated by the Nagoya municipal assembly, the local government, and its offices. We conducted a real world experiment with the Nagoya municipal government from November 1 to December 7, 2018. Nagoya City citizens discussed five themes about their city's future. We got 15,199 page views, visits from 798 participants, 157 registered participants, and 432 submitted opinions. The plan has five main themes. Themes 1 and 2 were facilitated by expert facilitators. Themes 3 and 4 were facilitated only by automated facilitation agents. Theme 5 was facilitated by cooperation between humans and agents.
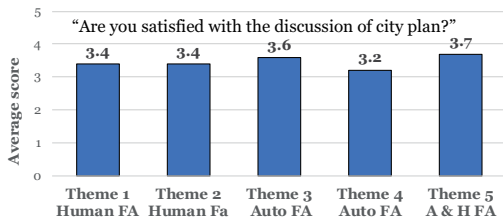
Questionnaire (N=20) results of "are you satisfied with the discussion of the city plan?". Satisfaction scores on discussion by Auto FA were satisfied at same level as discussion by Human FA.

Figure 2: Result: Satisfaction

Satisfaction: Figure 2 shows the results for the user satisfaction scores. After this experiment, we provided several questionnaires. One of the questions was "Are you satisfied with the disucssion of the city plan?". The participants could give their answers to select one from 5: strongly statisfied, 4: satisfied, 3: neutral, 2:unsatisfied, and 1: strongly unsatisfied. The satisfaction scores are almost the same scores, 3.2 to 3.7, among all of the themes, suggesting that users can experience satisfying discussions even if they are facilitated by the automated facilitation agent (Auto FA). In particular, the case of collaboration between automated facilitation agent and human facilitation (A & H FA) achieved the highest satisfaction score.

Performance: As a measure on performance of the automated facilitation agent, we investigated how much one facilitation message generated the other nodes, which means $(Num of each node)/(Num of FA)$. Table 1 shows the result. When we see the averages, then the performance of the human facilitator for theme 1 is lower than the other themes. When we see Theme 5, which is the case of collaborative facilitation by human and our agent, the performances to get Ideas and Pros are 280.6% and 130.6% drastically better than the other cases. From the viewpoint of the facilitation performance, collaborative facilitation between humans and agents worked quite well.

Table 1: Facilitation Performance (%)

Nodes	Theme				
	Th. 1	Th. 2	Th. 3	Th. 4	Th. 5
Issue	10.9	30.3	22.2	11.1	25.0
Idea	27.0	87.9	108.3	100.0	**280.6**
Pro	5.1	24.2	16.7	48.1	**130.6**
Con	4.4	18.2	16.7	40.7	30.6
Average	11.9	40.2	**41.0**	**50.0**	**116.7**

Figure 3: Actual Succesful Case

Actual case: Figure 3 shows an actual case where our automated facilitation agent successfully facilitated a discussion among civilians. Issue 1 was raised by the participants. The automated facilitation agent identified this post as an Issue. Then he/she asked "What can we do to solve it?" Then a participant posted idea 1. The automated facilitation agent identified this post as an idea and raised an issue to deepen the idea. Then a participant posted idea 2. The automated facilitation agent works very efficiently. There are a lot of succesful cases like this.

Conclusion

We presented our current implementation of a crowd-scale discussion support system based on an automated facilitation agent, which extracts discussion structures from text discussions, analyzes them, and posts facilitation messages. We did a large-scale experiment in Nagoya where our agent worked quite well.

References

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